

A Survey of the Causes of Civil Conflicts: Natural Factors and Economic Conditions *

Mathieu Couttenier¹ and Raphael Soubeyran²

¹*Department of Economics, University of Lausanne*

²*UMR1135 LAMETA, INRA, 2 Place Viala, 34000 Montpellier, France*

Abstract

We provide an overview of the roots of civil conflict and distinguish between economic conditions and natural factors. We discuss the very recent (quasi-experimental) evidence on the effect of economic wealth, commodity prices and climate on the likelihood of civil conflict. As a preamble, we present an overview of the theoretical literature on the roots of conflict and distinguish between “capacity-related” and “opportunity-related” causes of conflict. We also provide policy implications regarding the prevention of civil conflicts.

Keywords: Civil war, Conflict, Opportunity, Capacity, Natural Resources, Commodity prices, Climate.

JEL codes: D74, D72, Q34, O13, Q54.

*We would like to thank Jose de Sousa, Tarik Tazdait and an anonymous referee for their helpful comments and suggestions. We also thank Petros Sekeris for his comments on a previous version of this survey.

1 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: 20% of countries have experienced at least ten years of civil war during the period since 1960 (Blattman & Miguel 2010).

The prevalence of civil conflict and its deep and persistent effects have led researchers to understand the roots of civil conflict outbreak, incidence, duration and intensity. Being totally aware of the manifold roots of civil conflict, we choose to focus on two broad categories: economic determinants and natural factors. We consider here economics determinants such as the level of economic development, income volatility or international commodity prices. We consider natural factors as the abundance of natural resources (such as oil, gas or diamonds) or the local climate conditions.

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 over 25 (battle-related) deaths per year. The *Peace Institute of Oslo* (PRIO)¹ and *Correlates of War* Project (COW)² are the two main institutions which collect data on conflicts. They provide a list of all conflicts 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.³

Civil conflict 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 war battles worldwide. These wars have deep and manifold disastrous consequences. The World Bank report on “Conflict, Security and Development” (World Bank 2011) asked the Norwegian research institute Fafo to conduct surveys in six countries and territories to evaluate the effect of violence on livelihoods.⁴ Civil conflict generally affects large proportion of the population: “...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 & Verwimp 2008), the collapse of civil liberties and political rights (Chen et al. 2007), the tragic deterioration of health (Akresh et al. 2012, Domingues & Barre 2013) and education (Lai & Thyne 2007, Blattman & Annan 2010, Kibris 2014), the increase in inequalities, and the destruction of human and physical capital that hinders macroeconomic performance. All these consequences lead to

¹<http://www.prio.no/>

²<http://www.correlatesofwar.org/>

³Note that the definition of COW adds a condition. The conflict is considered as a war if the involved armed groups are capable of “effective resistance”. This condition is useful to distinguish wars from genocide or riots. The definition of wars considered in the PRIO dataset also considers a condition of “effective resistance”.

⁴The six countries and territories are the Democratic Republic of Congo, Ivory Coast, Mali, Sierra Leone, the Gaza Strip, the West Bank and Colombia.

a greater number of deaths which are an indirect cost of civil conflicts. Conflicts also have regional and global repercussions. The consequences extend to external relationships, with negative spillovers for neighboring countries (Murdoch & Sandler 2004), international trade destruction (Martin et al. 2008) and a massive flight of assets (Collier et al. 2004). Bozzoli et al. (2010) report that worldwide total GDP in 2007 would have been 14.3% higher if there had not been any conflict since 1960. In Tanzania, a country making development advances, the estimated negative spillovers in the prevalence of conflicts in neighboring country is about 0.7% of its GDP every year (World Bank 2011). 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 (Collier et al. 2009). Even after the conflict has ended, a civil conflict has deep, persistent effects which are complex to evaluate. Among these are long-term effects on such determinants of economic development as child education, social cohesion or health.

Since the publication of the literature by Blattman & Miguel (2010), who advocate for the “advantages of quasi-experimental econometric approaches for distinguishing correlation from causation”, the number of studies in this vein has grown quickly. In this review, we focus on economic conditions and natural factors with an emphasis on recent quasi-experimental studies which uses commodity prices and climate shocks. We discuss the debate on the causal effect of commodity price shocks on the likelihood of civil conflict, with the most recent studies being Dube & Vargas (2013), Aragon & Rud (2013), Bazzi & Blattman (2014), Berman & Couttenier (2014) and Berman et al. (2014). We also discuss the debate on the link between climate and civil conflicts, which is born from Miguel et al. (2004), with the most recent studies being Marchiori et al. (2012), Harari & Ferrara (2012), Hsiang et al. (2013), Couttenier & Soubeyran (2014), Maystadt et al. (2014) and Maystadt & Ecker (2014). The first step in each of these studies is to estimate the effect of commodity price shocks or climate shocks on the likelihood of civil conflict. The second step is to recover the mechanisms, which is a challenging quest mainly because it requires specific data. We thus discuss how the literature is attempting to recover the mechanisms through which commodity prices and climate affect the likelihood of civil conflict.

The review is organized as follows. We first present an overview of the theoretical roots of civil conflict (Section 2). We then focus on one of the central question in the conflict literature: the link between economic wealth and civil conflict (Section 3). We then discuss the new literature which tackles the issue of causality and aims at recovering the mechanisms (Section 4). Section 5 discusses some policy implications, notably with regards to the prevention of civil conflict.

2 The Theoretical Roots of Civil Conflict

In this Section, we first briefly review the main theories of conflict and then describe how they help to understand the specific roots of civil conflict. Our discussion echoes and complements existing surveys on the theoretical literature of conflict (Fearon 1995, Garfinkel & Skaperdas 2007a, Bloch 2009, Jackson & Morelli 2011).

2.1 The Theory of Conflict: Capacity and Opportunity

One of the main goals of the theoretical models of conflict is to explore the rational causes of 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 1995, 2005).⁵ Hence, bargaining failures and situations where the benefits from conflict are greater than the costs (for at least one of the agents involved) are the causes of conflict. Reconciling rationality and conflict is challenging because a conflict implies the destruction of productive resources.⁶ However, “capacity” and “opportunity” sometimes lead to conflict. 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”.

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’s *Leviathan* (Hobbes 1651) relates to conflicts due to the inability of men to trust each other.⁷ Conflict arises when the agents cannot commit to not fighting even after a transfer of resource from one agent to another (see Sonin & 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 (Hirshleifer 1989, Grossman 1991a, Skaperdas 1992). These models of conflict consider the trade-off between production and appropriation⁸ and predict that resources devoted to a conflict should increase with the relative effectiveness of the fighting technology. 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 may be included in the broad definition of technology.

The other causes of conflict lie in the opportunities for the different parties, i.e. their

⁵Jackson & Morelli (2011) update Fearon (1995)’s review and distinguish five main causes for these situations that we choose to group into “capacity” and “opportunity” causes of conflict.

⁶Garfinkel & Skaperdas (2007a) claim that the challenge comes from the emphasis put by economics on the gains from trade. Starting from a conflicting situation, it is generally assumed that Pareto improvements are possible. It is difficult to rationalize behaviors that prevent these improvements.

⁷See Rohner et al. (2013b) for a theoretical model and Rohner et al. (2013a) for an empirical study in Uganda.

⁸Garfinkel & Skaperdas (2007a) review the literature based on the “contest model” where the efforts put forth by the parties translate into a probability of winning a “prize”.

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 pervasive.⁹ A lack of information about the (endogenous) strength of the adversary can also generate conflict (Meirowitz & Sartori 2008). 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 (Waltz 1959, Schelling 1963, Kydd 1997, Baliga & Sjostrom 2004, 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). A State consolidation period during which power may shift in favor of the adversary is a context where preventive conflict may occur (Powell 2012). Mass killing can be interpreted as a strategy to reduce the future strength of the adversary (Esteban et al. n.d.). 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 & Morelli (2007) and Bevia & Corchon (2010) argue that conflict may arise when the decision maker expects greater benefits (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 Querou (2010) shows that elected leaders may decide to go to war because they anticipate that they will free-ride on the fighting efforts of their group members. Small-scale or limited conflicts can emerge because they convey information about the relative strength of the adversaries (Sanchez-Pages 2009).

A fascinating research topic is the timing of conflict.¹¹ When do conflicts arise and when do they end? Why and when do conflicts stop and start again? Garfinkel (1990) shows that peace can be supported as an equilibrium when sufficiently patient players use punishment strategies and Leventoglu & Slantchev (2007) and Yared (2010) show that temporary wars may arise in equilibrium in two different models. Yared (2010) consider a model with incomplete information (and he focuses on sequential equilibria) whereas Leventoglu & Slantchev (2007) consider a complete information model where adversaries have limited fighting capacities (and they focus on renegotiation proof equilibria). Bester & Konrad (2004) show that conflict (contest) may be delayed when there is asymmetry between defense and attack.¹²

⁹Conflict also emerges when there is an advantage to attack first (Powell 1993, Fearon 2005, Chassang & Padro i Miquel 2010, Morelli & Rohner 2010).

¹⁰Indivisibility of the contested resource eliminates some peace agreements and can also lead to conflict. Jackson & Morelli (2011) also argue that multilateralism may lead to bargaining failure.

¹¹For an overview of dynamic contest models, see Konrad (2009) and Konrad (2012) for a focus on the “discouragement effect”.

¹²For models of contest with attack and defense, see also the literature on sabotage in contests and

Bester & Konrad (2005) show that contestants have incentives to delay conflict until the stochastic strength (capacity) of the adversary is sufficiently low. A contestant may also delay conflict because the cost of conflict in the current period is larger than the future (discounted) expected benefits of winning the conflict (Polborn 2006). Jackson & Morelli (2009) explore the dynamic incentives of adversaries to invest in armaments as a deterrence strategy (which may delay conflict). Acemoglu et al. (2012) and Sekeris (2014) develop theories of (exhaustible) resource conflicts. Acemoglu et al. (2012) consider a two country model where the firms in the resource rich country fail to internalize the negative externality of their extraction on the increased likelihood that the resource poor country decide to attack. Firms then tend to extract the resource faster, which in turn increase the incentives for the resource poor country to launch a war. Sekeris (2014) consider a common pool resource problem and show that conflict arises when the resource becomes scarce.¹³ Finally, Powell (2013) proposes a theory of the pace of State consolidation in which consolidation occurs thanks to peaceful negotiations that weaken the rebel group and/or violent conflict that may lead to the end of the rebellion.

2.2 Civil Conflict: State Capacity and Rebels Opportunity

The economics and political science literature of civil conflict distinguishes three mechanisms (related to capacity and opportunity) through which civil conflicts emerge. Bazzi & Blattman (2014) recently discussed these mechanisms. It is important to have these mechanisms in mind in order to understand how scholars try to recover the mechanisms of civil conflict and how they interpret the empirical results. The first two are the “opportunity cost” of insurrection and the “State as a prize” mechanisms. Both are related to the “opportunity” theory of conflict, that is, to the incentives for civilians to rebel against the State. The “opportunity cost” of insurrection refers to the decreased citizens’ opportunity cost of becoming soldiers when their income from other activities decreases. Several scholars in economics and political science have build various models which help understanding this mechanism, e.g. Grossman (1991*b*), Hirshleifer (1995), Gates (2002), Chassang & Padro i Miquel (2009). The “State as a prize” mechanism refers to the returns from fighting, the State being a contestable prize. Thus, the higher the wealth of the State, the higher the value of the contestable prize and the higher the incentives to fight to control the State (i.e. to win the prize). This mechanism is also considered in several models, such as in Grossman (1999), Chassang & Padro i Miquel (2009) and in the rent-seeking contest literature (see Garfinkel & Skaperdas (2007*b*)). The third mechanism is the “State capacity” mechanism which is related to the “capacity” theory of conflict presented in the previous Section and refers to the ability of the State to defend against potential or actual opponents. The theory argues that the richer the State, the stronger its ability to monitor opponents, to deter rebellions, and to buy off opposition. The “State capacity” mechanism has been first formalized in political

tournaments, e.g. Lazear (1989), Bester & Konrad (2000), Chen (2003), Krakel (2003), Gurtler (2008) and Soubeyran (2009).

¹³On resource conflicts, see also (Soubeyran & Tomini 2012). They develop a simple model of water shortages and conflict.

science (Fearon & Laitin 2003). Garfinkel et al. (2008) propose a model of international trade incorporating the “opportunity cost” and the “State as a prize” mechanisms. Their main result is that countries tend to over-export the contested resource because conflict diverts labor from production to conflict. Dal Bo & Dal Bo (2011) propose a simple model which also incorporates the ‘opportunity cost’ and the “State as a prize” mechanisms. To the extent that conflict is more labor intensive than the (two sector) economy, they show that an increase in the price of the capital-intensive sector increases conflict while an increase in the price of the labor-intensive sector decreases conflict. This result has the advantage to imply clear predictions that can be tested empirically (see Section 4).

3 Economic Wealth and Civil Conflict

The academic research provides plenty of stylized facts on the accuracy of the link between economic development and conflict.¹⁴ There is a consensus on the negative correlation between the GDP per capita and the likelihood of civil conflict (Fearon & Laitin 2003, Collier & Hoeffler 2004). However, this result has opened two debates.

Opportunity cost or State capacity? The first debate has been mainly focused on the interpretation of this negative correlation. On the one hand, Fearon & Laitin (2003) have argued that this result may be due to the weak State capacity in poor countries. Indeed, in poor countries, the State may not have the capacity to enforce the law, to discourage the formation of rebels group or to build an army to deter rebellions. On the other hand, Collier & Hoeffler (2004) have argued that this result may be due to the low opportunity cost of fighting of poor citizens in poor countries, GDP per capita being a proxy of citizens’ individual wealth. When citizens are poor or are even not able to feed themselves, their opportunity cost of fighting is low. Despite Fearon & Laitin (2003) and Collier & Hoeffler (2004) have favored different interpretations, these two are not exclusive. This is confirmed by the evidence provided in Dube & Vargas (2013) which show that these two mechanisms have played simultaneously in Columbia (see further for a presentation of this paper).

Accuracy of the causal relationship: The second debate has mainly focused on the accuracy of the causal relationship. Miguel et al. (2004) were the first to address the weakness of the empirical identification and to raise concerns as regards the possible endogeneity of economic variables. Indeed, rich and poor countries differ on various political, geographic

¹⁴It is important to notice that the quality of the GDP data of poor countries could be very low (Deaton 2005, Young 2009). The statistical systems in poor countries suffer from shortcomings and these concerns are much more salient during civil conflict 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. Indeed, economic development and the improvement of the statistical system may enhance the quality of the data in the future. Note also, that nighttime light intensity data used as a proxy for economic activity could be a powerful instrument to overcome this issue (Chen & Nordhaus 2010).

or demographic dimensions. The risk of omitted variables bias, reverse causality and unobserved heterogeneity cast some doubts on the causal interpretation. Miguel et al. (2004) propose an instrumental variable approach to overcome this endogeneity issue. As most of the countries which have experienced civil conflict episodes rely heavily on the agricultural sector, they use rainfall variation as an instrument for economic growth. They focus on the Sub-Saharan countries in which irrigation of cropland is minimal and the share of the agricultural sector in economic wealth remains substantial. Economic growth is therefore closely related to weather shocks in this region of the world. They find a very strong negative correlation between rainfall negative variations and economic growth: a 5% drop in economic growth increases the probability of civil conflict by 12% in the following year. Hodler & Raschky (2014) extend the cross-country analysis to a sub-national level, using nighttime light intensity as a measure of regional wealth. They also conclude that negative economics shocks cause civil conflict. A potential concern about the instrumental variable approach is that it is valid only if the effect of weather on civil war is fully captured by the measure of wealth (otherwise, the exclusion restriction assumption is violated). Weather shocks may affect the likelihood of civil conflict through other channels, such as migrations (Marchiori et al. 2012), increased competition over water (Maystadt et al. 2014), or decreased self-consumption, which are hardly captured in GDP or nighttime light intensity measures. In spite of a controversy on the robustness of the identification strategy used in Miguel et al. (2004), see notably Ciccone (2011), a consensus has emerged on the fact that poor countries with slow economic growth/level of economic development are more prone to civil conflicts. Unfortunately, the authors cannot draw definitive conclusions as regards the different mechanisms. Indeed, weather shocks may fuel conflict because they decrease the opportunity cost of fighting for populations who are highly dependent on their agricultural production but also because a decrease in agricultural production decreases related tax revenue (mainly collected thanks to export tariffs on agricultural commodities) which may, in turn, result in a weakened State capacity and to an increase of violence.

An alternative strategy is to directly analyze the effect of climate measures on the likelihood of civil conflict. As explained in the next Section, this “reduced-form approach” is now commonly used for analyzing the effect of international commodity prices and natural resources financial windfalls on the likelihood of civil conflict.

4 The Quest for Causality and for Recovering the Mechanisms

Since the publication of the literature review by Blattman & Miguel (2010) who advocated for the “advantages of quasi-experimental econometric approaches for distinguishing correlation from causation”, the number of studies in this vein has grown quickly. In this Section, we provide an overview of the literature on two determinants, commodity prices and climate, with an emphasis on recent studies using quasi-experimental approaches. We first discuss the debate on the causal effect of commodity price shocks on the likelihood of civil conflict. We then discuss the debate on the link between climate and civil conflicts. The first step in each

study is to estimate the effect of commodity price shocks or climate shocks on the likelihood of civil conflict. The second step is to recover the mechanisms, which is a challenging quest mainly because it requires specific data. We discuss how the literature is attempting to recover the mechanisms through which commodity prices and climate affect the likelihood of civil conflict.

4.1 Commodity Price Shocks

The initial idea that trade in commodities and civil conflicts are linked has been raised in [Collier & Hoeffler \(2004\)](#). They show that the percentage of national income from primary commodity exports, encompassing exports of natural resources such as oil and exports of agricultural commodities such as coffee, is positively linked to the outbreak of civil war. [Fearon \(2005\)](#) argues that this correlation is fragile and only holds for oil.¹⁵

The accuracy of the causal relationship: Several studies tackle the issue of causality and use a quasi-experimental approach to show a causal link between commodity price and civil conflict. [Bruckner & Ciccone \(2010\)](#) show that an outbreak of civil war is more likely following downturns in the international price of Sub-Saharan countries' main export commodities, using a commodity price index with weights being time-invariant export shares. They restrict their analysis to commodities where the countries produce a sufficiently small share of world supply (that is less than 3%) to convince that the analysis does not suffer from a problem of reverse causality, and they find the same result. They also argue that international commodity prices do not reflect changes in the anticipation of future civil wars in exporting countries. If this was true, downturns in commodity prices would presumably be associated to a decrease in the likelihood of civil war. [Bazzi & Blattman \(2014\)](#) use a similar analysis but disaggregate commodities and consider various measures of conflict. They focus on the effect of commodity international price variations on various measures of civil conflict using a commodity price index with weights being lagged export shares. They find no evidence of an effect of commodity price variations on the outbreak of civil conflict. However, they find that rising commodity prices increase the likelihood that civil conflict ends and decrease conflict intensity. Rising oil and mineral prices do not affect the outbreak of civil conflict but decrease the length and the intensity of civil conflict. The significant effects are, however, not statistically robust. The main conclusion of their analysis is that price shocks may not affect the likelihood of new civil conflicts but may affect the length and the intensity of existing civil conflicts.

A recent literature turns toward micro case studies, exploiting within-country variation instead of country-year analysis. [Dube & Vargas \(2013\)](#) use exogenous price shocks in international commodity markets to assess how income shocks affect violence. They focus on 950 Colombian municipalities over 1988-2005 period.¹⁶ They claim that income shocks

¹⁵See [Blattman & Miguel \(2010\)](#) for a more detailed discussion.

¹⁶In a related study, [Angrist & Kugler \(2008\)](#) show that departments in which coca cultivation grew during the 90's saw an increase in violence.

may increase the likelihood of conflict but also reduce it depending on the nature of the commodity. More precisely, they study changes in the price of agricultural goods (coffee), which are labor intensive, and natural resources (oil), which are not. They show that a conflict is more intense when the price of coffee falls because of lowered wages. In addition, they find that a conflict is less intense when the price of oil falls. [Vanden Eynde \(2011\)](#) focuses on the India's Naxalite conflict, in particular to the rebel's group (Maoist) strategic choices of its target. Using a theoretical model, he shows that negative (labor) income shocks¹⁷ increase violence against civilians to prevent them from being recruited as police informers. Following his theoretical prediction, he argues that mineral resources is a key element in the strategy of Maoist group. [Maystadt et al. \(2013\)](#) report results for mining activities in the Democratic Republic of the Congo. They instrument granting of mining concession by a mineral price index (mineral prices weighted by the fixed number of past concessions of each mineral). They find that granting of mining concession does not affect the likelihood of conflict at the lowest administrative level but increases the likelihood of conflict at the higher administrative level. [Berman & Couttenier \(2014\)](#) and [Berman et al. \(2014\)](#) use fine-grained disaggregated data for the entire set of sub-Saharan African countries which significantly improves the external validity of the previous case studies.

[Berman & Couttenier \(2014\)](#) use fine-grained disaggregated data on conflict events to study the impact of external income shocks on the likelihood of violence. They work with a full grid of sub-Saharan African countries divided in sub-national units of 0.5×0.5 degrees latitude and longitude, i.e their unit of observation is cell-year. They consider 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.¹⁸ They find that the incidence, intensity, onset and ending of conflicts are generally significantly correlated with (temporary) commodity shocks within locations. Moreover, they find this relationship is significantly weaker for the most remote locations, i.e those located away from the main seaports. Their identification is also improved by the use of another (long-lasting) income shocks: financial crises in the partner countries. The effect of this shock is consistent with their previous results. At the country-level, these shocks have an insignificant impact on the overall probability of conflict outbreak, but do affect the probability that conflicts start in the most opened regions. In the same vein, [Berman et al. \(2014\)](#) assess the impact of mining on conflicts in Africa. They use a fine-grained dataset of geo-referenced information over the 1997-2010 period on the location and characteristics of violent events and mining extraction over 27 minerals. They study the impact on civil conflict of all major minerals in African countries at a spatial resolution of 0.5×0.5 degree. Their identification strategy relies on exogenous variations in the minerals' world prices and the presence of mines spread within country (they restrict the sample to a sub-sample of cells without opening/closing of

¹⁷He uses negative rainfall shocks as income shocks.

¹⁸A potential concern as regards the use of price indices in which weights are based on export shares is that the pattern of trade and the export shares may be affected by the occurrence of civil conflict (see [Garfinkel et al. \(2008\)](#) for a theoretical model). This might be a source of reverse causality in the empirical studies. [Berman & Couttenier \(2014\)](#) provide number of alternative measures of weights, suggesting that their analysis does not suffer from a reverse causality bias.

mine over the period). They are then able to identify a within cell-specific exogenous price variation effect on violence through the changes in world commodity prices conditional on having a permanent active mine. They show that mining activity increases violence at the local level. The quantification of their effects is sizeable, both at local level and aggregated at the country level. Moreover, they go further by showing that mining activity spreads violence across territory and time by enhancing the financial capacities of fighting groups.

Opportunity cost, State as a prize or State capacity? The recent papers presented above also study the channels through which commodity price variations affect civil conflict. [Bazzi & Blattman \(2014\)](#)'s results suggest that the State as a prize mechanism, if any, is not strong enough to result in a positive relationship between commodity prices and the likelihood of civil conflict. Since they find that decreasing agricultural commodity prices increase the length and the intensity of conflict, they do not rule out the opportunity cost and the State capacity mechanisms, which may play through decreasing agricultural incomes and State decreasing export tax revenue. [Dube & Vargas \(2013\)](#) show that a conflict is more intense when the price of coffee falls because of lowered wages (a labor-intensive commodity), which supports the opportunity cost effect. In addition, they find that a conflict is less intense when the price of oil falls (a capital intensive commodity), which is consistent with the State as a prize mechanism. In the context of their case study, it is a "Municipality" as a prize mechanism which is at stake. [Berman & Couttenier \(2014\)](#) propose evidence to disentangle between the opportunity cost mechanism and the State capacity mechanism. They favor the opportunity cost mechanism using two results. First, commodity price shocks have no significantly larger effects in cells located closer to the the country's capital city. This suggests that the State capacity mechanism, if any, is not stronger closer to the political center of the country. Second, they aggregate their data at the country level and do not find a significant effect of commodity price shocks on military spending and on the efficiency of revenue mobilization by the State. [Vanden Eynde \(2011\)](#), in the context of the Naxalite conflict, show that rebel groups are more violent against security forces but only when the group has an access to external found (which enable to recruit soldiers), which is especially true if it has access to mineral resources. [Berman et al. \(2014\)](#) ask how local violence escalate to national wars in a study which is at the intersection of the micro and macro literature. They take advantage of the richness of ACLED data that inform on the outcome of the battle events. They show that a rebel group, when it wins a battle and appropriates a mining area, is more likely to perpetrate violence elsewhere in the country in the following years. This suggests that fights around mines spread conflict across space (and time) by making rebellions financially feasible thanks to the financial windfall from the winning of the mine. This new mechanism may be called the "Rebels capacity" mechanism.

What can we learn from natural resource abundance? A related strand of the literature, which is worth mentioning here, focuses on the abundance of natural resources. [Humphreys \(2005\)](#) and [Ross \(2006\)](#) show that the abundance of natural resources is positively correlated with the risk of civil war using measures of oil and diamond deposits. [Boschini](#)

et al. (2007) disaggregate natural resources and introduce the concept of appropriability: 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. The literature reports a positive correlation between appropriability of a resource, rent-seeking activities, corruption or conflict (Fearon & Laitin (2003), Ross (2006), Fearon (2005, 2006) and Angrist & Kugler (2008) among others). Lei & Michaels (2014) and Cotet & Tsui (2013) cast doubts on the robustness of the effect of the abundance of natural resources on civil conflict. Cotet & Tsui (2013) 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 that their result is driven by a relatively strong “State capacity” effect and a relatively weak “Rebels opportunity” effect. Indeed, governments in oil abundant countries - notably in non-democratic countries - may use financial windfalls to deter potential challengers. This happens as long as the control of natural resources generates more power for the State than attraction for potential rebels. Lei & Michaels (2014) use a dataset on giant oilfield discoveries since 1946 to assess the causal link of oil production and conflicts. They find a positive effect of oil discoveries on conflict. The incidence of conflict is especially high for countries that have already experienced conflicts.

4.2 Climate

By (indirectly) linking climate to conflict, Miguel *et al.* (2004) have 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 countries in the region have 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 (World Bank 2011). Barrios *et al.* (2010) show that rainfall has been a significant determinant of poor economic growth for Africa and they also show that 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 the focus on Sub-Saharan Africa relevant to highlight a potential relationship between climate and civil war.

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 recruitment. 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 & Persson 2010) is generally high compared to the appropriation capacity of the rebel groups.

The empirical evidence: [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.¹⁹ Their estimates (using historical data) show that a 1 degree Celsius 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. [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. [Couttenier & Soubeyran \(2014\)](#) show that the link between rainfall, temperature and civil war found in the literature may be driven by aggregate shocks (such as global climate) that were not accounted for. A standard specification relying only on within country variation reveals a much weaker and insignificant link between weather variables and civil war. To increase statistical power, they propose an alternative measure of climate with the *Palmer Drought Severity Index* and continue to find a weak positive link between drought and civil war. [Harari & Ferrara \(2012\)](#) focus on Africa over 1997-2011 at a disaggregated level (0.5×0.5 degree). They show that drought during the growing season of the main crop cultivated in a cell increases the likelihood of civil conflict in that cell. [Maystadt & Ecker \(2014\)](#) show that temperature anomalies have increased the likelihood of civil conflict in Somalian's regions (over 1997-2009) and [Maystadt et al. \(2014\)](#) show that temperature anomalies have increased the frequency of violent conflict by 32% in Sudanese regions over the 1997-2009 period. In a meta analysis, [Hsiang et al. \(2013\)](#) consider 60 quantitative studies. They argue that there exist a convergence of the results that support a causal link between climate and conflicts. They claim that the magnitude of the effect of climate is substantial.²⁰ For 1 standard deviation change in climate (warmer temperature and extreme rainfall), they expect the intergroup conflict to rise by 14%.

Available data: Regardless of the quality of the data, rainfall and temperature 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. 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

¹⁹See [Buhaug \(2010\)](#), [Burke et al. \(2010b\)](#), [Buhaug et al. \(2010\)](#) and [Burke et al. \(2010a\)](#) for a debate on the robustness of this link.

²⁰See [Hsiang & Burke \(2014\)](#), [Buhaug et al. \(2014\)](#) and [Hsiang et al. \(2014\)](#) for a debate on this claim.

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). The Standardised Precipitation-Evapotranspiration Index (SPEI)²¹ as an alternative of PDSI. The SPEI has the practical advantage to be simple and available at a more disaggregated level than the PDSI.²² The PDSI has the advantage to be grounded on a theoretical model (Dai 2011).²³ The Weighted Anomaly Standardized Precipitation Index (WASP),²⁴ is a measure of precipitation deviation from normal. The WASP index is based on precipitation only, while the PDSI and SPEI is based on precipitation, temperature, soil horizon thickness and texture, vegetation and texture-based estimates of the available soil moisture. Global climate variations (El Niño Southern Oscillation) are also used instead of idiosyncratic variations of rainfall and temperature, and they analyze the link between global climate and a global measure of the risk of civil conflict.²⁵

5 Policy Implications

In the previous sections, we have presented a (non-exhaustive) list of empirical roots that appears to be major determinants of civil conflict. For each broad group of determinants, we have proposed a state of recent research. It is important to stress that the roots of civil conflicts presented above are not mutually exclusive. Civil conflicts often arise because of a conjunction of several events and conditions. We think that civil conflicts break out when there are latent tensions and specific events create a spark which fuels these tensions. The previous exposition of the conceptual causes of conflicts has implications for policy. As argued in the introduction, the costs of civil conflict 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 & Hoeffler 2007). Policies for recovery and peace-building can be targeted more easily than prevention policies that are a priori more diffuse. An effective

²¹This index was first developed in Vicente-Serrano, Begueria & Lopez-Moreno (2010).

²²See Ciccone (2011) and Miguel & Satyanath (2011) for a discussion on the appropriate way to model climate. However, note that their discussion focuses on the use of lagged climate variables instead of climate variations, but does not discuss the hydrological relevance of the climate index.

²³Vicente-Serrano, Begueria, Lopez-Moreno, Angulo & El Kenawy (2010) argue that the SPEI has the advantage over the PDSI to be able to depict droughts on time scales shorter than 12 months. However, this criticism is not a problem because the monthly values used to compute the PDSI can be used to depict such droughts (Dai 2011). Dai (2011) provides a criticism of the SPEI. He argues that it is the actual evapotranspiration and not the potential evapotranspiration that affects the water balance. The problem is that the SPEI uses the latter.

²⁴This index was first developed in Lyon & Barnston (2005). Levy et al. (2005) uses this measure in a study on conflict.

²⁵However, the perspective of the studies which use a global measure is quite different, see Hsiang et al. (2011).

criterion for anticipating the likelihood of a civil conflict 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 & Hoeffler 2007, World Bank 2011). The recent report from the World Bank argues that international assistance focuses on recovery rather than prevention (World Bank 2011). The predominance of civil conflicts 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. However, 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 & 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.

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 & 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 & Roberts 2006, Schlenker & 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. However, Buhaug (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 \(2010\)](#) argue that targeted climate adaptation initiatives (see the United Nations Framework Convention on Climate Change), can have significant positive welfare implications (see also [Adger et al. \(2009\)](#)), but that they should not replace traditional aid and intervention programs such as peace-building strategies. [Buhaug \(2010\)](#) 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.

One may think that it would be 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. Understanding the precise causes of civil conflicts, without denying the huge needs of post-conflict countries, may help to apply adequate instruments to prevent them. Some inexpensive interventions (such as state-society consultations) can be effective even if financial assistance is often necessary to stop the rising of violence ([World Bank 2011](#)).²⁶

6 Conclusion

A strand of the recent literature on civil conflict is building on a set of studies aiming at showing a causal link between a small set of determinants, using shocks such as international commodity prices variations or climate variations as source of exogenous variations. Recent studies also suggest that the usual incidence measure of conflict should be discarded and that scholars should focus on outbreak, duration and intensity of conflict. We echo authors of the most recent cross-national studies who claim that better quality data is needed. The next step will be deepening our understanding of the mechanisms. To do so, more micro-level case studies that distinguish between competing theories are needed. To fully reach this goal, a theoretical model encompassing the three main mechanisms: “opportunity cost”, “State as a prize” and “State capacity”, and able to provide testable results would be helpful.

References

- Acemoglu, D., Golosov, M., Tsyvinski, A. & Yared, P. (2012), ‘Persistent fighting and shifting power’, *American Journal of Political Science* **56**(3), 620–637.
- Acemoglu, D., Johnson, S. & Robinson, J. A. (2001), ‘The colonial origins of comparative development: an empirical investigation’, *American Economic Review* **91**(5), 1369–1401.

²⁶The World Bank also 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.

- Adger, W., Lorenzoni, I. & O'Brien, K. (2009), *Adapting to climate change: thresholds, values, governance*, Cambridge University Press, Cambridge, UK.
- Akresh, R., Bhalotra, S., Leone, M. & Osili, U. O. (2012), 'War and stature: Growing up during the nigerian civil war', *American Economic Review* **102**(3), 273–77.
- Angrist, J. D. & Kugler, A. D. (2008), 'Rural windfall or a new resource curse? coca, income, and civil conflict in colombia', *The Review of Economics and Statistics* **90**(2), 191–215.
- Aragon, F. M. & Rud, J. P. (2013), 'Natural resources and local communities: Evidence from a Peruvian gold mine', *American Economic Journal: Economic Policy* **5**(2), 1–25.
- Baliga, S. & Sjoström, T. (2004), 'Arms races and negotiations', *Review of Economic Studies* **71**(2), 351–369.
- Baliga, S. & Sjoström, T. (2009), The strategy of manipulating conflict, Departmental Working Papers 200906, Rutgers University, Department of Economics.
- Barrios, S., Bertinelli, L. & Strobl, E. (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. & Blattman, C. (2014), 'Economic shocks and conflict: Evidence from commodity prices', *American Economic Journal: Macroeconomics* **6**, 1–38.
- Berman, N. & Couttenier, M. (2014), 'External shocks, internal shots: The geography of civil conflicts', *CEPR Discussion Paper (DP9895)*.
- Berman, N., Couttenier, M., Rohner, D. & Thoenig, M. (2014), This mine is mine! How minerals fuel conflicts in Africa, OxCarre Working Papers 141, Oxford Centre for the Analysis of Resource Rich Economies, University of Oxford.
- Besley, T. & Persson, T. (2010), 'State capacity, conflict, and development', *Econometrica* **78**(1), 1–34.
- Bester, H. & Konrad, K. A. (2000), 'Sabotage in rent-seeking contests', *Journal of Law, Economics and Organization* **16**(1), 155–65.
- Bester, H. & Konrad, K. A. (2004), 'Delay in contests', *European Economic Review* **48**(5), 1169–1178.
- Bester, H. & Konrad, K. A. (2005), 'Easy targets and the timing of conflict', *Journal of Theoretical Politics* **17**(2), 199–215.
- Bevia, C. & Corchon, L. C. (2010), 'Peace agreements without commitment', *Games and Economic Behavior* **68**(2), 469–487.

- Blattman, C. & Annan, J. (2010), ‘The Consequences of Child Soldiering’, *The Review of Economics and Statistics* **92**(4), 882–898.
- Blattman, C. & Miguel, E. (2010), ‘Civil war’, *Journal of Economic Literature* **88**(48), 3–57.
- Bloch, F. (2009), Endogenous formation of alliances in conflicts, Working papers, HAL.
- Boschini, A. D., Pettersson, J. & Roine, J. (2007), ‘Resource curse or not: a question of appropriability’, *Scandinavian Journal of Economics* **109**(3), 593–617.
- Bozzoli, C., Bruck, T. & de Groot, O. J. (2010), The global economic costs of conflict, Technical report. GECC Project Paper 3/2010.
- Bruckner, M. & Ciccone, A. (2010), ‘International commodity prices, growth and the outbreak of civil war in sub-saharan africa’, *Economic Journal* **120**(544), 519–534.
- Buhaug, H. (2010), ‘Climate not to blame for african civil wars’, *Proceedings of the National Academy of Sciences* **107**(38), 16477–16482.
- Buhaug, H., Hegre, H. & Strand, H. (2010), Sensitivity analysis of climate variability and civil war, Technical report, PRIO Paper. Oslo.
- Buhaug, H., Nordkvelle, J., Bernauer, T., Bohmelt, T., Brzoska, M., Busby, J., Ciccone, A., Fjelde, H., Gartzke, E., Gleditsch, N., Goldstone, J., Hegre, H., Holtermann, H., Koubi, V., Link, J., Link, P., Lujala, P., O’Loughlin, J., Raleigh, C., Scheffran, J., Schilling, J., Smith, T., Theisen, O., Tol, R., Urdal, H. & von Uexkull, N. (2014), ‘One effect to rule them all? a comment on climate and conflict’, *Climatic Change* pp. 1–7.
- Burke, M., Dykema, J., Lobell, D., Miguel, E. & Satyanath, S. (2009), ‘Warming increases the risk of civil war in africa’, *Proceedings of the National Academy of Sciences* **106**(49), 20670–20674.
- Burke, M., Dykema, J., Lobell, D., Miguel, E. & Satyanath, S. (2010a), Climate and civil war: is the relationship robust?, NBER Working Papers 16440, National Bureau of Economic Research, Inc.
- Burke, M., Dykema, J., Lobell, D., Miguel, E. & Satyanath, S. (2010b), ‘Climate robustly linked to african civil war’, *Proceedings of the National Academy of Sciences* **107**(51), E185.
- Chassang, S. & Padro i Miquel, G. (2009), ‘Economic Shocks and Civil War’, *Quarterly Journal of Political Science* **4**(3), 211–228.
- Chassang, S. & Padro i Miquel, G. (2010), ‘Conflict and deterrence under strategic risk’, *Quarterly Journal of Economics* **125**(4), 1821–1858.
- Chen, K. (2003), ‘Sabotage in promotion tournament’, *Journal of Law, Economics and Organization* **19**(1), 119–139.

- Chen, S., Loayza, N. V. & Reynal-Querol, M. (2007), The aftermath of civil war, Policy Research Working Paper Series 4190, The World Bank.
- Chen, X. & Nordhaus, W. D. (2010), The value of luminosity data as a proxy for economic statistics, NBER Working Papers 16317, National Bureau of Economic Research, Inc.
- Cicccone, A. (2011), ‘Transitory economic shocks and civil conflict: A comment’, *American Economic Journal: Applied Economics* **3**(4), 215–227.
- Collier, P., Chauvet, L. & Hegre, H. (2009), The security challenges in conflict prone countries, Open access publications from universite paris-dauphine, Universite Paris-Dauphine.
- Collier, P. & Hoeffler, A. (2002), ‘Aid, policy and peace: Reducing the risks of civil conflict’, *Defence and Peace Economics* **13**(6), 435–450.
- Collier, P. & Hoeffler, A. (2004), ‘Greed and grievance in civil war’, *Oxford Economic Papers* **56**(4), 563–595.
- Collier, P. & Hoeffler, A. (2007), *Civil war*, Vol. 2 of *Handbook of Defense Economics*, Elsevier, chapter 23, pp. 711–739.
- Collier, P., Hoeffler, A. & Pattillo, C. (2004), ‘Africa’s exodus: capital flight and the brain drain as portfolio decisions’, *Journal of African Economies* **13**(02), ii15–ii54.
- Cotet, A. M. & Tsui, K. K. (2013), ‘Oil and Conflict: What does the cross country evidence really show?’, *American Economic Journal: Macroeconomics* **5**(1), 49–80.
- Couttenier, M. & Soubeyran, R. (2014), ‘Drought and civil war in sub-saharan africa*’, *The Economic Journal* **124**(575), 201–244.
- Dai, A. (2011), ‘Characteristics and trends in various forms of the palmer drought severity index during 1900–2008’, *Journal of Geophysical Research* **116**(D12115).
- Dal Bo, E. & Dal Bo, P. (2011), ‘Workers, warriors, and criminals: Social conflict in general equilibrium’, *Journal of the European Economic Association* **9**(4), 646–677.
- 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., Jones, B. F. & Olken, B. A. (2008), Climate shocks and economic growth: evidence from the last half century, Nber working papers, National Bureau of Economic Research, Inc.
- Domingues, P. & Barre, T. (2013), ‘The health consequences of the mozambican civil war: an anthropometric approach’, *Economic Development and Cultural Change, forthcoming* **61**(4).

- Dube, O. & Vargas, J. (2013), ‘Commodity price shocks and civil conflict: Evidence from colombia’, *The Review of Economic Studies* .
- Esteban, J., Morelli, M. & Rohner, D. (n.d.), ‘Strategic mass killings’, *Journal of Political Economy* .
- Fearon, J. (1995), ‘Rationalist explanations for war’, *International Organization* **49**(3), 379–414.
- Fearon, J. (2006), *Ethnic Mobilization and Ethnic Violence*, Oxford and New York: Oxford University Press, pp. 852–68.
- Fearon, J. D. (2005), ‘Primary commodity exports and civil war’, *Journal of Conflicts Resolution* **49**(4), 483–507.
- Fearon, J. D. & Laitin, D. (2003), ‘Ethnicity, insurgency, and civil war’, *American Political Science Review* **97**(14), 75–91.
- Garfinkel, M. (1990), ‘Arming as a strategic investment in a cooperative equilibrium’, *American Economic Review* **80**(1), 50–68.
- Garfinkel, M. R. & Skaperdas, S. (2007a), *Economics of conflict: an overview*, Vol. 2 of *Handbook of Defense Economics*, Elsevier, chapter 22, pp. 649–709.
- Garfinkel, M. R. & Skaperdas, S. (2007b), *Economics of Conflict: An Overview*, Handbook of Defense Economics, Volume 2: Defense In a Globalized World.
- Garfinkel, M. R., Skaperdas, S. & Syropoulos, C. (2008), ‘Globalization and domestic conflict’, *Journal of International Economics* **76**(2), 296–308.
- Gates, S. (2002), ‘Recruitment and allegiance: The microfoundations of rebellion’, *Journal of Conflict Resolution* **46**(1), 111–130.
- Grossman, H. (1999), ‘Kleptocracy and revolutions’, *Oxford Economic Papers* **51**(2), 267–283.
- Grossman, H. I. (1991a), ‘A general equilibrium model of insurrections’, *American Economic Review* **81**(4), 912–21.
- Grossman, H. I. (1991b), ‘A general equilibrium model of insurrections’, *American Economic Review* **81**(4), 912–21.
- Gurtler, O. (2008), ‘On sabotage in collective tournaments’, *Journal of Mathematical Economics* **44**(3/4), 383–393.
- Haavelmo, T. (1954), *A study in the theory of economic evolution*, North-Holland, Amsterdam.

- Harari, M. & Ferrara, E. L. (2012), Conflict, climate and cells: a disaggregated analysis, Working Papers 461, IGIER.
- Hirshleifer, J. (1989), 'Conflict and rent-seeking success functions: ratio vs. difference models of relative success', *Public Choice* **63**, 101–112.
- Hirshleifer, J. (1995), 'Anarchy and its breakdown', *Journal of Political Economy* **103**(1), 26–52.
- Hobbes, T. (1651), *Leviathan, or the matter, forme, and power of a commonwealth, ecclesiasticall and civil*, Elsevier.
- Hodler, R. & Raschky, P. A. (2014), 'Economic shocks and civil conflict at the regional level', *Economics Letters* **124**(3), 530 – 533.
- Hsiang, S. & Burke, M. (2014), 'Climate, conflict, and social stability: what does the evidence say?', *Climatic Change* **123**(1), 39–55.
- Hsiang, S., Burke, M. & Miguel, E. (2014), 'Reconciling climate-conflict meta-analyses: reply to buhaug et al.', *Climatic Change* pp. 1–7.
- Hsiang, S. M., Burke, M. & Miguel, E. (2013), 'Quantifying the influence of climate on human conflict', *Science* p. 10.1126/science.1235367.
- Hsiang, S. M., Meng, K. C. & Cane, M. A. (2011), 'Civil conflicts are associated with the global climate', *Nature* **476**, 438–441.
- Humphreys, M. (2005), 'Natural resources, conflict, and conflict resolution', *Journal of Conflict Resolution* **49**(4), 508–537.
- Jackson, M. O. & Morelli, M. (2007), 'Political bias and war', *American Economic Review* **97**(4), 1353–1373.
- Jackson, M. O. & Morelli, M. (2009), 'Strategic militarization, deterrence and wars', *Quarterly Journal of Political Science* **4**(4), 279–313.
- Jackson, M. O. & Morelli, M. (2011), *The reasons for wars - an updated survey*, Handbook on the Political Economy of War, Elgar Publishing.
- Justino, P. & Verwimp, P. (2008), Poverty dynamics, violent conflict and convergence in Rwanda, Research Working Papers 4, MICROCON - A Micro Level Analysis of Violent Conflict.
- Kibris, A. (2014), 'The conflict trap revisited: Civil conflict and educational achievement', *Journal of Conflict Resolution* .
- Konrad, K. A. (2009), *Strategy and Dynamics in Contests*, number 9780199549603 in 'OUP Catalogue', Oxford University Press.

- Konrad, K. A. (2012), ‘Dynamic contests and the discouragement effect’, *Revue d’Economie Politique* **122**(2), 233–256.
- Krakerl, M. (2003), ‘Helping and sabotaging in tournaments’, *International Game Theory Review* **19**(1), 119–139.
- Kydd, A. H. (1997), ‘Game theory and the spiral model’, *World Politics* **49**(3), 371–400.
- Lai, B. & Thyne, C. (2007), ‘The effect of civil war on education, 1980-97’, *Journal of Peace Research* **44**, 277–292.
- Lazear, E. (1989), ‘Pay equality and industrial politics’, *Journal of Political Economy* **97**.
- Lei, Y.-H. & Michaels, G. (2014), ‘Do giant oilfield discoveries fuel internal armed conflicts?’, *Journal of Development Economics* **110**(0), 139 – 157.
- Leventoglu, B. & Slantchev, B. L. (2007), ‘The armed peace: a punctuated equilibrium theory of war’, *American Journal of Political Science* **51**(4), 755–771.
- Levy, M. A., Thorkelson, C., Vorosmarty, C., Douglas, E. & Humphreys, M. (2005), Fresh-water availability anomalies and outbreak of internal war: results from a global spatial time series analysis, Working papers, Paper presented at the annual meeting of the International Studies Association, San Diego, CA.
- Lobell, D. B., Burke, M. B., Tebaldi, C., Mastrandrea, M. D., Falcon, W. P. & Naylor, R. L. (2008), ‘Prioritizing climate change adaptation needs for food security in 2030’, *Science* **319**(1).
- Lyon, B. & Barnston, A. G. (2005), ‘Enso and the spatial extent of interannual precipitation extremes in tropical land areas’, *Journal of Climate* **18**, 5095–5109.
- Marchiori, L., Maystadt, J.-F. & Schumacher, I. (2012), ‘The impact of weather anomalies on migration in sub-saharan africa’, *Journal of Environmental Economics and Management* **63**(3), 355 – 374.
- Martin, P., Mayer, T. & Thoenig, M. (2008), ‘Civil wars and international trade’, *Journal of the European Economic Association* **6**(2-3), 541–550.
- Maystadt, J.-F., Calderone, M. & You, L. (2014), ‘Local warming and violent conflict in north and south sudan’, *Journal of Economic Geography* .
- Maystadt, J.-F., De Luca, G., Sekeris, P. G. & Ulimwengu, J. (2013), ‘Mineral resources and conflicts in drc: a case of ecological fallacy?’, *Oxford Economic Papers* **66**(3).
- Maystadt, J.-F. & Ecker, O. (2014), ‘Extreme weather and civil war: Does drought fuel conflict in somalia through livestock price shocks?’, *American Journal of Agricultural Economics* **96**(4), 1157–1182.

- Meirowitz, A. & Sartori, A. E. (2008), ‘Strategic uncertainty as a cause of war’, *Quarterly Journal of Political Science* **3**(4), 327–352.
- Miguel, E. (2007), *Too poor for peace? Global poverty, conflict, and security in the 21st century*, Brookings Inst Press, Washington, DC.
- Miguel, E. & Satyanath, S. (2011), ‘Re-examining economic shocks and civil conflict’, *American Economic Journal: Applied Economics* **3**(4), 228–232.
- Miguel, E., Satyanath, S. & Sergenti, E. (2004), ‘Economic shocks and civil conflict: an instrumental variables approach’, *Journal of Political Economy* **112**(4), 725–53.
- Morelli, M. & Rohner, D. (2010), Natural resource distribution and multiple forms of civil war, Technical report.
- Murdoch, J. & Sandler, T. (2004), ‘Civil wars and economic growth: Spatial dispersion’, *American Journal of Political Science* **48**, 138–151.
- Palmer, W. (1965), Meteorological drought, Research Paper 45, US Dept. of Commerce.
- Polborn, M. (2006), ‘Investment under uncertainty in dynamic conflicts’, *Review of Economic Studies* **73**(2), 505–529.
- Powell, R. (1993), ‘Guns, butter and anarchy’, *American Political Science Review* **87**, 115–132.
- Powell, R. (2012), ‘Persistent fighting and shifting power’, *American Journal of Political Science* **56**(3), 620–637.
- Powell, R. (2013), ‘Monopolizing violence and consolidating power’, *The Quarterly Journal of Economics* .
- Querou, N. (2010), Group bargaining and conflict, Technical report. FEEM Working Paper No. 125.2010.
- Rohner, D., Thoenig, M. & Zilibotti, F. (2013a), ‘Seeds of distrust: conflict in uganda’, *Journal of Economic Growth* **18**(3), 217–252.
- Rohner, D., Thoenig, M. & Zilibotti, F. (2013b), ‘War signals: A theory of trade, trust, and conflict’, *The Review of Economic Studies* **80**(3), 1114–1147.
- Ross, M. (2006), ‘A closer look at oil, diamonds and civil war’, *Oxford Economic Papers* **9**, 265–300.
- Sanchez-Pages, S. (2009), ‘Conflict as a part of the bargaining process’, *Economic Journal* **119**(539), 1189–1207.

- Schelling, T. C. (1963), *The strategy of conflict*, London and New York, Oxford University Press.
- Schlenker, W. & Lobell, D. B. (2010), ‘Robust negative impacts of climate change on african agriculture’, *Environmental Research Letters* **5**.
- Schlenker, W. & Roberts, M. J. (2006), ‘Nonlinear effects of weather on corn yields’, *Review of Agricultural Economics* **28**(3), 391–398.
- Sekeris, P. G. (2014), ‘The tragedy of the commons in a violent world’, *The RAND Journal of Economics* **45**(3), 521–532.
- Skaperdas, S. (1992), ‘Cooperation, conflict, and power in the absence of property rights’, *American Economic Review* **82**(4), 720–39.
- Slantchev, B. (2007), Feigning weakness, mimeo, University of California at San Diego.
- Sonin, K. & Schwarz, M. (2008), ‘A theory of brinkmanship, conflicts, and commitments’, *Journal of Law, Economics and Organization* **24**(1), 163–183.
- Soubeyran, A. & Tomini, A. (2012), ‘Water shortages and conflict’, *Revue d’Economie Politique* **122**(2).
- Soubeyran, R. (2009), ‘Contest with attack and defense: does negative campaigning increase or decrease voter turnout?’, *Social Choice and Welfare* **32**, 337–353.
- Sutton, A. E., Dohn, J., Loyd, K., Tredennick, A., Bucini, G., Solorzano, A., Prihodko, L., & Hanan, N. (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.
- Vanden Eynde, O. (2011), Targets of violence: Evidence from india’s naxalite conflict. mimeo.
- Vicente-Serrano, S. M., Begueria, S. & Lopez-Moreno, J. I. (2010), ‘A multiscalar drought index sensitive to global warming: The standardized precipitation evapotranspiration index’, *Journal of Climate* **23**, 1696–1718.
- Vicente-Serrano, S. M., Begueria, S., Lopez-Moreno, J. I., Angulo, M. & El Kenawy, A. (2010), ‘A new global 0.5 degrees gridded dataset (1901-2006) of a multiscalar drought index: Comparison with current drought index datasets based on the palmer drought severity index’, *Journal of Hydrometeorology* **11**, 1033–1043.
- Waltz, K. (1959), *Man, the State, and war*, Columbia University Press: N.Y.

World Bank (2011), Conflict, security and development, Technical report, International Bank for Reconstruction and Development and World Bank.

Yared, P. (2010), 'A dynamic theory of war and peace', *Journal of Economic Theory* **145**(5), 1921–1950.

Young, A. (2009), The african growth miracle, Lse working paper.