



An overview of the roots of civil wars: natural factors and economic conditions

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An Overview of the Roots of Civil Wars: Natural Factors and Economic Conditions

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PARIS SCHOOL OF ECONOMICS
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An Overview of the Roots of Civil Wars: Natural Factors and Economic Conditions

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ABSTRACT

We provide an overview of the roots of civil conflict. We distinguish between economic conditions and natural factors as two broad categories of roots identified in the empirical literature. As a preamble, we present an overview of the theoretical literature on the roots of civil war and distinguish between “capacity-related” and “opportunity-related” causes of conflict. We also provide policy implications regarding the prevention of civil conflicts.

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An Overview of the Roots of Civil Wars: Natural Factors and Economic Conditions

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EXECUTIVE SUMMARY

Civil war is one of the most deadly human phenomena. Since the end of World War II, more than 5 million people have died because of civil wars worldwide. These wars have deep and manifold disastrous consequences.

We provide an overview of the roots of civil conflict. As a preamble, we present an overview of the theoretical literature on the roots of civil war and distinguish between "capacity-related" and "opportunity-related" causes of conflict. We distinguish between economic conditions and natural factors as two broad categories of roots identified in the empirical literature. Poverty, inequalities or low economic growth are economic determinants that are strongly link to civil war. The fractionalization of the society or the climate change seems to be a major concern on the determinants of civil conflicts.

In this report, our focus is on the roots of civil war instead of aftermath. In the case of civil war, **we think that prevention is better than cure**, but it is not clear whether opportunities for prevention are more promising than opportunities for ending ongoing conflicts and reducing the risk of conflict recurrence. An effective criteria for anticipating the likelihood of civil war is to consider whether the country has already suffered from a civil conflict. Indeed, half of the civil wars since World War II, and every civil war that began after 2003 have taken place in countries that had a previous civil war. A recent report from the World Bank argues that international assistance focuses on recovery rather than prevention. **The main focus of the literature on the causes of civil war may then seem paradoxical.**

However, one may think that it would be more relevant for research-based policies to improve the targeting of conflict-prone countries and to introduce appropriate mechanisms to prevent conflicts and avoid the very high associated costs. The aim is not to deny the huge needs of post-conflict countries. However, **understanding the precise causes of civil war may help to apply adequate instruments to prevent them.** Countries need an improvement of coordination between policies, security and development to carry out prevention interventions.



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The main empirical result of the literature suggests that **the best long-run conflict prevention strategy is economic development**. A direct instrument for development is aid to poor countries. Aid has some positive effects in conflict prevention, in addition to the desired reduction of poverty. **An essential factor of long-run development is also the quality of institutions**. An improvement of institutions linked to security, justice and labor market should first be consolidated to prevent repeated cycles of violence.

Solutions to prevent conflicts linked to climate change are presumably to be found in the agricultural sector. **Most authors argue that agriculture lies at the heart of the climate-civil war relationship**. Indeed, African countries remain highly dependent on agriculture for both employment and economic production, with agriculture accounting for more than 50% of gross domestic product . Governments and aid agencies should help Africa in reducing conflict risk by improving the ability of agriculture to deal with climate change. Develop new crop varieties adapted to dry climates, build modern irrigation infrastructures, develop catastrophic weather event insurance are mechanism that can help to prevent the effect of climate change of conflict for instance. Our point of view is that **climate adaptation initiatives have to be considered as an additional tool to help development and prevent conflicts**.

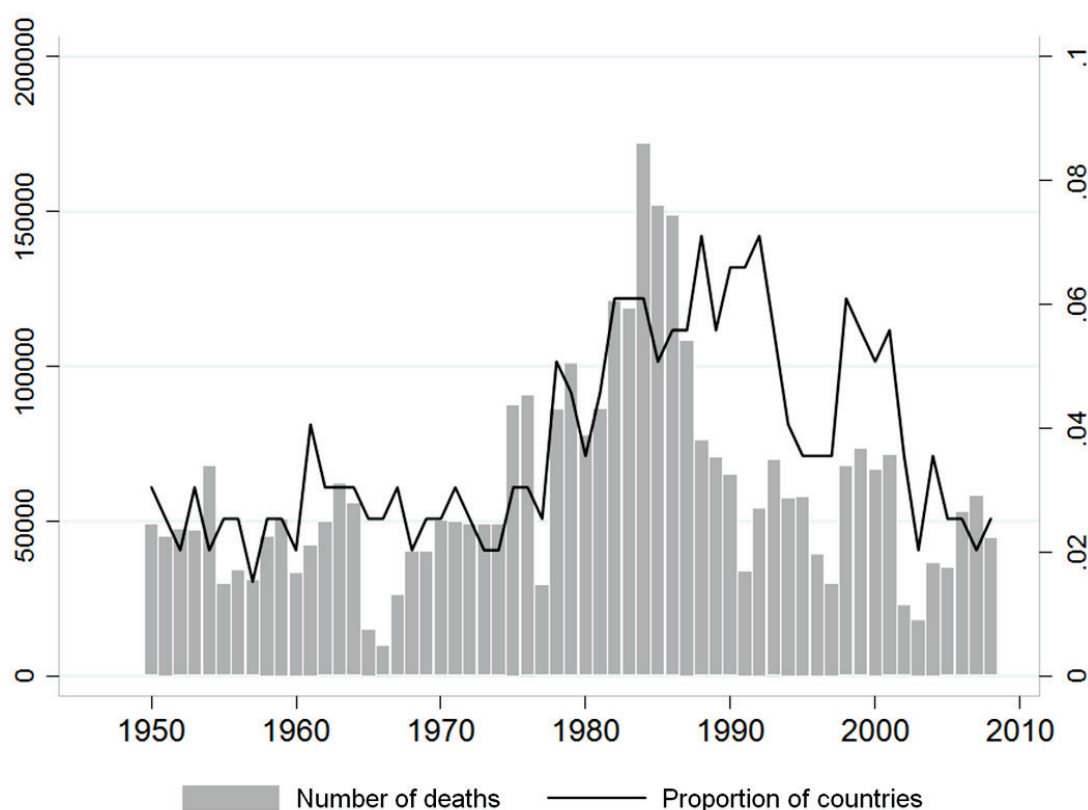
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Introduction

While a vast majority of countries have experienced economic development since the end of World War II, some countries have suffered from repeated cycles of violence. Civil wars and civil conflicts are frequent as well as persistent. Each year since 1950, about 2-7% of countries in the world have suffered from a civil war (Figure 1)¹ and about a third of countries worldwide (53 countries) have experienced a civil war over the period (see Figure 2). Twenty-five percent of countries have experienced at least ten years of civil war during the period. The average length of civil wars is about eight years and during the last decade, 90% of civil wars have occurred in countries that had already been subjected to a civil war in the last 30 years.

Figure 1 – Number of Deaths and Proportion of Countries Since 1950



Source: UCDP/PRIO data (version 4-2009)

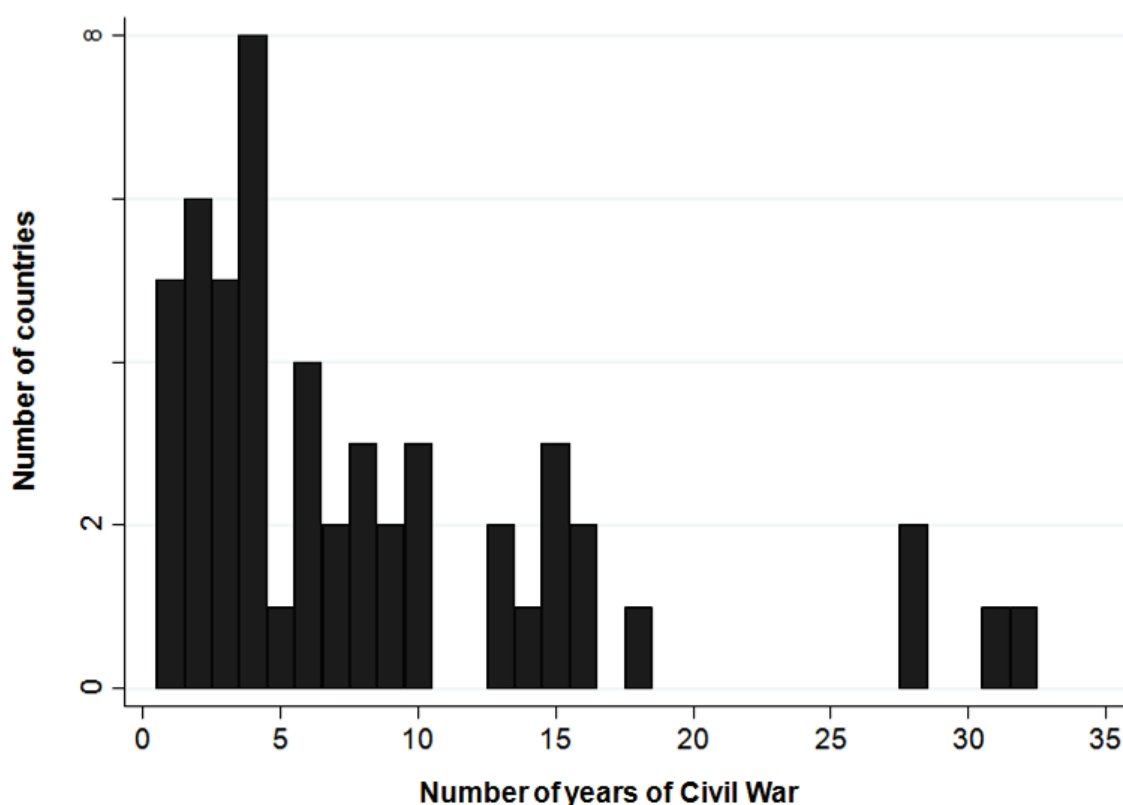
Civil war is one of the most deadly human phenomena. Since the end of World War II, more than 5 million people have died because of civil wars worldwide. These wars have deep and manifold disastrous consequences. The World Bank report on Conflict, Security and Development (World Development Report, 2011) asked the Norwegian research institute Fafo to conduct surveys in six countries and territories to evaluate the effect of violence on

¹ We use the UCDP/PRIO data (version 4-2009). According to the values given by UCDP/PRIO, the upper bound is 11 million deaths since World War II. The percentage of countries which have experienced a civil war is calculated for a number of countries equal to 197.

livelihoods². The proportion of the population touched by conflicts is very large: “[...] up to 26 percent of respondents report that their immediate family’s home had been looted, up to 32 percent had been displaced, and up to 19 percent had a family member who had been tortured”. Other consequences of civil war include a poverty boom (Justino and Verwimp, 2008), the collapse of civil liberties and political rights (Chen et al., 2007), the tragic deterioration of health and education, the increase in inequalities, and the destruction of human and physical capital that hinders macroeconomic performance. All these consequences lead to a greater number of deaths which are an indirect cost of civil wars.

Conflicts also have regional and global repercussions. The consequences extend to external relationships, with negative spillovers for neighboring countries (Murdoch and Sandler, 2004), international trade destruction (Martin et al., 2008) and a massive flight of assets (Collier et al., 2004). An estimate of the negative spillovers finds that Tanzania, a country making development advances, has lost 0.7% of its GDP every year for each neighboring country in conflict (World Development Report, 2011).

Figure 2 – Years of Civil War Since 1950



Source: UCDP/PRIO data (version 4-2009)

² The six countries and territories are DR Congo, Ivory Coast, Mali, Sierra Leone, the Gaza Strip, the West Bank and Colombia.

The consequences of civil war are quite well identified, but it is very difficult to provide an accurate assessment of its global costs. Nevertheless, Collier et al. (2009) attempt to do so : in the case of a small, low-income country, the cost is around 43 billion dollars for the direct loss of income. The estimated cost goes up to 60 billion dollars when the mortality and morbidity effects are taken into account.

Unfortunately, even after the conflict has ended, a civil war has deep, persistent effects which are complex to evaluate. Among these are long-term effects on such deep determinants of economic development as child education, social cohesion or health. At the same time, Collier et al. (2009)'s analysis does not focus on the spatial and geographic inequality raised by the conflict. Civil wars induce global spillovers such as terrorism, crime or disease which are very difficult to capture (Collier et al., 2009). Finally, the question of the comparative analysis of a dollar added to one's income needs to be considered. Indeed, the effect of a dollar added to one's income is not the same for poor or rich people. Collier et al. (2009)'s assessment provides a first insight into the calculation of the costs of conflicts³.

Before we go any further, it is important to explain how civil war and civil conflict are defined when quantitative data are available. Political scientists and economists define conflict in a given country as an internal conflict that concerns at least two parties (government being among them), with a use of armed forces resulting in human deaths. A conflict is categorized as a civil war if there are over 1,000 (battle-related) deaths per year and as a civil conflict if there are between 25 and 999 (battle-related) deaths per year. The Peace Institute of Oslo (PRIO)⁴ and Correlates of War Project (COW)⁵ are the two main institutions which collect data on conflicts. They provide a list of all conflicts since the end of World War II for each country in the world, with information on the geographical localization of the conflict, the parties involved and for some recent cases the number of deaths in each battle with a specified point in time.

The prevalence of civil war and its deep and persistent effects has led researchers to understand the roots of civil war outbreak, incidence, duration and intensity. The roots of civil war are manifold, but we have chosen to focus on two broad categories, economic and natural factors. Economic roots are for instance the level of economic development, the economic growth or economic inequality. Natural factors are for instance specific geographical conditions (inhospitable terrain, such as mountains, swamps or jungle), the abundance of natural resources (such as oil, gas or diamonds), and the local climate conditions.

³ They also underline the necessity to improve methods and data to calculate the whole costs of wars properly.

⁴ <http://www.prio.no/>

⁵ <http://www.correlatesofwar.org/>

Identifying the roots of civil war and understanding the interactions between these roots is crucial in order to prevent these wars. In this report , we present an overview of the roots of civil war and we more specifically highlight the link between natural factors, economic wealth and civil war. We present some of the major questions in the literature such as: what motivates people to engage in an armed conflict? What is the opposing parties' main goals? Why can they not reach a peaceful agreement? Do economic factors affect civil war and peace and, if so, how? Do inequalities increase the likelihood of a civil war in a given country? Along which lines does civil war emerge in a society? What is the role of natural resources? Do natural events increase the likelihood of a civil war and how? Will climate change increase the occurrence of civil wars?

We focus on the major roots of civil war identified in the literature. In the first part, we shed light on the economic theory of conflicts that provides a useful framework to understand conflicts in general. It helps to disentangle the empirical conclusions regarding civil wars in particular. In the second part of this report, we present an overview of the roots of civil conflict identified in the empirical literature and distinguish between economic conditions and natural factors as two broad categories. Moreover, we present several directions for future research. The third part presents some policy implications, notably with regards to the prevention of civil conflict

1 Capacity and Opportunity: The Theoretical Roots of Civil Conflict

One of the main goals of the theoretical models of conflict is to explore the rational causes of conflict. Reconciling rationality and conflict is challenging because a conflict implies the destruction of productive resources⁶. However, “capacity” and “opportunity” sometimes lead to conflict⁷. Parties can be able or not to fight (they can be strong or weak, and they can be able or not to raise revenue) and they can be able or not to commit to not fighting, which are examples of what we refer to as “capacity”. Parties may also or not have incentives to fight, i.e. their benefits to fight may outweigh or not their (opportunity) cost of fighting, which is what we refer to as “opportunity”. A strand of the recent literature aims at explaining the rational reasons for conflict. There are two prerequisites for conflict between rational agents. Conflict arises only if there is no mutually advantageous and enforceable agreement or if the agents are not able to reach such an agreement (Fearon, 2005)⁸. Hence, the reasons for conflict should explain bargaining failures or situations where the benefits from conflict are greater than the costs for at least one of the agents involved.

1.1 Commitment and Fighting Technology

Commitment problems are pervasive causes of conflicts. An inability to enforce a bargaining agreement and/or to credibly commit to abiding by an agreement is related to the capacity of the parties to fight and their capacity not to fight. The anarchic state of nature described in Hobbes (1651)’s *Leviathan* relates to conflicts due to the inability of men to trust each other. Conflict arises when the agents cannot commit to not fighting even after a transfer of resource from one agent to another (see Konstantin and Schwarz (2008) for a dynamic solution to this problem). Contest models in line with Haavelmo (1954) rely on a lawless framework and on the commitment explanation of conflicts. In this literature, conflicts are predominant because of a focus on social dilemma games.

A key element of these models is the technology for fighting (see Hirshleifer (1989), Grossman (1991) and Skaperdas (1992)). These models of conflict considered the trade-off between production and appropriation⁹. Resources devoted to a conflict should increase with the relative effectiveness of the fighting technology.

⁶ Garfinkel and Skaperdas (2007) claim that the challenge comes from the emphasis put by economics on the gains from trade.

⁷ Our discussion is mainly based on three surveys on the theoretical literature of conflict (Garfinkel and Skaperdas, 2007; Bloch, 2009; Jackson and Morelli, 2009).

⁸ Jackson and Morelli (2009) review five main causes for these situations that we choose to group into “capacity” and “opportunity” causes of civil war.

⁹ Garfinkel and Skaperdas (2007) review the literature based on the “contest model” where the efforts put forth by the parties translate into a probability of winning a “prize”

This technology is broadly defined in the literature as the strategies to take power in a state. It includes different kinds of protest such as rapid strikes, public protests or revolution; different strategies to dismiss the government such as mass popular demonstrations or creating defections within the regime.

The technology for fighting is also the capacity to have an access to firearms, to have skilled and trained fighters, and to have foreign support for instance. Some specific geographical conditions such as the ruggedness of the terrain, the proportion of the country that is made up of mountains, swamps or jungle is included in the broad definition of technology.

1.2 Cost, benefits and information

The other causes of conflict lie in the opportunities for the different parties, i.e. their individual costs and benefits to fight: parties may fight because of asymmetric information about the potential costs and benefits of a conflict, because of the indivisibility of resources that might change hands in a war (so that not all potentially mutually beneficial bargaining agreements are feasible), because of agency problems, where the incentives of leaders differ from those of the populations that they represent, or because of multilateral interactions where every potential agreement is blocked by some coalition of states or constituencies which can derail it. Distorted benefits because of information asymmetries are pervasive¹⁰.

Agents may have inconsistent beliefs, and conflict may thus result for instance from the overconfidence of both parties (Slantchev, 2007). Another form of asymmetric information leading to conflict is linked to the motivations of the agents. If a rational agent thinks that there is a (small) probability of being faced with an irrational foe, the rational agent can choose to arm and fight (see Waltz (1959), Schelling (1963), Kydd (1997), Baliga and Sjoström (2004), Baliga and Sjoström (2009)). The fear that the adversary will become stronger in the future may also be a reason for conflict (see the discussion in Taylor (1954) for the case of wars between great powers). Mass killing can then be interpreted as a strategy to reduce the future strength of the adversary (Esteban et al., 2010).

Another convincing reason for conflict lies in the possibility of a conflict of interests between the decision maker and the rest of the group represented. Jackson and Morelli (2009) and Bevia and Corchon (2010) argue that conflict may arise when the decision maker expects greater benefit (gains or glory) than his group (the citizens in the case of interstate conflicts) or when the decision maker does not internalize all the costs that his group bears.

¹⁰ Conflict also emerges when there is an advantage to attack first (Powell, 1993; Fearon, 2005; Chassang and i Miquel, 2008; Morelli and Rohner, 2010).

1.3 Two controversies

The first controversy that we call “the paradox of capacity” is linked to the comparison between the theoretical “contest model” results and the main correlation highlighted in the empirical literature. Blattman and Miguel (2010) notice that this literature does not clearly support the cross- country correlation between poverty and civil war. Indeed, poverty makes fighting more profitable than producing (Grossman, 1999), but as the national income decreases one should expect less fighting because there is less to fight over (the “prize” is smaller).

The second controversy that we call “cooperation in conflict” relates to the study of the microeconomics foundations of conflicts. The vast majority of the aforementioned papers consider fighting groups as unitary actors. Important remaining questions are: why do individuals join armed groups? How and why do groups form? Along which lines do conflicts emerge? These three questions are linked to the famous collective action problem (Olson, 1971) since conflicts such as civil wars occur between groups. Despite the fact that the essence of any conflict lies in the failure of cooperation, some degree of cooperation (collective action) is necessary in fighting groups. Classic solutions to the collective action problem use incentives to motivate participation. Most models (see Grossman (1999)) consider material and pecuniary incentives such as wages, opportunities to loot, promises of future reward, or physical protection from harm. Principal-agent models have been used to illustrate such situations.

Gates (2002) builds a model on the use of material incentives alongside ethnic ideology to motivate citizens to participate in the rebellion and Chwe (1990) and Beber and Blattman (2008) argue that pain is also used as an incentive. Several scholars (Gurr, 1971; Paige, 1975; Scott, 1976) argue that inequality motivates participation in a rebellion because it brings on a sense of frustration over inequality, the destabilization of traditional social systems, or the exclusion from the economic benefits of modernization.

Their arguments are illustrated by the agrarian revolutions in the 1960s and 1970s. For an overview of ethnic mobilization and violence, see (Laitin, 2007; Fearon, 2006). On ethnic divisions and economic performance, see (Alesina and La-Ferrara, 2005; Bardhan, 2004). In a recent paper, Esteban and Ray (2011a) provide a microfoundation for the link between conflict intensity and some usual indexes of inequality and polarization. They propose a behavioral model where “cohesion” is maximal when individuals maximize the objective of the group. Cohesion can also be interpreted as a measure of the (exogenous) severity of the collective action problem inside groups.

The second key factor in analyzing groups is the “degree of publicness” of the goods (whether goods are public goods or group-specific). Esteban and Ray (2011b) show that intra-group homogeneity in the extent of radicalism promotes conflict. The endogenous formation of fighting groups and the endogenous determination of the separating lines of fighting groups are two important interrelated questions.

The endogenous formation of groups in contest models has been reviewed in Bloch (2009). This literature has highlighted two general intuitions. The first intuition is called the “paradox of

alliance formation” (Konrad, 2009). This paradox is based on a simple result: parties have no incentive to form a two-player alliance against a third one (Skaperdas, 1998; Esteban and Sakovics, 2003) because members of the alliance have incentives to free-ride on each other.

Thus, they reduce their efforts because they have to share the prize and then do not receive full return on their effort. The latter effect is even stronger if the sharing is inefficient (e.g. if the members of the alliance have to fight to appropriate the prize). The paradox of alliance formation poses a challenge, as alliances are observed in reality. The second intuition of the literature is that the grand coalition plays a special role. In a model where all coalitions may possibly form and the prize is peacefully shared among alliance members if the grand coalition forms (and no resources are wasted on conflict), Bloch et al. (2006) and Sanchez-Pages (2007) show that the grand coalition will often emerge as the equilibrium of the process of endogenous coalition formation. This result presents a challenge to understand why smaller, competing alliances form and fight¹¹.

A very interesting direction for research considers the determination of the lines of group conflicts. Robinson (2001) and Esteban and Ray (2008) consider that agents belong to different groups based on several lines. Typically, citizens are distributed into groups along class lines and ethnic lines. They show that ethnic conflicts are more likely than class conflicts. More specifically, Esteban and Ray (2008) argue that ethnic conflict is more likely than class conflict using the comparative advantage principle: the rich have a low opportunity cost of resources and the poor have a low opportunity cost of conflict labor. The synergy between the rich and the poor makes ethnic alliances more efficient for fighting than class alliances (see Esteban and Ray 2011b for a related empirical study).

¹¹ Lee (1995), Baik and Shogren (1995), and Noh (2002) study situations where the members of groups choose a sharing rule (they weigh the egalitarian and the relative performance rule). The most prominent result is that in the case of two groups, the relative performance rule is chosen whereas both groups would be better off in choosing the egalitarian rule.

2 Economic and Natural Factors: the Empirical Roots of Conflict

In this section, we present a (non-exhaustive) list of empirical roots that appears to be major determinants of civil conflict. For each broad group of determinants, we propose a state of the research and several directions for future research. Note that all the roots of civil conflicts presented below are not mutually exclusive. Civil conflicts break out because of a conjunction of many parameters. There are latent tensions in every country and other determinants create a spark which fuels tensions and can lead to the outbreak of civil conflicts.

2.1 Economic Wealth Determinant

A growing body of empirical literature looks at conflict and its determinants. Economic wealth matters as Collier and Hoeffler (2004) claimed in their seminal paper “...that political and social variables that are most obviously related to grievances have little explanatory power. By contrast, economic variables, which could proxy some grievances but are perhaps more obviously related to the viability of rebellion, provide considerably more explanatory power” (p1). The role of economic growth or economic development in the outbreak and incidence of civil war is an illustration of the dichotomy between greed and grievance. As Figure 3 shows, when we plot the Log GDP per capita in 2007 with the percentage of years in conflict, it seems that there is a negative correlation.

2.1.1 About the validity of the GDP data of poor countries

Before interpreting this correlation, it is important to call into question the validity of the GDP data of poor countries (Deaton, 2005; Young, 2009). The statistical systems in poor countries suffers from shortcomings and these concerns are much more salient during civil war episodes. As a result, it is essential to keep in mind that studies focusing on the GDP of poor countries suffer from a problem of GDP measure. However, we can be optimistic that this issue will be overcome. First, the economic development and the improvement of the statistical system will enhance the quality of the data. Second, alternative measures can be used. For instance, Chen and Nordhaus (2010) examine the luminosity (the measure of nighttime lights) as a proxy for economic activity. Last, this point underlines the necessity to consider the analysis at the level of the country with caution and to increase the research at a micro-level.

2.1.2 Poverty and Conflict

Keeping in mind the insufficiency of the data, the literature reports a negative correlation between the log GDP per capita and the percentage of years in conflict. But the interpretation of this correlation is open for debate.

The first debate lies in the interpretation of this negative correlation. The interpretation uses concepts very close to the two broad categories of roots of civil war presented in the theoretical part of this report: capacity and opportunity. On the one hand, Fearon and Laitin (2003) interpret the robust negative effect of GDP per capita on civil war as a weakness of the state's

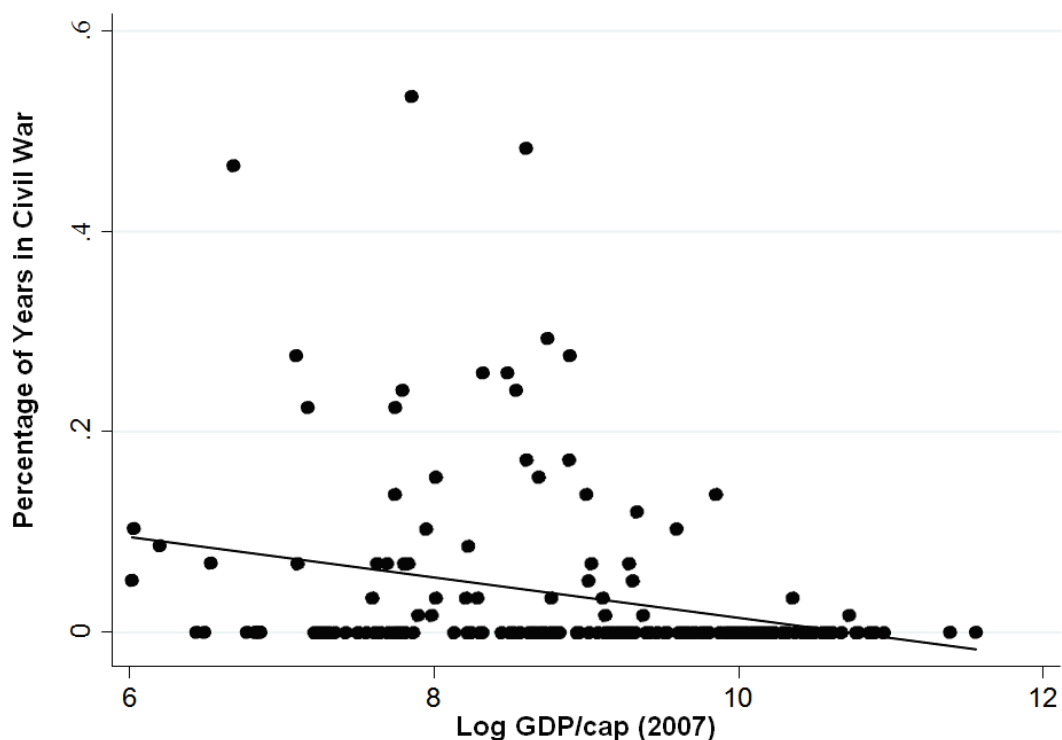
capacity (which favors the recruitment of rebels). In other words, the state does not have the capacity for instance to enforce the law, to discourage the formation of rebels group or to build an army to impress the rebels. On the other hand, Collier and Hoeffler (2004) interpret the result as being due to a weak opportunity cost of fighting faced by potential rebels. They consider the GDP per capita as a proxy of individual wealth. If the individual wealth is low or individuals are not able to have enough to eat, the opportunity cost is low. Fearon and Laitin (2003) and Collier and Hoeffler (2004) have different interpretations, but both have a theoretical support (see the previous section). Moreover, we can say that these two interpretations do not seem to be exclusive. The literature needs to go further to identify if one of these interpretations is more significant than the other.

The second debate lies in the accuracy of the causal relationship. Miguel et al. (2004) are the first to address the weakness of the empirical identification and notably the endogeneity of economic variables for civil war. They argue that the effect of economic conditions on civil war could be influenced by a reverse effect (reverse causality). Indeed, civil war has a deep, negative impact on the economic development of a country. In order to disentangle the relationship, they propose to use an instrumental variable method¹².

As most of the countries which have experienced civil war episodes rely heavily on the agricultural sector, Miguel et al. (2004) use rainfall variation as an instrument for economic growth. They focus on the Sub-Saharan Africa countries where the irrigation of the cropland is minimal and the part of the agricultural sector (in national income) remains substantial.

The national income is then very sensitive to weather shocks in this region of the world. They find that a “negative growth shock of five percentage points increases the likelihood of conflict by one-half the following year” (p1). In spite of a very fascinating controversy on the robustness of this instrumentation (we will look further into that issue in the next section), a consensus emerges on stating that poor countries with slow economic growth are more likely to be subject to civil wars. Unfortunately, this econometric strategy does not allow the authors to draw definitive conclusions about the distinction between channels explaining the negative correlation between GDP and civil war. On the one hand, weather shocks can induce conflict because they reduce the opportunity cost of fighting for populations that are highly dependent on crops. On the other hand, a climatic shock can reduce the agricultural production and the related taxes which weakens the state’s capacity.

¹² A variable correlated with the level of development and growth, but not with the residual part of the probability to enter into an armed conflict.

Figure 3 – Civil Wars and Economic Development

Source: Penn World Table 7.0, PRIO

Figure 3 represents the Log GDP per capita in 2007 with the percentage of years in civil wars since the end of World War II. Data on GDP come from Penn World Table 7.0 and data on civil war from PRIO

2.1.3 Using Price Shocks to Identify a Causal Relationship

In this regard, a few papers use price shocks to study the relationship between economic conditions and civil war (Besley and Persson, 2008; Bruckner and Ciccone, 2010). Besley and Persson (2008) study the direct impact of import commodity prices and export commodity prices on civil wars. They do not focus directly on commodity price variations. They show that higher world market prices of exported commodities are strong, significant predictors of the prevalence of civil war. They interpret this result as a consequence of growing government revenue, which increases the incentive to capture the power. They also show that higher world market prices of imported commodities increase the likelihood of civil conflict, reducing real wages and also the opportunity cost of fighting. Bruckner and Ciccone (2010) exploit international commodity price movements as an instrumental variable for economic conditions. They use the annual growth rates of the commodity price index as their main explanatory variable, whereas Besley and Persson (2008) use the level of the price index. Bruckner and Ciccone (2010) show that civil wars are more likely to occur in countries that experience a downturn in the international price of their export commodities. These two papers claim that the level or the variation of commodity prices are significant.

We can imagine that the effects of commodity prices are not the same depending on the level of development. Countries where civil wars are likelier to occur after a downturn in

international commodity prices are countries where the state has the weakest ability to overcome such a downturn.

2.1.4 Further Research

Bazzi and Blattman (2011) claim “that errors and publication bias have likely distorted the theoretical and empirical literature on political instability”. They argue that the results of cross-national analyses (on commodity shocks and civil wars) are not robust to alternative econometric methods or data.

One can also think that this criticism is also true for almost all cross-national analyses on civil wars. However, we think that many avenues of research can lead to an improvement of the understanding of the roots of civil war. In the case of commodity shocks, a first improvement would be the use of a region-specific measure of agricultural specialization within a country. In other words, considering changes in the world demand of agricultural commodities produced by the different regions within a country, thus removing the usual assumption that specialization is similar across regions would be a first improvement.

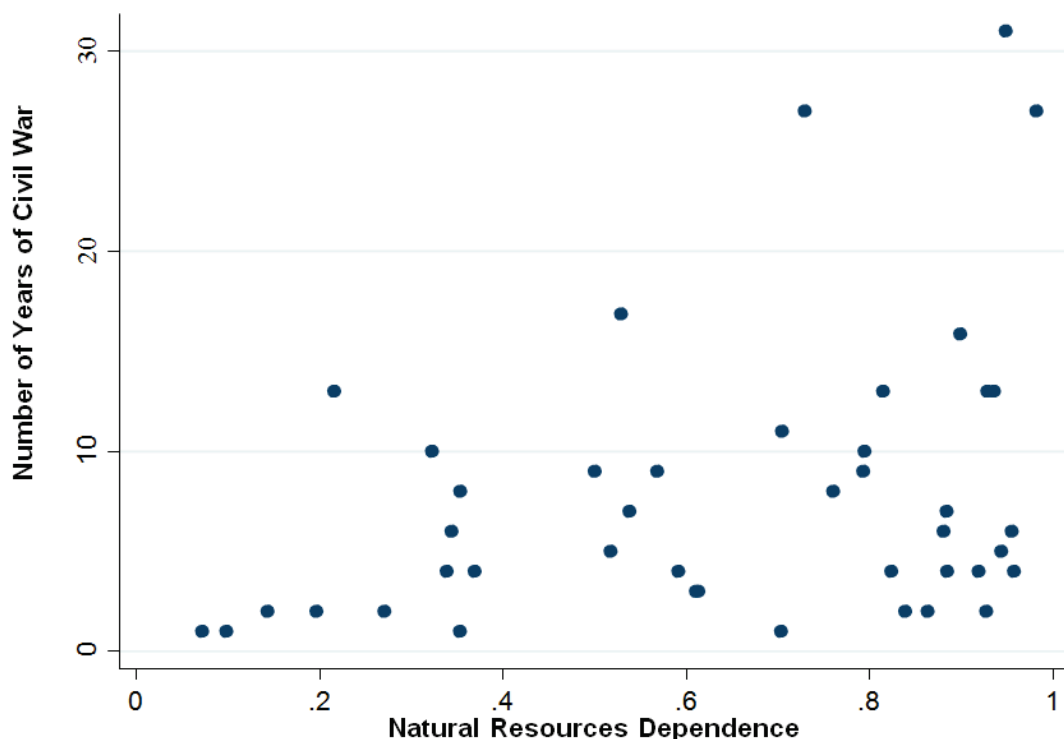
In order to further improve the identification, it could be useful to increase the number of external income shocks considered. Similarly, researchers need to find other external shocks such as sudden financial constraints for countries, trade policy or monetary policy which can lead to regional income variations. A third improvement would be to use the intra-country dimension in the available data to study the effect of external income shocks on the geography of conflicts. For instance, Dube and Vargas (2011) show that a conflict is likelier to break out when the coffee price falls, but less likely when the oil price falls in Colombian municipalities. We think that this kind of result needs to be confirmed for other countries.

2.2 Natural Factor Determinants

2.2.1 Natural Resource Determinants

Many studies, which are based on cross-country comparisons, argue that there is a link between the dependence on natural resources and the outbreak of civil war. [Figure 4](#) concisely illustrates this fact by linking the dependence on natural resources and the number of years of civil war¹³. The higher the dependence on natural resources, the higher the number of years of conflict. It seems that countries which have abundant natural resources are more likely to be subject to civil war.

¹³ A variable correlated with the level of development and growth, but not with the residual part of the probability to enter into an armed conflict.

Figure 4 – Civil Wars and the Dependence on Natural Resources

Source: PRIO and World Bank

Figure 4 represents a ratio for the dependence on natural resources linked to the number of civil wars. We only consider countries involved in a civil war since the end of World War II. The dependence on natural resources is defined as exports of natural resources over total exports.

Collier and Hoeffler (1998) and Collier and Hoeffler (2004) were the first to show that the dependence on natural resources and the risk of civil war are positively correlated when the level of dependence is low and they are negatively correlated when the level of dependence is high. Among others, Humphreys (2005) and Ross (2006) show that the abundance of natural resources is positively correlated to the risk of civil war using some measures of oil and diamond deposits. As we underline it in the theoretical part of this report, the abundance of natural resources represents an incentive to fight to capture the power and to have an access to the mineral wealth. Moreover, natural resources can help finance the rebellion. It is the case particularly for natural resources which have a high appropriability level, such as diamonds for instance¹⁴.

Debate on this relationship

Brunnschweiler and Bulte (2009) and Cotet and Tsui (2010) were the first to dispute the robust effect that the dependence on natural resources may have on civil war. Brunnschweiler and Bulte (2009) show that aggregate resource wealth lowers the probability of a major conflict breaking out. They argue that the usual measure of the dependence on natural resources used in the literature can be affected by the history of the country and the occurrence of a civil

¹⁴ Boschini et al. (2007) uphold the concept of appropriability for a natural resource. A resource is highly appropriable if it has a high intrinsic value and is easily transportable and storable. Precious stones for example, are highly appropriable, whereas oil and gas are not if we just take non-renewable resources into account. According to them, the more appropriable the resource, the higher the probability that this resource will lead to rent-seeking, corruption or conflict.

conflict. In order to overcome this issue, they use the abundance of natural resources (“a stock variable capturing the discounted value of the future flow of resource rents”).

They test whether it is causally linked to conflicts and no longer find any effect. In the same way, Cotet and Tsui (2010) use new data describing worldwide oil discovery and extraction over the 1930-2003 period and show the lack of effect on the onset of civil war. They suggest an explanation to their results based on the idea that governments in oil abundant countries (notably non-democratic countries) use the financial windfall to deter potential challengers. It seems that the financial wealth from the abundance of natural resources strengthens those in power more than it generates an incentive for potential rebels.

The negative effects of dependence to natural resources

Another explanation to the lack of consensus is that natural resources can influence civil war through channels related the resource curse. Sachs and Warner (1995) were the first to show that the dependence on natural resources has a negative effect on economic growth. An abundant literature has delved deeper into this result, and challenged it as well. The debate on this question goes beyond the scope of this report, but some channels underlined by the literature can improve the understanding of the effect of natural resources on civil war.

The first and well-known channel is the “Dutch disease” and is characterized by the following phenomenon. The financial windfall generated by natural resources induces a real exchange rate appreciation, a de-industrialization, a contraction of traded-sectors and an expansion of non-tradable sectors with a shift of labor. This finding needs to be tied in with the literature linking trade openness and growth which underlines the importance of export composition for growth. Countries promoting exports of more “sophisticated” goods grow faster than others, thanks to learning by doing and other positive externalities (Hausmann et al., 2007). The abundance and exploitation of natural resources then induce a structural change which supports weak “sophistication” products and weak learning by doing effects (Matsuyama, 1992). The economic growth is also weaker which can increase the probability of conflict as we mentioned previously. Another strand of the literature on the resource curse focuses on the effects of natural resources on economic institutions or political institutions such as the level of democracy. A large literature demonstrates that the abundance of natural resources deteriorates the (economic) institutional quality (Sachs and Warner, 1995; Sala-i Martin and Subramanian, 2003; Isham et al., 2005; Boschini et al., 2007), even if a few recent papers on this topic no longer identify an effect (Brunnschweiler, 2008; Alexeev and Conrad, 2009) or identify a non-linear effect of natural resource rents on institutional quality, and find a hump-shaped relationship (Couttenier, 2008). As regards the effects of natural resources on democracy, authors again underline a negative effect (see Tsui (2011) ’s paper among others). Tsui (2011) exploits variations in the timing and size of oil discoveries to identify the impact of oil on democracy. He quantifies this result and finds “that discovering 100 billion barrels of oil pushes a country’s democracy level almost 20 percentage points below trend after three decades”.

In their recent papers, Haber and Menaldo (2011) and Wacziarg (2011) challenge these findings. Haber and Menaldo (2011) focus on the effect of natural resources on authoritarianism. They test the link between resource dependence and regime type within a country over a long time period and find that natural resources are not associated with the undermining of democracy or less complete transitions from authoritarianism to democracy. In the same way, Wacziarg (2011) find no empirical evidence that crude oil prices deteriorate democracy or sustain autocracy.

The importance of political regime

Even if the robustness of the effect that natural resources have on political institutions is still open to debate, this effect may be a channel to explain the indirect effect of the abundance of natural resources on civil war. Indeed, in their seminal papers, Collier and Hoeffler (2004) and Fearon and Laitin (2003) expect democratic countries to be less prone to civil war than autocratic countries. They give some evidence of the impact that the level of democratization has on the probability of conflict. Goldstone et al. (2010) show that regime type is among the most robust predictors of the onset of civil war. Collier and Rohner (2008) give some new insight to this question. They show that the effect of democracy is conditional on the income level of the country. In rich countries, democracy decreases the probability of conflict, but below an income threshold, the effect of democracy can be negative.

To conclude partially on the empirical findings, thanks to macro-economic studies, we can arguably say that a consensus emerges on the following: poor countries with a slow economic growth, weak institutions, a high population density, a low level of secondary school education and some specific geographical conditions (rough terrain, such as the proportion of the country that is mountainous, swamps or jungle) are more likely to be prone to civil war. Conditions that favor insurgency (poverty, political instability or large populations) seem to have a considerable explanatory power, besides ethnic or religious concerns (Collier and Hoeffler, 1998; Fearon and Laitin, 2003; Collier and Hoeffler, 2004). However, an increasing number of micro-economic studies question these findings (see Dube and Vargas (2011) or Vanden Eynde (2011) for instance). These micro-economic studies may provide a deeper understanding of the roots of civil war.

2.2.1 Climate and Civil War

As explained in the previous section, Miguel et al. (2004) was the first paper to propose a convincing strategy to study the causal relationship between economic variables and civil conflict. They provide evidence of a negative causal relationship between economic wealth and civil war by using climate as an exogenous source of economic wealth variation. By linking climate to conflict, this paper has also opened a fascinating new debate between scholars.

The sub-Saharan African region serves as the main source of information on this question. On the one hand, this region has been riddled with civil conflicts; 29 out of 43 countries experienced a civil war during the 1980s and the 1990s. On the other hand, African countries depend on rain-fed agriculture and agriculture accounts for more than 50% of the GDP in a majority of African countries (see World Development Report (2011)). Barrios et al. (2010) show that rainfall has been a significant determinant of poor economic growth for Africa and they also show this is not true for the other regions of the world. They show that the drop in rainfall is responsible for 15%-40% of the gap in African wealth (per capita) relative to developing countries. These peculiarities make Sub-Saharan Africa the focus to highlight a relationship between climate and civil war.

Capacity and opportunity

Both capacity and opportunity suggest the existence of a climate-conflict relationship. The opportunity-related effect of climate suggests that drought may increase the likelihood of civil conflict because rebellion groups are generally more “labor” intensive than government forces. A normal climate maximizes the chances to get good and foreseeable harvests and increases the opportunity cost to engage in fighting, which reduces rebel group re-ruitment. Conversely, drought reduces the agricultural sector production and reduces the wealth of the citizens, decreasing their opportunity cost to engage in fighting, which favors rebel group recruitment. The capacity-related effect also suggests a positive drought-conflict relationship because the fiscal capacity of the government (Besley and Persson, 2009) is generally high compared to the appropriation capacity of the rebel groups.

Measuring Climate

The two variables usually considered in the literature on climate and civil war are rainfall (Miguel et al., 2004; Bruckner, 2010) and temperature (Burke et al., 2009; Ciccone, 2011) measurements. Many of the papers in this literature try to construct a measurement that captures the idea of drought thanks to different calculations with rainfall and temperature. They use for instance the proportional change in rainfall from the previous year or the sum of squared rainfall deviations across a country in a given year. They alternatively use the absolute rainfall deviations (from average levels) or also the absolute rainfall deviations above some predetermined threshold levels.

Regardless of the quality of the data, we think that rainfall and temperature measurements are not sufficient to characterize drought. Other factors, such as the yearly distribution of rainfall and the accumulation capacity of the soil matter. For a given amount of rainfall (or

temperature), it is important to take into account the duration of the time period of accumulation and the capacity of the soil to support or accumulate this quantity of rain.

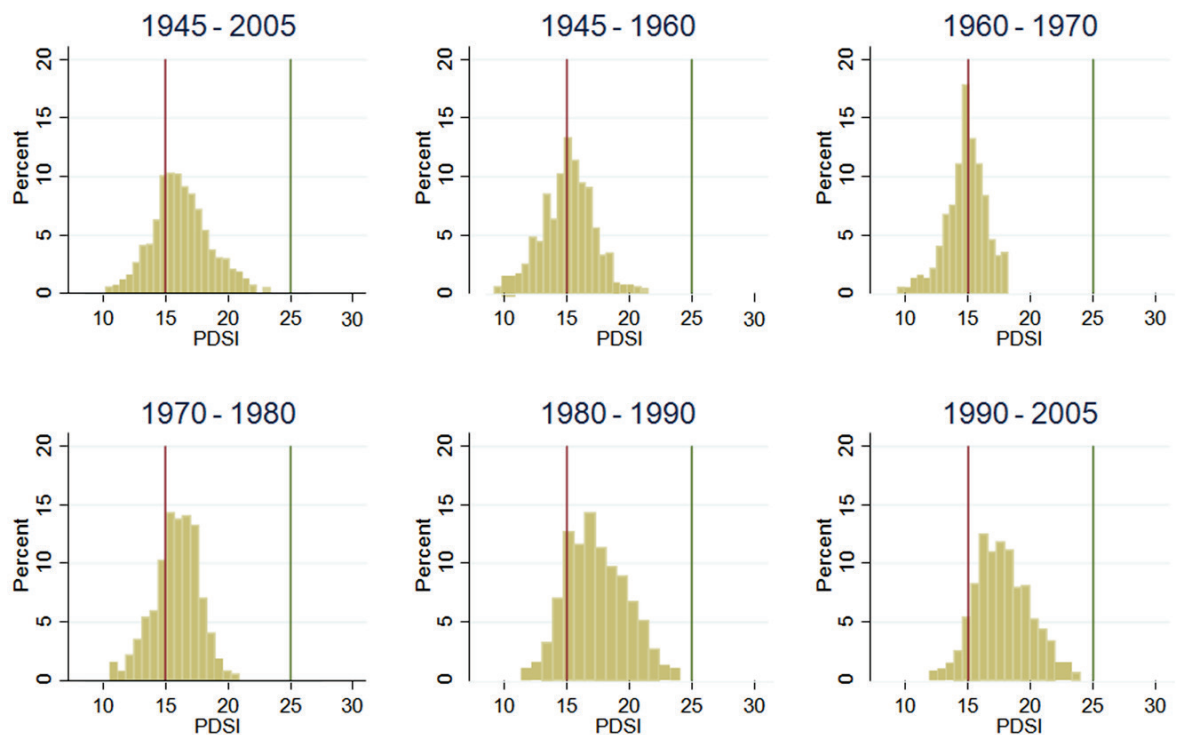
A same quantity of rainfall also has different implications for countries depending on their geographic location, the quality of their soil, and their agricultural specialization. We take these remarks into account in (Couttenier and Soubeyran, 2010). We use the Palmer Drought Severity Index (PDSI) which is based on a hydrological model and depends on local conditions and on climatic history (Palmer, 1965).

Data is available since 1870 at 2.5 latitude and longitude degree intervals. The PDSI values in two different countries with the same current temperature and rainfall levels may differ because of differences in local conditions (e.g. the duration of the day, or the characteristics of the soil). The PDSI values in a country at two different dates with the same temperature and rainfall levels may also differ because the PDSI takes the local climatic history into account. The PDSI is a much richer measurement of drought than the level of precipitations or temperature. Thus, the analysis is not subject to criticisms regarding the choice of the variable (rainfall or temperature) or regarding the choice of the climate model (level or growth rate). Finally, our analysis covers a longer time period (from independence to 2005), which is much more than the period usually considered in the literature (the 80s and the 90s).

Figure 5 plots the evolution of the density curve of drought in Sub-Saharan African countries since 1945. The PDSI is scaled from 0 to 30. The value 15 represents a “normal” climate and 25 an “extremely dry” climate. The distribution shifts to the right (drier climate) for each decade. Only 1% of the observations are above 20 (which represents a “dry” climate) and no observations are above 25 (“extremely dry” climate) over the 1945-1960 period. For the last period (1990-2005), 25% of the observations represent a “dry” climate and 2% of the observations represent an “extremely dry” climate. Figure 5 perfectly illustrates the purpose of the book on Climate Change (2007) which claims that climate change generates an increase in the number of droughts.

Another data set that has been used (Hsiang et al. 2011) is the annual shifts between El Niño and La Niña phases of the El Niño/Southern Oscillation. This data allows to avoid the question about local proxies and is linked to climate change on a global scale. An advantage of this data is the large time scale availability compared to rainfall data. This data helps understanding the variations in the risk of civil war through time. However, it cannot be used in micro-economic studies and does not capture climate differences within countries and between countries.

Figure 5 – PDSI Density, Drought distribution by Decades
Vertical line is a normal climate



Source: Couttenier Soubeyran 2012

Figure 5 shows the density of the PDSI for the sub-Saharan region for the 1945-2005 period and its evolution over the decades. A value of 15 refers to the “normal” climatic situation and a value of 25 to an “extremely dry” climate situation.

Empirical Findings

The seminal paper by Miguel et al. (2004) refers to sub-Saharan African countries in the 1981-1999 period. Miguel et al. (2004) find a very strong negative correlation between rainfall negative variations and economic growth. They find that a 5% drop in economic growth increases the probability of civil conflict by 12% in the following year.

Burke et al. (2009) focus on the direct link between climate and civil war and use climate projections to predict the likelihood of future civil wars. They study a reduced form relationship between rainfall, temperature, and civil war and show that higher temperatures increase the likelihood of civil war. Their estimates using historical data show that a 1% degree increase leads to a 49% increase in the likelihood of civil war incidence. Projected climate models lead the authors to conclude that there will be a 54% increase in the likelihood of civil war incidence by 2030.

Several scholars have challenged the robustness of the link between rainfall/temperature and civil war; their arguments fall into two categories. The first set of arguments is linked to the lack of robustness to changes in the data and/or in the coding choices. Jensen and Gleditsch (2009) argue that the measure of conflict in Miguel et al. (2004) is problematic and that estimates of the effect of growth on civil conflict should be limited to conflict in a state territory.

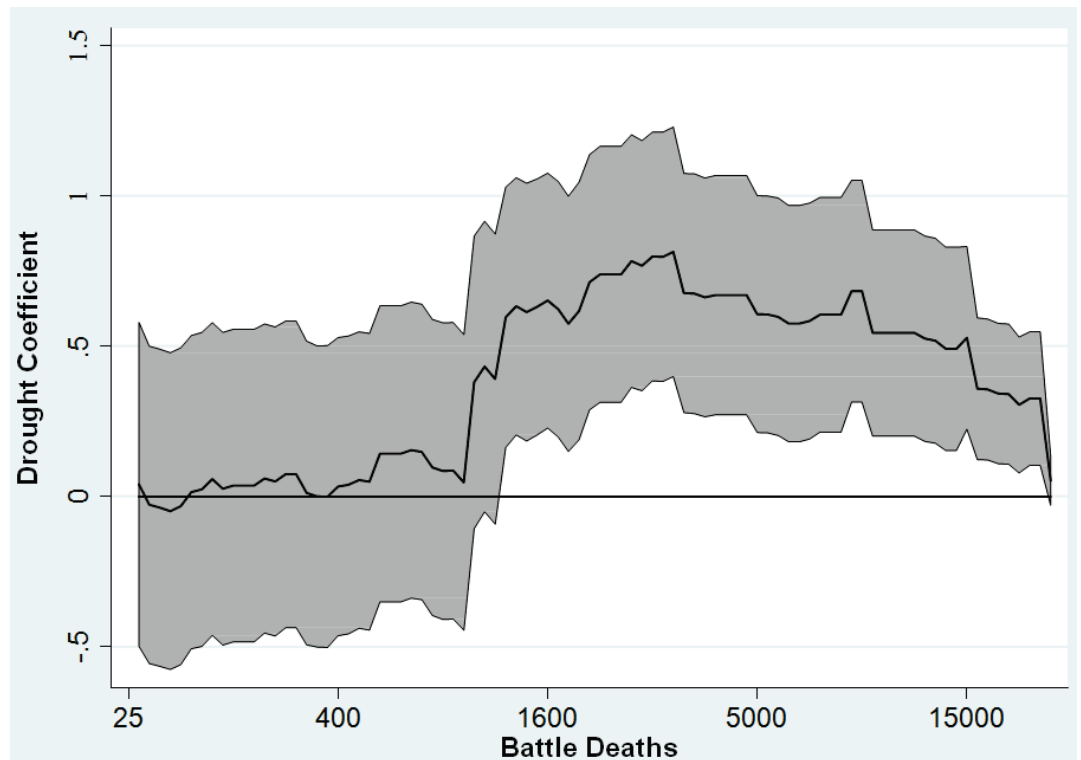
Along the lines of Fearon and Laitin (2003), they argue that negative economic shocks will decrease the capacity of governments to send troops to fight in civil wars in other states; however, Burke et al. (2010b) explain this mechanism as negative economic shocks making it easier to recruit fighters (because of their reduced opportunity cost). The second category of criticism is linked to the choice of the climate model. Ciccone (2011) argues that Miguel et al. (2004)'s findings rest on their choice of estimating the link between rainfall variations and civil conflict. He claims that the result is driven by a positive correlation between lagged rainfall levels and civil conflict. Ciccone (2011) uses the latest data and finds no link between rainfall levels and civil conflict. Miguel and Satyanath (2011)'s response is that if the focus is on the causal relationship between economic shocks and civil conflict, the use of rainfall levels rather than rainfall variations does not affect their initial result. They claim that behavioral economics arguments (which explain why individuals are often sensitive to recent changes in the status quo) support the use of rainfall variations rather than rainfall levels.

However, very recent studies reassess the link between climate and conflict. Hsiang et al. (2011) associate climate changes on a global scale with global patterns of civil conflict. They identify a relationship between the El Niño Southern Oscillation from 1950 to 2004 and the probability of new civil conflicts. They show that the Southern Oscillation may have played a part in 21% of all civil conflicts.

In Couttenier and Soubeyran (2010), we exploit the PDSI and explore the relationship between drought and civil war, over the 1945-2005 period, in sub-Saharan African states following independence (Couttenier and Soubeyran, 2010). The analysis covers a longer time period than previous studies which refer to the 1980s and the 1990s. We focus on civil wars in independent African states and exclude the colonial period¹⁵.

It is worth noticing that estimates which use rainfall and temperature data are very sensitive (see the discussion of Buhaug et al. (2010) in Burke et al. (2010a)). We conduct several sensitivity tests: changes in the threshold of battle-related deaths for civil wars. As defined in the introduction, in the empirical literature, a conflict is considered as a civil conflict when there are 25 to 999 deaths per year and as a civil war when there are more than 1,000 deaths related to the conflict. We show that no matter how intense the civil war, drought always has a positive effect on it. However, we find no significant effect on the likelihood of civil conflict (see Figure 6).

¹⁵ When the colonial period is included, the results suggest that drought has no effect on the incidence of civil war since the coefficient of the PDSI variable is not significant. But this leads to consider "states" that did not exist (such as "Ivory Coast" from 1945 to 1960). This strategy also leads to ignore the existence of colonial empires, and this is a potential reason for the non-significant effect of drought on the likelihood of civil war in the first results. Indeed, the significance of drought may be strongly reduced because a colonizer may compensate for its adverse effects. The process of decolonization and emergence of new states presents a theoretical and empirical challenge. In order to overcome this issue, we only consider independent African states.

Figure 6 – Drought effect and Intensity

Source: Couttenier Soubeyran 2012

We estimate the effect of drought for each threshold between 25 and 200,000 battle-related deaths per year. This Figure reports the value of the estimated coefficient of the PDSI at the 10% confidence interval (grey area).

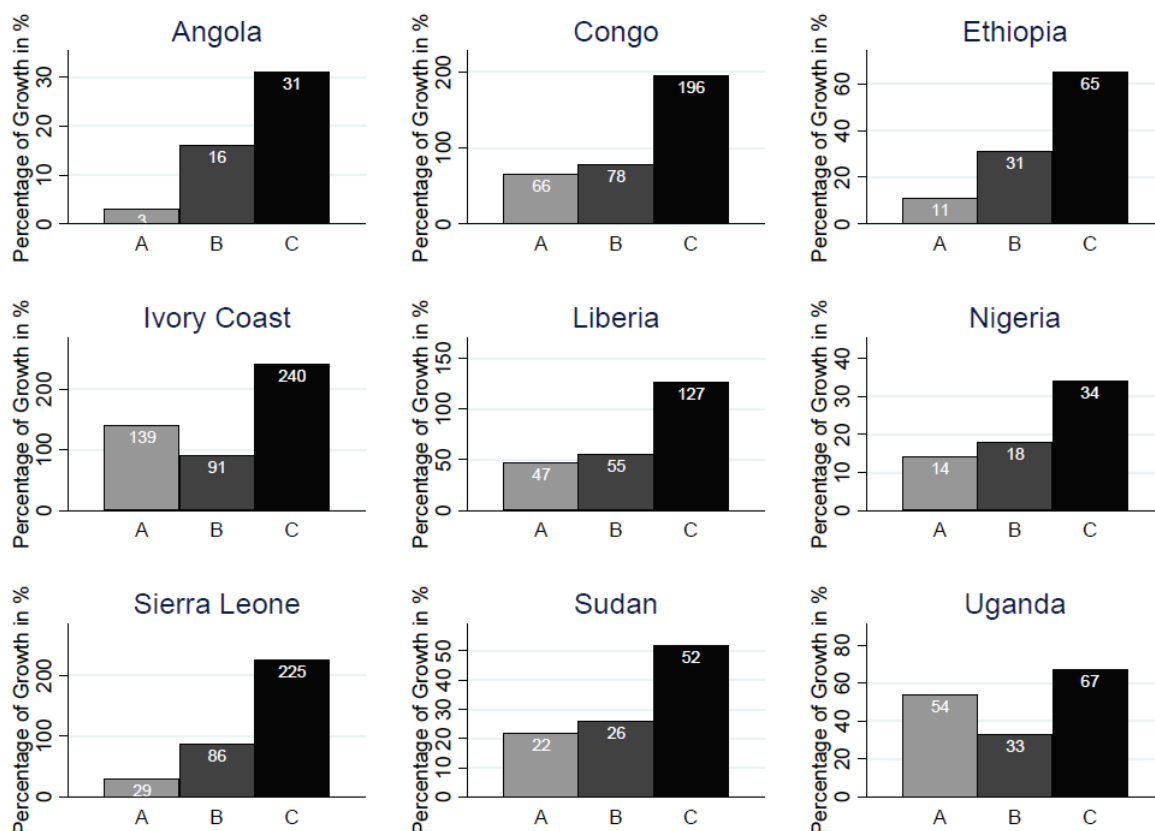
We also provide some quantifications¹⁶. We estimate that a shift from a “normal” climate to an “extremely dry” climate increases the average probability of civil war incidence by approximately 60%. The average probability is 7.5% for a “normal” climate and 12% for an “extremely dry” climate. The increase of drought can have a very strong incidence for some countries. For instance, five countries have a probability of conflict per year which is greater than 50% with an “extremely dry” climate (Angola, Ethiopia, Nigeria, Sudan, and Uganda).

Figure 7 presents the evolution of the probability of conflict for the nine countries with the highest estimated probability of civil war onset, for three scenarios. These countries have a probability of civil war which was above 3% in 2005. Scenario A considers the percentage of increase of the probability of civil war when the climate shifts from “normal” (PDSI = 15) to its level in 2005. It shows the effect of an increase of PDSI from a “normal” situation to the climatic situation nowadays and gives a first glimpse of the impact of global warming. The change has a very strong incidence for some countries. The probability of civil war increases by 66% for Congo and 149% for Ivory Coast. Scenario B considers the percentage of increase of the probability of civil war when the climate shifts from “normal” (PDSI = 15) to “dry” (PDSI = 20).

¹⁶ These quantifications should be interpreted with some caution since they only consider changes to drought conditions; any changes in the other variables are left aside.

The graphs show a 78% increase for Congo (which is close to the 66% for 2005 because the climate in Congo was close to “dry”) and a 91% increase for Ivory Coast. The increase rate of the probability of conflict ranges between 16% and 91%. Scenario C considers the percentage of increase of the probability of civil war when the climate shifts from “normal” (PDSI = 15) to “extremely dry” (PDSI = 25). In this scenario, the increase rate is multiplied by 2 to 3 compared to Scenario B (it ranges between 31% and 240%). This provides an estimate of the possible deep impact of global warming on the probability of civil war.

Figure 7 – Country cases



Source: Couttenier Soubeyran 2012

Figure 7 shows the evolution of the probability of conflict for 9 countries with the highest probability of civil war in 2005. These countries had a probability of civil war above 3% in 2005. We present 3 cases: Case A represents the percentage of increase from a “normal” climate (PDSI = 15) to the drought level in 2005. Case B represents the percentage of increase from a “normal” climate (PDSI = 15) to a “dry” climate (PDSI = 20). Case C represents the percentage of increase from a “normal” climate (PDSI = 15) to an “extremely dry” climate (PDSI = 25).

As acknowledged by many of the authors in this literature, micro-level analysis is crucially needed to better explain how climate affects political violence. Such micro-level evidence is lacking and it is even difficult to find elements in case studies that link conflict to climate. The most cited case is the civil war in Darfur.

It is an ethnic conflict between Arabs and Black Africans, but some scholars argue that drought (and desertification) is a contributory cause of this war because it increases disputes over arable land and water (Faris, 2009). Miguel et al. (2004) provide two cases (Sierra Leone and Niger) where rainfall negative variations can be found to precede the outbreak of violence. They argue that civil war in Sierra Leone was initiated by rebels in 1991 with the help of troops from Liberia following a negative rainfall shock in 1990. The hydrological (cumulative index, PDSI) data used in Couttenier and Soubeyran (2010) shows a long period of drought between 1986 and 1991. As argued by Miguel et al. (2004), the climate presumably made agricultural labor relatively less attractive than joining armed militias

Further Research

As already mentioned, we think that micro-level analysis is needed to deepen our understanding of the link between climate and conflict. As the effect of climate may be driven by the specialization of the country in agricultural activities, we think that studying the relationship between agricultural specialization, drought, and the likelihood of civil conflict is an interesting topic for further research.

In that sense, considering an heterogeneous effect of drought thanks to the nature of crops or the timing of their growing season would be very useful.¹⁷ We are also convinced that the literature needs to go further in two directions. First, we think that data now allows to go beyond the country-year framework by focusing on within-year weather fluctuations. Second, we think that research needs to turn to intra-country studies. A high heterogeneity of climate within a country may induce some grievances or migrations which could increase the probability of conflict outbreak.

3 Policy Implications

The previous exposition of the conceptual causes of conflicts has implications for policy. As argued in the introduction, the costs of civil war are very high. In the case of civil war, prevention is better than cure, but it is not clear whether opportunities for prevention are more promising than opportunities for ending ongoing conflicts and reducing the risk of conflict recurrence (Collier and Hoeffler (2007)). Policies for recovery and peace-building can be targeted more easily than prevention policies that are a priori more diffuse.

3.1 The more you fight...the more you fight

An effective criterion for anticipating the likelihood of civil war is to consider whether the country has already suffered from a civil conflict. Indeed, half of the civil wars since World War II, and every civil war that began after 2003 have taken place in countries that had a previous civil war (Collier and Hoeffler, 2007; World Development Report, 2011). The recent report from the World Bank argues that international assistance focuses on recovery rather than prevention (World Development Report, 2011). The predominance of civil wars during the 80s and the 90s in the South has led international support to be targeted to ending civil conflicts. The aid received in post-conflict countries greatly exceeds the aid received in fragile states to prevent an escalation of violence. An illustration is West Africa during the 2000s. The World Bank reports that the aid to two post-conflict countries, Liberia in 2008 and Sierra Leone over the 2000-2003 period, was around US\$415 per capita and US\$186 per capita (each year) respectively. By contrast, aid for preventing conflict in Guinea, Guinea-Bissau, and Togo was only US\$42 per capita.

3.2 Focusing on conflict-prone countries

The main focus of the literature on the causes of civil war may then seem paradoxical. However, one may think that it would be more relevant for research-based policies to improve the targeting of conflict-prone countries and to introduce appropriate mechanisms to prevent conflicts and avoid the very high associated costs. The aim is not to deny the huge needs of post-conflict countries. However, understanding the precise causes of civil war may help to apply adequate instruments to prevent them. There are some inexpensive interventions, such as state-society consultations even if financial assistance is often necessary to stop the rising of violence (World Development Report, 2011).

The World Bank reports that the lack of coordination between policies, security and development is a weakness in carrying out prevention interventions. Recent UN initiatives have been introduced to address the challenge of merging these very different operations.

3.3 Long-run prevention: development and institutions

The main empirical result of the literature suggests that the best long-run conflict prevention strategy is economic development. A direct instrument for development is aid to poor countries. Aid has some positive effects in conflict prevention, in addition to the desired reduction of poverty. Collier and Hoeffler (2002) argue that aid has no systematic direct effect on the risk of conflict, but that it is beneficial nonetheless through its effect on growth.

However, Collier et al. (2004) show that the gain is modest relative to the cost of the aid and they argue in consequence that conflict reduction should not be the core rationale for aid to low-income countries. An essential factor of long-run development is the quality of institutions Acemoglu et al. (2001). The World Bank report argues that institutions for security, justice and jobs should first be consolidated to prevent repeated cycles of violence.

3.4 Adapting agriculture to climate change

Solutions to prevent conflicts linked to climate change are presumably to be found in the agricultural sector. Most authors argue that agriculture lies at the heart of the climate-civil war relationship. One can indeed think that the effect of drought on civil war is mainly channeled through agricultural production and its effect on economic growth. Indeed, African countries remain highly dependent on agriculture for both employment and economic production, with agriculture accounting for more than 50% of gross domestic product (World Bank 2009).

Lobell et al. (2008) and Schlenker and Lobell (2010) show that increases in temperature and decreases in precipitation have strong negative effects on staple crop production. Projections indicate that Africa is one of the regions in the world where the decrease in rainfall will be the heaviest. As argued in Burke et al. (2009), the negative effects of climate fluctuations on agricultural productivity and their importance for economic performance (Dell et al., 2008; Schlenker and Roberts, 2006; Schlenker and Lobell, 2010) should lead governments and aid agencies to help Africa in reducing conflict risk by improving the ability of agriculture to deal with climate change.

Burke et al. (2009) suggest several strategies to mitigate the effect of climate change on the likelihood of conflict. These strategies include technical solutions such as developing new crop varieties adapted to dry climates, and to build irrigation infrastructures and improve existing ones (World Bank 2008). They also include mechanisms such as the development of catastrophic weather event insurance (among which index insurance, World Bank 2005) to compensate for weak primary insurance markets. Miguel (2007) suggests making international aid contingent on climate risk to prevent the emergence of violent acts. Buhaug et al. (2010) and Sutton et al. (2010) cast doubt on the existence of the climate-conflict relationship and fear the perverse effect of policies focusing on climate change.

Buhaug et al. (2010) argue that targeted climate adaptation initiatives (see the United Nations Framework Convention on Climate Change), can have significant positive welfare implications (Adger et al., 2009), but that they should not replace traditional aid and intervention programs such as peace-building strategies. Sutton et al. (2010) fear that the incautious reader will conclude that civil war in sub-Saharan Africa will necessarily increase with climate change. Buhaug et al. (2010) and Sutton et al. (2010) fear that the positive link will be interpreted as meaning that civil war in sub-Saharan Africa is unavoidable and that it will discourage aid and peace-building program contributors. Our point of view is that climate adaptation initiatives have to be considered as an additional tool to help development and prevent conflicts.

References

- Acemoglu, D., S. Johnson, and J. A. Robinson (2001). *The colonial origins of comparative development: an empirical investigation*. American Economic Review 91(5), 1369–1401.
- Adger, W., I. Lorenzoni, and K. O'Brien (2009). *Adapting to climate change: thresholds, values, governance*. Cambridge University Press, Cambridge, UK.
- Alesina, A. and E. La-Ferrara (2005). *Ethnic diversity and economic performance*. Journal of Economic Literature 43(3), 762–800.
- Alexeev, M. and R. Conrad (2009). *The elusive curse of oil*. The Review of Economics and Statistics 91(3), 586–598.
- Baik, K. H. and J. Shogren (1995). *Competitive-share group formation in rentseeking contests*. Public Choice 83, 113–126.
- Baliga, S. and T. Sjostrom (2004). *Arms races and negotiations*. Review of Economic Studies 71(2), 351–369.
- Baliga, S. and T. Sjostrom (2009). *The strategy of manipulating conflict*. Departmental Working Papers 200906, Rutgers University, Department of Economics.
- Bardhan, P. (2004). *Scarcity, conflicts, and cooperation: essays in the political and institutional economics of development*. Cambridge and London: MIT Press.
- Barrios, S., L. Bertinelli, and E. Strobl (2010). *Trends in rainfall and economic growth in africa: a neglected cause of the african growth tragedy*. The Review of Economics and Statistics 92(2), 350–366.
- Bazzi, S. and C. Blattman (2011). *Economic shocks and conflict: the (absence of?) evidence from commodity prices*. mimeo, Yale University.
- Beber, B. and C. Blattman (2008). *The industrial organization of rebellion: The logic of forced labor and child soldiering*. Technical report, Unpublished.
- Besley, T. J. and T. Persson (2008). *The incidence of civil war: theory and evidence*. NBER Working Papers 14585, National Bureau of Economic Research, Inc.
- Bevia, C. and L. C. Corchon (2010). *Peace agreements without commitment*. Games and Economic Behavior 68(2), 469–487.
- Blattman, C. and E. Miguel (2010). *Civil war*. Journal of Economic Literature 88(48), 3–57.
- Bloch, F. (2009). *Endogenous formation of alliances in conflicts*. Working papers, HAL.
- Bloch, F., S. Sanchez-Pages, and R. Soubeyran (2006). *When does universal peace prevail? secession and group formation in conflict*. Economics of Governance 7(1), 3–29.
- Boschini, A. D., J. Pettersson, and J. Roine (2007). *Resource curse or not: a question of appropriability*. Scandinavian Journal of Economics 109(3), 593–617.
- Bruckner, M. (2010). *Population size and civil conflict risk: is there a causal link?* Economic Journal 120(544), 535–550.
- Bruckner, M. and A. Ciccone (2010). *International commodity prices, growth and the outbreak of civil war in sub-saharan africa*. Economic Journal 120(544), 519–534.
- Brunnschweiler, C. N. (2008). *Cursing the blessings? Natural resource abundance, institutions, and economic growth*. World Development 36(3), 399–419.
- Brunnschweiler, C. N. and E. H. Bulte (2009). *Natural resources and violent conflict: resource abundance, dependence, and the onset of civil wars*. Oxford Economic Papers 61(4), 651–674.
- Buhaug, H., H. Hegre, and H. Strand (2010). *Sensitivity analysis of climate variability and civil war*. Technical report, PRIO Paper. Oslo.
- Burke, M., J. Dykema, D. Lobell, E. Miguel, and S. Satyanath (2009). *Warming increases the risk of civil war in africa*. Proceedings of the National Academy of Sciences 106(49), 20670–20674.

- Burke, M., J. Dykema, D. Lobell, E. Miguel, and S. Satyanath (2010a). *Climate and civil war: Is the relationship robust?* NBER Working Papers 16440, National Bureau of Economic Research, Inc.
- Burke, M., J. Dykema, D. Lobell, E. Miguel, and S. Satyanath (2010b). *Climate robustly linked to african civil war*. Proceedings of the National Academy of Sciences 107(51), E185.
- Chassang, S. and G. P. i Miquel (2008). *Conflict and deterrence under strategic risk*. NBER Working Papers 13964, National Bureau of Economic Research, Inc.
- Chen, S., N. V. Loayza, and M. Reynal-Querol (2007). *The aftermath of civil war*. Policy Research Working Paper Series 4190, The World Bank.
- Chen, X. and W. D. Nordhaus (2010). *The value of luminosity data as a proxy for economic statistics*. NBER Working Papers 16317, National Bureau of Economic Research, Inc.
- Chwe, M. S.-Y. (1990). *Violence in incentives: pain in a principal-agent model*. Technical Report 871, Northwestern University Center for Mathematical Studies in Economics and Management Science Discussion Paper.
- Ciccone, A. (2011). *Transitory economic shocks and civil conflict: A comment*. Technical report, Forthcoming American Economic Journal: Applied Economics.
- Collier, P., L. Chauvet, and H. Hegre (2009). *The security challenges in conflict prone countries*. Open access publications from universite paris-dauphine, Universite Paris-Dauphine.
- Collier, P. and A. Hoeffler (1998). *On economic causes of civil war*. Oxford Economic Papers 50(4), 563–73.
- Collier, P. and A. Hoeffler (2002). *Aid, policy and peace: Reducing the risks of civil conflict*. Defence and Peace Economics 13(6), 435–450.
- Collier, P. and A. Hoeffler (2004). *Greed and grievance in civil war*. Oxford Economic Papers 56(4), 563–595.
- Collier, P. and A. Hoeffler (2007). *Civil war*, Volume 2 of Handbook of Defense Economics, Chapter 23, pp. 711–739. Elsevier.
- Collier, P., A. Hoeffler, and C. Pattillo (2004). *Africa's exodus: capital flight and the brain drain as portfolio decisions*. Journal of African Economies 13(02), ii15–ii54.
- Collier, P. and D. Rohner (2008). *Democracy, development, and conflict*. Journal of the European Economic Association 6(2-3), 531–540.
- Cotet, A. and K. K. Tsui (2010). *Oil and conflict: what does the cross-country evidence really show?* Working Papers 201002, Ball State University, Department of Economics.
- Couttenier, M. (2008). *Relationship between natural resources and institutions*. Documents de travail du centre d'économie de la sorbonne.
- Couttenier, M. and R. Soubeyran (2010). *Drought and civil war in sub-saharan africa*. Working Papers 2010.150, Fondazione Eni Enrico Mattei.
- Deaton, A. (2005). *Measuring poverty in a growing world (or measuring growth in a poor world)*. The Review of Economics and Statistics 87(1), 1–19.
- Dell, M., B. F. Jones, and B. A. Olken (2008). *Climate shocks and economic growth: evidence from the last half century*. Nber working papers, National Bureau of Economic Research, Inc.
- Dube, O. and J. Vargas (2011). *Commodity price shocks and civil conflicts: evidence from Colombia*. Mimeo, NYU.
- Esteban, J., M. Morelli, and D. Rohner (2010). *Strategic mass killings*. HiCN Working Papers 78, Households in Conflict Network.
- Esteban, J. and D. Ray (2008). *On the salience of ethnic conflict*. American Economic Review 98(5), 2185–2202.
- Esteban, J. and D. Ray (2011a). *Linking conflict to inequality and polarization*. American Economic Review 101(4), 1345–74.

- Esteban, J. and D. Ray (2011b). *A model of ethnic conflict*. The Journal of the European Economic Association (9), 496–521.
- Esteban, J. and J. Sakovics (2003). *Olson VS. Coase: coalitional worth in conflict*. Theory and Decision 55(4), 339–357.
- Faris, S. (2009). *Forecast: The Surprising-and Immediate-Consequences of Climate Change*.
- Fearon, J. (2006). *Ethnic Mobilization and Ethnic Violence*, pp. 852–68. Oxford and New York: Oxford University Press.
- Fearon, J. D. (2005). *Primary Commodity Exports and Civil War*. Journal of Conflicts Resolution 49(4), 483–507.
- Fearon, J. D. and D. Laitin (2003). *Ethnicity, insurgency, and civil war*. American Political Science Review 97(14), 75–91.
- Garfinkel, M. R. and S. Skaperdas (2007). *Economics of conflict: an overview*, Volume 2 of Handbook of Defense Economics, Chapter 22, pp. 649–709. Elsevier.
- Gates, S. (2002). *Recruitment and allegiance: The microfoundations of rebellion*. Journal of Conflict Resolution 46(1), 111–30.
- Goldstone, J. A., R. H. Bates, D. L. Epstein, T. R. Gurr, M. Lustik, M. G. Marshall, J. Ulfelder, and M. Woodward. (2010). *A global model for forecasting political instability*. American Journal of Political Science 54(1), 190–208.
- Grossman, H. I. (1991). *A general equilibrium model of insurrections*. American Economic Review 81(4), 912–21.
- Grossman, H. I. (1999). *Kleptocracy and revolutions*. Oxford Economic Papers 51(2), 267–83.
- Gurr, T. R. (1971). *Why men rebel*. Princeton and Oxford: Princeton University Press. Haavelmo, T. (1954). *A study in the theory of economic evolution*. North-Holland, Amsterdam.
- Haber, S. and V. Menaldo (2011). *Do natural resources fuel authoritarianism? a reappraisal of the resource curse*. American Political Science Review 105(1), 1–26.
- Hausmann, R., J. Hwang, and D. Rodrik (2007). *What you export matters*. Journal of Economic Growth 12(1), 1–25.
- Hirshleifer, J. (1989). *Conflict and rent-seeking success functions: ratio vs. difference models of relative success*. Public Choice 63, 101–112.
- Hobbes, T. (1651). *Leviathan, or the matter, forme, and power of a commonwealth, ecclesiasticall and civil*. Elsevier.
- Humphreys, M. (2005). *Natural resources, conflict, and conflict resolution*. Journal of Conflict Resolution 49(4), 508–537.
- Isham, J., M. Woolcock, L. Pritchett, and G. Busby (2005). *The varieties of resource experience: natural resource export structures and the political economy of economic growth*. World Bank Economic Review 19(2), 141–174.
- Jackson, M. O. and M. Morelli (2009). *The reasons for wars - an updated survey*. Forthcoming in the Handbook on the Political Economy of War. Elgar Publishing.
- Jensen, P. S. and K. S. Gleditsch (2009). *Rain, growth, and civil war: the importance of location*. Defence and Peace Economics 20(5), 359–372.
- Justino, P. and P. Verwimp (2008). *Poverty dynamics, violent conflict and convergence in Rwanda*. Research Working Papers 4, MICROCON - A Micro Level Analysis of Violent Conflict.
- Konrad, K. A. (2009). *Strategy and dynamics in contests*. LSE Perspectives in Economic Analysis, Oxford University Press, Oxford UK.
- Konstantin, S. and M. Schwarz (2008). *A theory of brinkmanship, conflicts, and commitments*. Journal of Law, Economics and Organization 24(1), 163–183.
- Kydd, A. H. (1997). *Game theory and the spiral model*. World Politics 49(3), 371–400.

- Laitin, D. (2007). *Nations, states, and violence*. Oxford and New York: Oxford University Press.
- Lee, S. (1995). Endogenous sharing rules in collective rent-seeking. *Public Choice* 85, 31–44.
- Lobell, D. B., M. B. Burke, C. Tebaldi, M. D. Mastrandrea, W. P. Falcon, and R. L. Naylor (2008). *Prioritizing climate change adaptation needs for food security in 2030*. *Science* 319(1).
- Martin, P., T. Mayer, and M. Thoenig (2008). *Civil wars and international trade*. *Journal of the European Economic Association* 6(2-3), 541–550.
- Matsuyama, K. (1992). *Agricultural productivity, comparative advantage, and economic growth*. *Journal of Economic Theory* 58(2), 317–334.
- Miguel, E. (2007). *Too poor for peace? Global poverty, conflict, and security in the 21st century*. Brookings Inst Press, Washington, DC.
- Miguel, E. and S. Satyanath (2011). *Re-examining economic shocks and civil conflict*. Technical report, Forthcoming American Economic Journal: Applied Economics.
- Miguel, E., S. Satyanath, and E. Sergenti (2004). *Economic shocks and civil conflict: an instrumental variables approach*. *Journal of Political Economy* 112(4), 725–53.
- Morelli, M. and D. Rohner (2010). *Natural resource distribution and multiple forms of civil war*. Technical report.
- Murdoch, J. and T. Sandler (2004). *Civil wars and economic growth: Spatial dispersion*. *American Journal of Political Science* 48, 138–151.
- Noh, S. (2002). *Resource distribution and stable alliances with endogenous sharing rules*. *European Journal of Political Economy* 18, 129–151.
- Olson, M. (1971). *The logic of collective action: public groups and the theory of groups*. Cambridge and London: Harvard University Press.
- Paige, J. M. (1975). *Social movements and export agriculture in the underdeveloped world*. New York: Macmillan, Free Press.
- Palmer, W. (1965). *Meteorological drought*. Research Paper 45, US Dept. of Commerce.
- Powell, R. (1993). Guns, butter and anarchy. *American Political Science Review* 87, 115–132.
- Robinson, J. A. (2001). *Social identity, inequality and conflict*. *Economics of Governance* 2(1), 85–99.
- Ross, M. (2006). *A closer look at oil, diamonds and civil war*. *Oxford Economic Papers* 9, 265–300.
- Sachs, J. D. and A. M. Warner (1995). *Natural resource abundance and economic growth*. NBER Working Papers 5398, National Bureau of Economic Research, Inc.
- Sala-i Martin, X. and A. Subramanian (2003). *Addressing the natural resource curse: an illustration from Nigeria*. NBER Working Papers 9804, National Bureau of Economic Research, Inc.
- Sanchez-Pages, S. (2007). *Endogenous coalition formation in contests*. *Review of Economic Design* 11(2), 139–163.
- Schelling, T. C. (1963). *The strategy of conflict*. London and New York, Oxford University Press.
- Schlenker, W. and D. B. Lobell (2010). *Robust negative impacts of climate change on african agriculture*. *Environmental Research Letters* 5.
- Schlenker, W. and M. J. Roberts (2006). *Nonlinear effects of weather on corn yields*. *Review of Agricultural Economics* 28(3), 391–398.
- Scott, J. C. (1976). *Moral economy of the peasant: rebellion and subsistence in Southeast Asia*. New Haven and London: Yale University Press.
- Skaperdas, S. (1992). *Cooperation, conflict, and power in the absence of property rights*. *American Economic Review* 82(4), 720–39.
- Skaperdas, S. (1998). *On the formation of alliances in conflict and contests*. *Public Choice* 96(1-2), 25–42.

- Slantchev, B. (2007). *Feigning weakness*. Mimeo, University of California at San Diego.
- Sutton, A. E., J. Dohn, K. Loyd, A. Tredennick, G. Bucini, A. Solorzano, L. Prihodko, , and N. Hanan (2010). *Does warming increase the risk of civil war in africa?* Proceedings of the National Academy of Sciences 107(25).
- Taylor, A. (1954). *The struggle for mastery in Europe, 1848 to 1918*. Oxford, Clarendon Press.
- Tsui, K. (2011). *More oil, less democracy: evidence from worldwide crude oil discoveries*. Economic Journal 121(551), 89–115.
- Vanden Eynde, O. (2011). *Targets of violence: Evidence from india's naxalite conflict*. mimeo.
- Wacziarg, R. (2011). *The first law of petropolitics*. Forthcoming Economica.
- Waltz, K. (1959). *Man, the State, and war*. Columbia University Press: N.Y.
- World Development Report (2011). *Conflict, security and development*. Technical report, International Bank for Reconstruction and Development and World Bank.
- Young, A. (2009). *The african growth miracle*. Lse working paper.

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