ECONOMIC INCENTIVES IN CIVIL WAR PEACE SETTLEMENTS: A GAME THEORETIC APPROACH

By

MORITZ PETER RISSMANN

Bachelor of Arts in European Economic Studies
Otto-Friedrich University of Bamberg
Bamberg, Germany
2010

Bachelor of Science in Applied Economics
Budapest University of Technology and Economics
Budapest, Hungary
2010

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
MASTER OF SCIENCE
December, 2012

ECONOMIC INCENTIVES IN CIVIL WAR PEACE SETTLEMENTS: A GAME THEORETIC APPROACH

Thesis Approved:

Nikolas Emmanuel, Ph.D.

Thesis Adviser

Brenda Phillips, Ph.D.

Joel Jenswold, Ph.D.

Name: MORITZ P. RISSMANN

Date of Degree: DECEMBER, 2012

Title of Study: ECONOMIC INCENTIVES IN CIVIL WAR PEACE SETTLEMENTS: A GAME THEORETIC APPROACH

Major Field: INTERNATIONAL STUDIES

ABSTRACT:

Subjects generate income by investing in productive activities or appropriation. Conflict is always pareto-inferior to peace. Malevolent preferences, disharmonious consumption, asymmetric information, and weak institutions lead the parties into a conflict trap.

This study finds that third-party economic intervention in conflicts can overcome the constraints of scarce resources, reverse the incentives for fighting, and shift the decision making process towards higher social welfare levels which lay beyond violent outcomes of the bargaining process. Intervening parties have to complement the current toolset of coercive and noncoercive measures with economic development and state building.

The models of conflict suggest that for some players, appropriation yields more profit than regular production. Without guaranteed independent authorities the players are better off defending themselves. Given expectations about the future, players may decide for war even when peace yields higher immediate benefits. Players will not disarm unless they can be sure that their security needs will be satisfied in the future. Even without a common government and disarmament, opposing parties can reach a peaceful equilibrium: At some point the costs of war outweigh the payoff. If the payoff of a civil war, e.g. rights, is a public good, individuals have no incentive to join the fight unless they are offered immediate personal advantages. Investments in a civil war economy have to be targeted. Increasing the productivity of land in a territory-based conflict is deconstructive. Conflicts are continuous games in which outcomes alternate between war and peace. Peace settlements are not final and will need renegotiations.

Keywords: *civil war, violent intrastate conflict, incentive-based intervention, economic incentive, peace settlement*

TABLE OF CONTENTS

Chapter Page

LIST OF FIGURES

CHAPTER I

INTRODUCTION

The idea of appropriating as a form of income that competes with regular productive efforts was introduced by Pareto (1909, p. 466) and picked-up by Haavelmo (1954, p. 92) as well as Hirshleifer (1985). Only until then researchers devoted increased attention to the economic incentives of conflict. This was a necessary step toward a more realistic understanding of violent conflict. The literature refers to violent conflict as inter- and intra-state conflicts, civil wars, revolutions, etc. Tullock (1971, p. 89) argues that the previous understanding of revolutions was overly romanticized: Civil wars are not driven only by altruistic motives, but also by various opportunities for personal gains. This has significant implications on understanding the motives of conflict, their settlement, and interventions. Aware that conflict is driven by many factors, this study focusses on the economic motives of conflict. Other motives will be mentioned briefly when the models below account for such.

No player will miss a chance to profit from others. Based on this conclusion from the works of Niccolo Machiavelli, Hirshleifer (1994, p. 3) introduces the Machiavelli Theorem. It complements Coase's Theorem (Coase, 1960) which says that no player will miss a chance to engage in mutually beneficial trade. This means that conflicting parties

will only cooperate when the payoff is higher than from fighting. On the other hand, players will not desert from agreements as long as they cannot realize higher payoffs on their own.

Since the end of the Cold War, civil wars have made up the main part of violent conflicts. This is not to say that the Cold War caused these civil wars. Fearon (1995) finds in an empirical study that the majority of civil wars which were observed after the end of the Cold War started after World War II. Therefore, it is essential to obtain a better understanding of the nature and motives of conflicts. Economic modeling is an important tool to create such awareness.

The Importance of Conflict Economics in the Research on Civil Wars

Conflict economics utilizes methods and tools of economic analysis to research conflicts and related issues. The study of conflict economics intersects with a variety of economic fields such as development economics, public finance, microeconomics and macroeconomics, international trade, and behavioral economics. Applying economic theory to conflicts is useful because conflicts evolve around problems which play important roles in economic studies: competition over resources and property rights, public goods, negative external effects, taxation and redistribution, economic decision making of individuals and firms, and first-mover advantages and dominance. Conflict economics is strongly oriented towards policy recommendations. Economists strive to find the most effective and efficient tools to solve a problem. Different phases of a problem may call for different instruments. However, the implementation of these instruments requires different skill sets. The ultimate goal of understanding conflicts is to

find tools for its resolution and prevention. Therefore, the study of conflicts is also referred to as peace studies.

Microeconomics has two branches: exchange theory and conflict theory (Hirshleifer, 1995b, p. 188). Exchange theory is based on the assumption of Coase's Theorem. Economic subjects will cooperate if it is mutually beneficial (Coase, 1960). Conflict theory deals with one-sided advantage through conflict and is best summarized by Machiavelli's Theorem: Individuals will use the opportunity to profit from others (Hirshleifer, 1994).

As there is no universal model to explain the theory of exchange, there is no universal method to model conflict. Perfect competition and monopoly and their various mixtures require different modeling approaches. Conflict theory is not an exception (Hirshleifer, 1995b, p. 179).

Economists are not interested in the design or proper employment of economic incentive schemes to steer conflict towards peace. This is better left to diplomats, politicians, development organizations which can rely on individuals who have the insights of the conflict, area, players, relationships, and networks. Economists are interested in economies of scale and scope, complements and substitutes in production, and the motivating factors that make individuals behave as they do. When economists study the technology of conflict, they are interested in macroeconomic factors and global payoff schemes for the conflicts at hand. Therefore, when modeling conflict, Hirshleifer (1995b, p. 175) refers to the Macrotechnology of conflict.

The importance of conflict economics has grown significantly and studies of conflict fall into two regional categories: interstate conflicts and intrastate conflicts. Due to the World Wars and the following Cold War, it is reasonable to say that relationships between states were more important until the end of the twentieth century. Interdependency was believed to have positive external effects on conflicts. Since the end of the Cold War, the spotlight has shifted toward the study of intrastate conflicts: insurrections, revolutions, uprisings, civil wars, civil conflicts. The ongoing insurrections in the Arab World reinforce the timeliness and relevance of conflict economics and demand an even stronger focus on intrastate conflicts. The study of conflict economics is critical for an extensive audience including incumbents, insurgents, mediating third parties, neighboring countries, international organizations, and international trade.

Research Question

The present work intends to study whether third-party intervention in intrastate conflicts can help to overcome the constraint of scarce resources, influence/reverse the incentives for fighting, and shift the decision making process towards higher social welfare levels that lay beyond violent outcomes of the bargaining model.

Rationale for the Study

Incentive-based, soft intervention needs further attention. The current literature on soft intervention usually deals with purchases (see e.g. Rothchild and Emmanuel (2010)). However, if economic factors are responsible for pushing an entire population into civil war, intervening parties have to engage in economic development and state building.

This work aspires to help filling the research gap. It shall fit into the research on the motivations of civil war (see e.g. Collier and Hoeffler (1998) or Collier and Hoeffler (2004)), on identity-based conflicts (see e.g. Rothchild (1997, pp. 1-22)), violence (see e.g. Kalyvas (2006, pp. 146-209)), and coercive as well as non-coercive interventions (see e.g. Rothchild (1997, pp. 243-280) and Rothchild and Emmanuel (2010)).

The results of this study will be useful to researchers as well as mediators and peacekeepers in civil wars. Understanding the dynamics of bargaining during civil wars will allow developing strategies of intervention which can shift the outcome of the bargaining process toward a non-violent solution. The hypothesis is that economic incentives create a bargaining atmosphere, increase the number of potential settlements, and yield options which favor non-violent sustainable solutions. If the frameworks studied in this work find such conclusions, intervening third parties will have to complement military and diplomatic interventions with economic incentives.

Due to the ongoing Arab Revolt[1] and whenever the models allow, the discussion will focus on the bargaining between two groups of which one is the government and the other one is constituted by the dominated population outside the governing elite and its protégées.

[1] The media generally refers to this chain of events as *Arab Spring*, however, the insurgents prefer the wording of *Arab Revolt*. (Personal communication with Rami Khouri, speaker for Oklahoma State University's Global Briefing series on October 18, 2012)

Outline of the Study

The study outlays the fundamental concepts of bargaining in intrastate conflicts and discusses findings which are important to the problem at hand. It is presented in five chapters. Chapter one introduces the reader to the research question and situates the problem within the context of research on peace settlements of civil wars. Moreover, the first chapter explains the importance of the field of conflict economics to research on civil wars.

Chapter two provides definitions and a review of the literature that relate to the research question. Essentially, the review includes works on the motives of civil war, methods of intervention, and the sustainability and duration of peace settlements. In addition, this part briefly reviews research on civil wars with regard to international trade.

Chapter three presents economic models of conflict that contributed to understanding the motivations of civil war and its bargaining process. In order to facilitate the understanding of the models and their assumptions, chapter two starts off by explaining common game theoretical choices of modeling conflict. The models show what economic incentives influence the decisions of individuals and groups to start or join a civil war. Furthermore, the models show what role economic incentives and expectations play in ending or preventing civil war. The pioneering works by Haavelmo (1954) and Hirshleifer (1985) are presented first and followed by works which further developed the models of conflicts.

Chapter 4 presents the findings and conclusions from the previous chapters. The review of the literature suggests internal and external dynamics that lead to civil war if the

pressures cannot find other reliefs. A Pressure and Release Model for Civil Wars illustrates the relations between studies on the correlates of civil war. Identifying root causes helps to draw conclusions about the optimal instruments of intervention. The economic models of conflict presented in the Methodology suggest that individuals as well as groups are drawn by economic incentives into conflict. If conflict is an alternative to regular productive activity and serves as a way to generate income, intervention and peace settlements have to offer equal or better payoffs. The findings are discussed separately and summarized in *lemmas*. When appropriate, examples and suggestions are provided to the reader.

Chapter 5 concludes and summarizes the results of this study. Economic incentives have positive effects on peace negotiations and the durations of peace settlements. Future research has to identify the best timing of the different incentive schemes and study their effects on the duration of peace empirically. The chapter ends with several suggestions for future research.

CHAPTER II

REVIEW OF THE LITERATURE

This chapter defines important terms for this study and reviews the literature on the correlates of war and peace as well as third-party intervention. In addition, it reviews the Pressure and Release model from the literature on social vulnerability to natural disasters. This model is picked up and modified in following sections.

The structure of the section on the correlates of war illustrates the main branches within the literature. However, some of its critics are mentioned as well.

Definitions

Defining major terms which are used throughout this work shall facilitate the understanding on the models and allow for a consistent way of interpretation. The definitions are based on the prevailing literature on conflict.

Conflict

A conflict arises when two individuals or groups perform actions which are mutually inconsistent. Either they both want to have access to a rivalrous good or service or their individual goals are incompatible. The solution to a conflict is the finding of a mutually

compatible set of actions. Conflicts can involve more than two parties (Nicholson, 1992, p. 11).

For economists, competition is when two or more subjects in the economy contest over resources. Trade is a result from contesting over resources and yields win-win situations for all trade partners. Competition changes to conflict when subjects decide to engage in unproductive efforts, e.g. hampering or sabotaging others, in order to achieve one-sided advantages. As a result, conflict theory is different from exchange theory. The analysis of conflict needs to incorporate both branches (Hirshleifer, 1995b, p. 167).

Whereas conflict can have various non-violent[2] and violent forms, this study and the models below only deal with violent conflict, or war. Some models simply study war, others specify whether they study inter or intra-state conflicts, civil wars, or revolutions. In the context of this article, *conflict* shall be understood as violent conflict between two or more groups within one state. This definition encompasses intrastate as well as internationalized intrastate wars. Hence, it is close to the term of *deadly quarrels* introduced by Richardson (1960). However, Richardson's definition also includes regular state-versus-state wars, wars between criminal organizations, and 'simple' murder.

Intrastate conflict can take various forms, such as civil wars, revolutions, or genocides. For example, different parts of the population can fight against each other, or the population as a whole can raise against the governing elite. Accordingly, some of the

[2] See e.g. Gould (1973) and Priest and Klein (1984) on legal conflicts, and Ashenfelter and Johnson (1969) on industrial conflicts.

research and models presented below distinguish between the forms of violent intrastate conflict. This study is interested in the economic motivation of violent intrastate conflict and ways to influence such incentives. A detailed discussion of the scope and dynamics of conflicting groups is beyond the range of this work. Therefore, the study does not differentiate between the forms of violent intrastate conflict.

For reasons of simplicity, *civil war* is occasionally used interchangeably for *violent intrastate conflict*. Definitions of civil war vary due to different minimum requirements of violence, starting and ending dates, and geographic boundaries. It can be difficult to differentiate between interstate and internationalized intrastate wars (Sambanis, 2004, p. 815). Sambanis (2004, pp. 816-817) questions the definition of civil war by Small and Singer (1982) as organized intrastate violence that involves the government and requires more than 1,000 battle deaths. Such definitions do not account for different degrees of organization, civil wars without effective governments, or imprecise reporting of casualties. For the purpose of this study, a general definition of civil war as organized, intrastate violence is sufficient. A minimum of battle deaths is not required.

Violence is the application of force upon someone else's person or property. *Coercion* is threatening others to make them do or stop doing something (Tullock, 1980, pp. 7-8).

In Nicholson's definition of conflict, conflict resolution is not necessarily equal to eliminating conflicting interests. A solution is a compatible set of actions that works for all parties and renders conflict unnecessary. Each party should accept the settlement either because of rationality and self-interest, or out of fear from uncertainty about the future and retaliatory actions. Hence, a possible settlement has to be pareto optimal to

the point of departure. Otherwise, conflict is favorable to at least one party (Nicholson, 1992).

Third party intervention is necessary if the conflicting parties are not capable of ending the conflict or if the intervening third party wishes to prevent the suffering that goes along with a military victory by either side.

Distribution and Redistribution

Conflict, or engaging in unproductive actions, is the devotion of resources of opponents with conflicting interests to counteract each other's attempts to reach their ambitions. Conflict arises during *redistribution* and when *distribution* problems occur (Tullock, 1980, pp. 5-6).

Investments in producing goods and services yield benefits and subjects in the economy will bargain over the distribution of these benefits. In addition, the subjects are influenced by their opportunities to gain some of the others' initial resource endowments. This will be referred to as redistribution (Tullock, 1980, pp. 2-3). Bargaining involves cooperative games to reach pareto superior situations, and non-cooperative games that entail one-sided advantages (Tullock, 1980, p. 6).

Social Welfare

Social welfare, or social income, is the aggregated amount of resources, income, or utility of all parties in the studied economy. In a two-player society, social income would be the income of player 1 plus the income of player 2.

Conflict involves transaction costs. In order for players to achieve their goals in the bargaining process, they have to invest resources which then cannot be invested in productive efforts. Compared to perfect competition, conflict reduces the social income (Tullock, 1980, p. 6).

Rationality

Even though, conflict reduces social welfare, bargaining may be a rational choice for the individual parties. Appropriating a given amount of goods may cost less than producing the same bundle of goods. In this case, appropriating is rational. The term *rational* is used without any judgment on whether the action is morally correct or unethical (Tullock, 1980, pp. 3-4).

The Correlates of Peace and Conflict

Following the concern of Garfinkel and Skaperdas (2012), this study uses the term *correlates* rather than *causes* of peace and conflict in order to acknowledge that the causes of peace and conflict and their importance may vary from case to case. In addition, conflict and peace involve uncertainty, incomplete information, destruction, and external effects. Hence, one cannot be sure about what causes war and what is merely a symptom of underlying root causes.

Poverty, hunger, and disease, for example, are not necessarily the causes of civil war. Coghlan et al. (2006) suggest that millions died in the Democratic Republic of Congo due to hunger and disease as a result of the civil war. The destruction of war could also broaden the gap between the rich and the poor (Collier & World Bank, 2003).

The following section provides an overview about the literature on the correlates of peace and conflict. The author agrees with Lake and Rothchild (1996) in that violent conflict cannot only be caused by the competition over resources or old hatreds. Violence is expensive, it destroys human as well as physical capital, creates suffering, and has short as well as long term consequences. Taydas, Enia, and James (2011) even argue that distinguishing the correlates of war into greed and grievances limits our understanding of the occurrence of civil wars.

Grievance

The *Grievance* branch in the literature on the correlates of peace and war argues that if the situation is bad enough, the population or parts of it will revolt against the system or group that, in their view, causes or neglects their situation (Singh, 2007, p. 401). Common themes are that natural resources encourage separatism, old hatreds create vicious circles of violence, and inequalities in income lead to class wars.

Gurr (1970) laid the foundation for the grievance literature with his *relative deprivation* theory. Relative deprivation is the difference between what an individual thinks it deserves and what it can get. This frustration builds up anger which eventually results in violence.

Poverty is generally considered to be a major correlate of war. For the poor, conflict has high potential and low opportunity costs. Therefore, poor countries are likely to experience more conflicts (Collier & Hoeffler, 2004; Fearon & Laitin, 2003). In their empirical analysis, Collier and Hoeffler (2004) find that generally, social and political

factors have few explanatory power, whereas economic factors can explain considerable parts of the appearance of civil wars.

Low economic performance increases the chance of conflict. Mehlum, Moene, and Torvik (2005) construct a model that suggests that poverty reinforces conflict and economic growth strengthens peace. Miguel, Satyanath, and Sergenti (2004) study the relationship between economic growth and the risk of conflict in 41 African countries during 1981–99. They find that the risk of conflict increases by 50% for every 5% decline of economy performance.

Unequal distribution of resources and the lack of redistribution of thereof lead to growing wealth gaps between better and lesser endowed groups. Without instruments to acquire capital, individuals or groups with few resources face self-reinforcing inequality (Bénabou, 2000). Banerjee and Duflo (2003) suggest that the effect of inequality on economic growth is ambiguous. Economic growth is an inverted U-shaped function of inequality. Therefore, economic growth can decrease with increases as well as decreases in inequality. Both papers derive their results from cross-country analysis.

Greed and Opportunity

The branch of *Greed* and *Opportunity* within the literature on conflict sees conflict as a business opportunity. Opportunity for violence refers to low costs of conflict and the prospect of material gain. This research relates to the Machiavelli Theorem (Hirshleifer, 1994, p. 3). Individuals will engage in conflict if they can achieve a net gain (Muller & Opp, 1986; Olson, 1965).

The idea of conflict as a form of income that competes with regular productivity was introduced by Pareto (1909, p. 466) and picked-up by Haavelmo (1954, p. 92). Anderton and Carter (2009, chap. 2) provide a good review of the framework and corresponding literature.

Low opportunity costs of war increase the risk of violent conflict to resolve grievances. In addition, the literature on violent conflict introduced another set of motivations. Rebellion-as-investment yields gains after the fight. Grossman (1991) models insurgence and its deterrence as functions of tax rates and income distribution. Groups use rebellion as an economic activity to compete for scarce resources. Rebellion-as-business yields profits during the fight. Violent conflict may be motivated by the opportunity of looting or illicit activities (Collier, 2000). Both forms of rebellion are motivated by greed and facilitated by profitable opportunities.

Looting is a form of income in civil wars. Azam (2002) constructs a model which suggests that looting is more severe in societies without credit markets. Conflicting parties have to loot in order to finance war efforts. Azam and Hoeffler (2002) draw similar conclusions and extend their analysis to find that looting as a form of violence can also substitute for regular war efforts.

Per capita income, natural resource endowments, and the size of the population influence the risk and duration of civil wars. High per capita income raises the opportunity costs of war. Natural resources have two effects. They provide income which increases the attractiveness of war. On the other hand, natural resources provide a tax base for the government which can strengthen its military and enforce property rights. This could

lower the risk of conflict. Therefore, the correlation of natural resources and civil war is non-monotonic (Collier & Hoeffler, 1998).[3]

Identity and Polarized Societies

Identity-based conflicts add another dimension to conflict. Whereas recent literature shows that fractualization, e.g. ethnic or religious division, is unlikely to cause civil wars, it is likely to influence the intensity of violence and the conflict's likeliness to be settled peacefully.

An identity is formed by an individual's religious, historic, and social background (Horowitz, 1985, pp. 52-53). This also includes race, language, and regional belonging (Gilley, 2004, p. 1158)[4]. According to A. D. Smith (2010, p. 13) an ethnie is a shared identity with, e.g. common myths, traditions, and values. Therefore, an ethnic group is a community that creates a sense of belonging together based on the assumption of common kinship (Byman, 2002, p. 5). The members of an ethnic group generally fight for equal representation and rights within a nation. An ethnic group does not have defined geographical or political boundaries of membership. Hence, ethnicity is different from national identity and nationalism (Jesse & Williams, 2010, p. 5). Barrington (1997, pp. 713-713) argues that a nation is characterized by inclusivity and the determination to control the territory that the members claim to own.

[3] Also see Buhaug and Rød (2006) as well as Fearon and Laitin (2003) on geographic factors and large populations, and Englebert and Ron (2004) as well as Thies (2010) on natural resources.
[4] Compare also Hutchinson and Smith (1996, pp. 6,35), Fearon and Laitin (2000, p. 20), and (Fearon, 2003, p. 7)

Ethnic identity is a subcategory in a larger set of identities. Nationality can be one of the necessary attributes to determine one's ethnic identity (Chandra, 2006, p. 400). Chandra (2006, p. 399) argues that visible attributes such as race are not sufficient to define ethnicity. Chandra (2006, p. 414) further increases our understanding of ethnic identity by assigning the attributes of stickiness and visibility to identity-building factors. This helps greatly in explaining why ethnicity is exclusive and cannot be changed.

Brubaker and Laitin (1998, p. 428) and Byman (2002, p. 6) define ethnic violence as violent acts between ethnicities. Furthermore, at least one belligerent must not be a state or its representative, and ethnic differences have to be vital instead of secondary to the violence. Ethnic conflict is a special type of intrastate violent conflict.

All parties to a conflict will interpret history on their own which results in different perceptions of historic events. Mistrust and competition build up a security dilemma. Neither party can afford to disarm or stop conquering. Identity-based conflicts require all stakeholders to discuss their perceptions of history and build up trust before a conflict can be settled (Posen, 1993).

Fearon and Laitin (2003) find that ethnic divisions do not cause civil wars. Fractualization does not show a positive relationship with the outbreak of civil war. Collier and Hoeffler (1998) derive a more nuanced conclusion from their study: The correlation between fractualization and civil war is non-monotonic. Highly fractionalized and homogenous societies both face reduced risks of civil war. Low fractionalization bears higher risk of civil war. Collier, Hoeffler, and Söderbom (2004) and Elbadawi and Sambanis (2002) confirm these results. Ethnically divided societies experience more war

than homogenous societies. The effect is strongest for polarized societies, i.e. when the society is divided into two groups of similar size.[5]

If polarization correlates with the outbreak of conflict which brings destruction, it is logical to study the correlation of polarization and economic growth. Benhabib and Rustichini (1996) construct a growth model with two groups. The government favors one group over the other. The model suggests that economic growth is relatively slower if one group is treated unequally. Alesina, Baqir, and Easterly (1999) suggest that ethnic division leads to lower supplies of public goods. The players cannot agree on policies and fear one-sided advantages. Fafchamps (2000) studies the access of African manufacturers to supplier and bank credit. Business interactions seem to overcome divisions. Ethnicity or gender do not play a significant role to the access to bank credit. Supplier credit, however, is harder to achieve. This suggests that parties in divided societies refrain from giving each other credit. Trading and networking can overcome these restraints.

Property Rights

The absence of property rights or the lack of their enforcement determines (a) the allocation between productive and unproductive efforts, and (b) economic growth (Gonzales, 2012). The Coase Theorem states subjects never pass up a chance to engage in mutually beneficial trade. However, a key assumption of the Coase Theorem is well-defined property rights (Coase, 1960).

---

[5] Esteban and Ray (1994) seem to have been the first ones to axiomize polarization and introduce it to economics.

Without proper enforcement of property rights, opposing parties engage in conflict and appropriate from each other. Proper enforcement, by e.g. a government, reduces conflict and brings social income close to its maximum. However, if property rights are not enforced independently, one player could seek one-sided advantages and become a hegemon (Tullock, 1974).

Without property rights, individuals prefer immediate over long-term advantages. They do not commit to sustainable usage of resources unless they can be assured that others will do so as well. Hence, sustainable usage can only occur if property rights are defined and enforced (Deacon, 1996).

Rational and Irrational Warfare

The literature on greed and opportunity as correlates of war suggests that war maximizes profits or income for some individuals and groups. For them, war is a business opportunity.

Rational conflicting parties should realize that peaceful settlements are superior to war. Long-term effects of war, destruction, and social welfare impacts of conflict decrease the contested pie. Aware of the considerable amount of past and ongoing civil wars, there have to be factors that lead decision makers to irrational choices.

Decision makers in conflict decide for war over peace either because they are guided by emotions, fail to internalize the costs of war, or prefer war (Fearon, 1995). Chapter 3 will introduce the concepts of preferences, opportunities, and perceptions in order to account for players that fail to see all costs of war or simply prefer war. It will be shown that players may prefer conflict because they have a relative advantage in warfare. Moreover,

players may be unable to internalize the opportunity costs of war because of the nature of the distribution of information. Here, it is essential to acknowledge that emotions lead to irrational activities that undermine the rational choices presented in the models below.

Emotions can include fear, hatred, rage, and resentment (Petersen, 2002). Hatred can be derived from economic competition, different traditions and states of development, and fear of extinction (Horowitz, 1985). Hirshleifer (1985) uses the term 'hostile preferences'. Misperceptions about one's own or the adversary's strength or motives can lead to conflict. In addition, misperceptions can also involve exaggerated expectations about the post-conflict income distribution. Hirshleifer terms this as rebellion-by-mistake (1985, pp. 63-64).

Political entrepreneurs can use emotions to rally groups and fuel conflicts. Glaeser (2005) constructs an economic model that suggests that political entrepreneurs can fuel hatred by repeating stories. Hatred is not formed by truth but by repetition of such stories. Economic subjects have no incentive to seek the truth, unless interactions with the "enemy", e.g. trade, yield benefits.

Lake and Rothchild (1996, p. 41) discuss hatred and its relation with ethnic conflict. They argue that conflict rises in the presence of fear of the future and not because of old hatreds. Fear is created by failing states, information failures, security dilemmas, and problems of credible commitments. Nevertheless, they acknowledge that history may exacerbate fear.

Revenge often is perceived as a main cause to continuing conflict and to undermining peace settlements (Chagnon, 1988; Judah, 2000; Kim & Smith, 1993). Scientific

research suggests that taking revenge stimulates the brain and yields satisfaction (see e.g. de Quervain et al. (2004) and Knutson (2004)).

In a continuous game, anticipation of retaliation creates a self-deterrence effect. Runkel and Amegashie (2012) construct a model which suggests that revenge does not have to destabilize conflict. Revenge is understood as an utility-enhancing action which is positively related to past destruction. In other words, the higher the destruction in the past, the more satisfaction the revenge-seeking party will experience. However, this set up implies reciprocity: The other party will seek revenge itself. Revenge in this model bears a self-deterrence effect which could outweigh the benefits of revenge.

Trade

As stated above, trade can help to overcome problems of divided societies and reduce the risk of conflict. Polachek (1980) finds in a cross-country study that interdependence through trade lowers conflict significantly.

Accordingly, when Skaperdas and Syropoulos (1996b) model conflict with the prospect of trade, the authors originally expected the potential for trade to reduce the incentives for warfare. However, the model suggests that in a setting with more than two countries, the prospect of trade increases arming. Expectations of trade increase the payoff of conquering other territories by so much that they outweigh the losses of decreased trade. In addition, the authors find if trade is expected, arming is so high that at least one country could favor conflict without trade.

Besley and Persson (2008) find that world market prices influence the risk of civil wars. Higher import prices lower the real wage of the population and worsen grievances.

Higher export prices yield higher tax or customs benefits for the controlling authority. Armed groups may have more incentives to seize control of the authorities.

Third Party Intervention in Civil Wars

Third party interventions and their effect on the risk, intensity, and duration of civil war has been studied by various scholars. Rosenau (1968) and Rosenau (1969) laid the groundwork for research on interventions. Rosenau established two criteria to characterize interventions and distinguish them from regular interstate interactions: Interventions are authority-targeted and convention-breaking policies. The first requires interventions to target the local authority structures. The second requires policies to differ from everyday interactions. Increasing reoccurring foreign aid flows does not qualify, whereas cutting it off does.

Future research on intervention developed towards two main branches. The first dealt with the outcome of interventions. The second studied who, when, and how actors decide to intervene.

Kaufmann (1996) and Kaufmann (1998) state that conflicts are ended best by separating the conflicting parties into different nations. Given the continuing violence in former Yugoslavia, Kaufmann doubted the efficiency of third party interventions. In an empirical study, however, Sambanis (2000) finds that partition does not reduce the likelihood of reoccurring violence. Resolving conflicts by redefining borders is not a sustainable solution.

Regan (1996) finds that interventions are more likely to stop violence if they incorporate a mix of military and economic instruments. However, conflicts with intervention last longer. Regan (2002), Enterline, Balch-Lindsay, and Joyce (2008), Elbadawi and Sambanis (2000), Byman and Seybolt (2003), and Gent (2008) agree that diplomatic or military interventions generally stretch civil wars. Furthermore, Licklider (1995) concludes that negotiated settlements are very likely to break up and ultimately just delay a final settlement by military victory. Hence, there is some evidence that interventions often fail their endeavors. However, further research by Dixon (1996), Regan and Stam (2000), Greig (2001), Regan and Aydin (2006), and Regan, Frank, and Aydin (2009) suggests that targeted mediation can have a significant impact on the likelihood of peaceful and sustainable settlements. Specifically, these authors recognized that mediation has to be timed and adjusted to each individual case in order to be effective. Murdie and Davis (2010) show that interventions sometimes even undermine human rights in the target country. Lockyer (2011) argues that biased intervention can change the form of warfare between the belligerents.

Regan (1998), Findley and Teo (2006), and Regan (2010) discuss the general motivation of intervening and its chances of success. Regan (1998) constructs a model that suggests that international public attention is one of the major factors to trigger intervention. Especially humanitarian interventions are very likely. On the other hand, intense violent conflict and shared borders decrease the chance for outside intervention. A review of the literature on intervention by Regan (2010) confirms the previous results: Intergovernmental organizations are likely to intervene in conflicts that draw a lot of international attention. Unilateral interventions, however, occur quietly. Evans and

Sahnoun (2002) argue that the international community has a responsibility to intervene in order to prevent massive loss of life.

The Instruments of Intervention

Generally, intervening parties can choose from two different sets of intervention methods to complement their mediation: coercive and noncoercive. Both methods aim at raising the opportunity costs of war. Noncoercive incentives entail rewards for altering the preferences and cooperation: purchases, insurance, and legitimation. They aim for conflict resolution. Coercive incentives are threats and punishments that may put an end to conflict but they do not resolve it. Coercive incentives are sanctions, pressures, and force. Hence, coercive incentives are tools of conflict management rather than conflict resolution. For coercive incentives to work the intervening parties need high degrees of credibility (Rothchild, 1997, pp. 97-107). Kydd (2003) discusses the credibility problem of threats and promises.

Noncoercive Incentives

Noncoercive incentives entail rewards for altering the preferences and cooperation. Purchases are very easy to offer and relatively cheap. They aim at shifting the relative gains so that the targeted groups or individuals choose different strategies (Rothchild, 1997, p. 99). Charles Taylor, for example, received rewards for leaving Liberia and going into exile in Nigeria.

Insurances are promises by the intervening party to protect the interests of the opposing groups. If the belligerents feel that their interests are protected by a third party, it may be

easier for them to agree on a peace agreement. In order to do so, the insuring party has to show that it understands the concerns of every party and is willing to invest in their protection. Offering purchases and insurance in the form of amnesty to Charles Taylor has illustrated the shortcoming of these policies (Rothchild & Emmanuel, 2010, p. 129). The recipients may find ways to profit from the noncoercive intervention but also to bypass it and continue their negative influence on violence. Charles Taylor managed to stir up conflict from his exile. Furthermore, the intervening party may lose the approval of its constituency (Rothchild & Emmanuel, 2010, p. 130).

Legitimation of a target group can help to give this group access to international resources. Similarly, losing legitimacy can reduce the available resources for conflict as well as lowering its prospective gains. It might even lower morale and reduce support within the groups for their elites. Legitimation has to be bound to political conditions and standards. Otherwise, it might provide false incentives for behavior that is not supported by the intervening country (Rothchild & Emmanuel, 2010, p. 130).

Economic support is a new form of non-coercive incentives. As demonstrated by the review of the literature on *Grievances*, a growing body of literature links poverty and disparities in income distribution to a risk of civil war. Therefore, this incentive is designed to address inequalities. This incentive is different from the monetary rewards offered by purchase incentive because it aims to help all subjects in the economy (Rothchild, 2003).

Coercive Incentives

Coercive incentives are threats and punishments that may put an end to conflict but they do not resolve it. Coercive incentives manage rather than resolve conflict. For coercive incentives to work the intervening parties need high degrees of credibility (Rothchild, 1997, p. 103).

Pressures try to force a party to change or compromise on its position through media appeals, warnings, threats, or the break off of diplomatic relations. When the negotiations between the Ugandan belligerents in Nairobi in 1985 did not achieve any results for several months, warnings were used to get the peace settlement back on track. The Kenyan President Daniel arap Moi proposed an ultimatum to sign the accord before the parties would have to pack and return to fighting (Rothchild, 1997, p. 103).

Sanctions are economic pressures to cripple the targeted group's resources and to make conflict more difficult. It is a very tangible instrument to show disapproval of a group's actions. However, the imposing party needs influence and resources in order to fully implement sanctions (Rothchild, 1997, pp. 104-105). Sanctions on the supply of weapons to Somalia illustrate how difficult the maintenance of sanctions is.

Force is the usage or refusal of military power to stop violence and penalize noncompliance to agreements or standards. Using military power is expensive for the intervening party as well as for the targeted groups. Intervening countries can choose between military assistance or military intervention. In the late 1970s, the US, for example, withheld military assistance to the government in Mogadishu until they

withdrew their forces from Ethiopia (Rothchild, 1997, pp. 105-106). Military intervention was used recently to help defeating Gadhafi's regime in Libya.

The Phases of Conflicts

Rothchild (2003) argues that the instruments to manage or end conflict are not always effective. The article identifies phases of conflict and the respective optimal tools. The author states, though, that the phases are overlapping. Identifying the conflict phase in which a given conflict is, can be difficult. Often it only is possible retrospectively. This creates a dilemma for the intervening party. Intervention in early phases of conflict is cheaper and can possibly prevent violence. In later phases, more resources have to be diverted to intervention in order to have an impact on the conflict.

Conflict is a dynamic process with five phases. The conflict will naturally go through all five phases. Interventions, however, can reverse or slow down the process (Rothchild, 2003). Rothchild (2003) agrees with Rubin and Campbell (1998) that conflicts do not experience all phases in one rush. Instead, conflicts alternate between violence and armed peace. As noted by Fearon (1995), most civil wars observed during 1990 and 2000 started shortly after World War II. Every conflict needs to be evaluated individually, the five phases shall serve as a mind map to find the right mix of methods of intervention for every conflict. Figure 1 illustrates the phases of conflict and the respective costs of intervention.

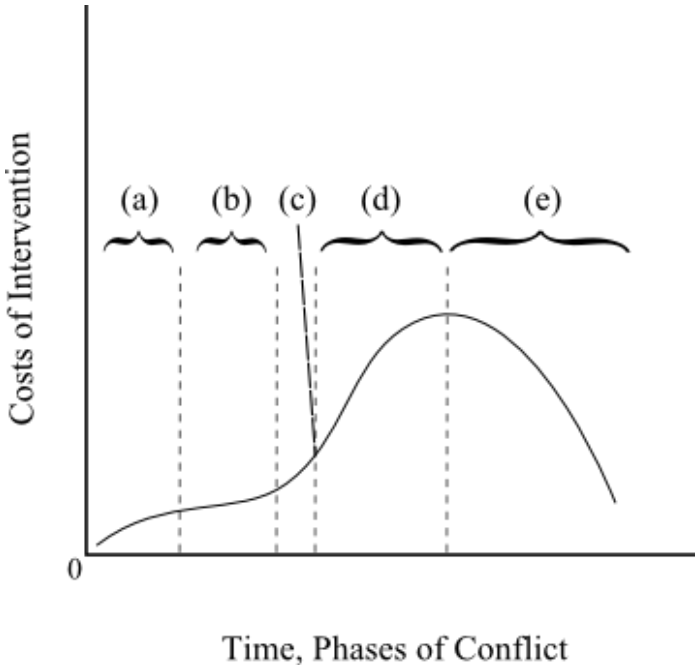

Figure 1: The Phases of Conflict and Respective Costs of Intervention

The phase of potential conflict (*a*) (see Figure 1) deals with the underlying root causes and dynamic pressures. Intervention is cheap and bears great potential for relief. Intervening parties can directly influence any socio-economic, cultural, or institutional issues. Rothchild (2003) argues that all issues are negotiable, no matter if they are tangible or intangible, true or imagined. However, without very detailed knowledge about a society, this phase is very hard to spot in time. The most effective instruments of intervention are diplomatic mediation and economic incentives. Force or sanctions would exacerbate grievances and speed up the process towards violence.

The phase of gestation (*b*) is more difficult to influence because the opposing groups are already at the brink of violence. The intervening party has to demonstrate dedication and

willpower to prevent conflict. Diplomatic mediation and economic incentives have to be reinforced with threats, sanctions, and insurance.

The trigger (c) is rather an event than a phase. It is hard to predict and can result in immediate violence. In Rwanda, for example, violence broke out immediately after the crash of the airplane that was carrying the Rwandan president Juvénal Habyarimana and the Burundian president Cyprien Ntaryamira.

The escalation phase (d) is the hardest and most expensive time of intervention. In addition, the expected impact of intervention is at its minimum in this phase. Military intervention needs to stop the violence, sanctions need to cripple the supply of military goods, purchases and economic support need to satisfy even hardliners, and insurances need to guarantee lasting peace.

During the post-conflict phase (e) the marginal utility of intervention rises again. Military intervention in the form of peacekeeping forces is recommended. Since the boots are already on the ground, intervening parties can more easily enforce insurances and sanctions. The sanctions should be removed as the peace process advances.

Conflicts can be separated into five different phases: potential conflict, gestation, trigger event, escalation, and post-conflict phase. The early phases are difficult to reveal, but they reveal the highest payoff rates of intervention. The further the conflict progresses, the lower the marginal utility of intervention, and the more coercive incentives are needed to affect the progression of violence.

Diplomatic mediation should be used in every phase. Intervening parties face a dilemma concerning the timing of military intervention. It would be beneficial to deploy military forces prior to the trigger event for the purpose of preventing suffering during the early escalation phase. However, the trigger event often is not predictable. Military deployment would then have to start in the gestation phase. However, in this case, the intervening party would militarize the conflict even before the potential belligerents would.

Trust-Building Measures

The same set of phases and methods of intervention apply for identity-based conflicts and divided societies. Lake and Rothchild (1996) discuss intervention in ethnic conflicts and conclude that ethnic conflict is caused by insecurity and mistrust. Therefore, prior to the "regular" methods of intervention, local authorities or external parties have to use confidence-building measures in order to build trust between the groups and allow for peace. Because ethnicity is exclusive, interactions may become rare. This leads to low trust levels that have to be increased before further cooperation is possible. Lake and Rothchild (1996) identify trust as the primary goal for intervention in ethnic conflict. They list four confidence-building measures.

Lake and Rothchild (1996, pp. 57-58) argue that hostilities in Bosnia worsened because the Serbs described the Muslims as second-class citizens. Therefore, the first confidence-building measure is demonstrations of respect. State elites and dominant groups have to consider the minority's resentment.

The second measure of trust-building is power-sharing. Nelson Mandela included power-sharing in South Africa's interim constitution to appease the local as well as the external white community. However, the authors also argue that power-sharing agreements may fail and even renew conflict if they are poorly enacted. The society first needs to develop an ethical standard of collaborative politics (Lake & Rothchild, 1996, pp. 58-59).

Third, elections can provide stability by giving groups the incentive to organize, discuss, and form coalitions. Electoral rules have to guarantee minimal representation and require candidates to represent more than one ethnic group. Furthermore, elections have to be tied to regional autonomy or federalism. Otherwise, it is still very possible that minorities will be excluded from the democratic process, or that political leaders attempt to outbid their opponents by making promises to their own ethnicity. The South African National Congress, for example, adopted proportional representation in order to provide minorities with some security. In Nigeria, the decision between two presidential candidates was made in respect of their total votes and their vote shares throughout the states. They needed simple total majority as well as at least one quarter of the votes in two-thirds of the states (Lake & Rothchild, 1996, pp. 59-61).

The fourth measure of trust-building is regional autonomy and federalism. Decentralization and local authority provides sizeable incentives for insurgents to accept proposals for settlement. It was an important factor in peace talks in Bosnia, Sri Lanka, Cyprus, and others. Ethiopia adopted a federalized system to counteract the memories of repression by previous governments. However, federalized systems can also lead to further distance between the groups and eventually to the breakup of a country. The

cases of Yugoslavia and Sudan demonstrated that revoking federalized systems can be a reasons major renewed violence (Lake & Rothchild, 1996, pp. 61-63).

The Pressure and Release Model

The Pressure and Release model (PAR model) originates from the disaster research field. It describes how the progression of social vulnerability increases the risk of a disaster. The PAR model facilitates the identification of vulnerable groups. Ben Wisner, Piers Blaikie, Terry Cannon, and Ian Davis developed the PAR model by pooling their knowledge about social vulnerability, environmental problems, disasters, and disaster response and recovery. They published the first edition of their book *At Risk* in 1994. The following discussion about the PAR model will draw from the latest edition of their book (Cheung, 2007, pp. 49-86).

The PAR model assumes two opposing forces that exert pressure on a society: Vulnerability and Hazard. A hazard can be anything from earthquakes, volcanic eruptions, and floods to landslides, droughts, famines, and epidemics. The necessary condition for a disaster to emerge is that the hazard occupies the same time and space element as human beings. The sufficient condition is that the hazard causes substantial damage to a significant amount of persons making recovery unlikely without external help.[6] Recovery encompasses physical as well as psychological recovery of the people affected. Vulnerability refers to socially constructed factors that exacerbate potential damage from a hazard (Cheung, 2007, pp. 49-50).

[6] Oliver-Smith (1999) and Quarantelli (1995) published on the anthropological discussions about definitions of 'disaster'.

The PAR model breaks down vulnerability into root causes, dynamic pressures, and unsafe conditions (see Figure 2). This distinction helps to identify progressions of vulnerability and to trace symptoms back to their causes. Furthermore, the corresponding time elements provide information about whether changes can yield immediate relief. Issues that are deeply rooted in the political or economic system may not be able to change instantly.

Root causes are the underlying processes that characterize the interactions within a society and its relations to the global community. Root causes are generally entrenched in cultural traditions, ideologies, and beliefs. Hence, they are usually very distant in time. Spatial distance arises either from physical distance or from non-participatory or centralized systems (Cheung, 2007, pp. 52-53).

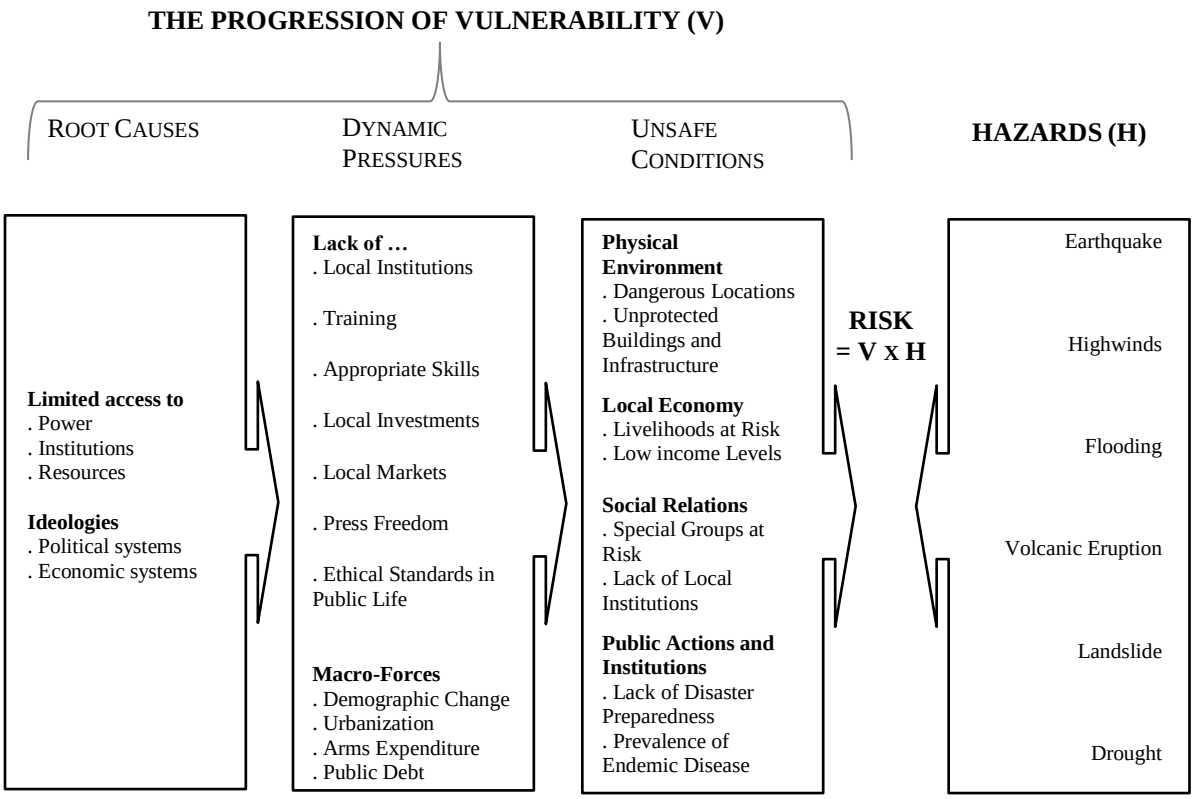

Figure 2: The PAR model (adapted from Cheung (2007, p. 51))

Dynamic pressures are immediate appearances that channel the root causes into unsafe conditions (Cheung, 2007, pp. 53-54). The PAR model mostly deals with internal dynamics such as demographic change, urbanization, public debt, natural resource degradation, and the failures of markets and institutions. Given a growing global interdependence, country studies need to consider external influences as well. External dynamic pressures are volatile world prices, foreign direct investments, spillovers from external conflicts, refugees, or environmental change.

The physical environment, poor economic performance, a lack of social networks, and bad governance create risky livelihoods. Unsafe conditions are very tangible and allow

micro-mapping in order to identify groups that need increased attention before and after a disaster (Cheung, 2007, pp. 54-55).

The PAR model states that the risk of a hazard causing a disaster is exacerbated by vulnerability. Therefore, the risk of a disaster (R) is a function of vulnerability (V) and the intensity of the hazard (H) (Cheung, 2007, p. 49).

$$R = f(V, H) \quad with \quad R = V * H$$

This form is very appropriate since it shows that a disaster cannot occur if either vulnerability or hazard are non-existent. In addition, even a minor hazard can cause a major disaster if the vulnerability is sufficiently large. The PAR model suggests different outcomes for the exact same hazard in different societies.

The model incorporates pressure releasing effects as positive developments that reduce vulnerability. Appropriate government policies may counteract dynamic pressures or unsafe conditions. Temporary solutions can have immediate effects. However, policy makers have to understand that they cannot achieve sustainable improvements without addressing the underlying root causes.

CHAPTER III

METHODOLOGY

The Methodology presents the theoretical frameworks with which the research problem will be approached. The literature presented is part of the field of conflict economics. The models presented show how economic incentives influence the decision making of conflicting parties. Though every model studies peace and conflict from a different angle, they are based on similar assumptions and draw from the correlates of peace and war presented in the Literature Review.

The structure of this chapter follows a logical as well as chronological pattern. The first part introduces terminology and assumptions related to game-theoretic modeling of conflict. Understanding different types of games, the role of information, and the number of players eases the understanding of assumptions made in the frameworks below. Economic models have to be studied in context with the knowledge, and political and economic situation in which they were formed. No model fits every situation; different situations require different assumptions. Often, assumptions move the model away from reality. On the other hand, assumptions facilitate modeling and yield the opportunity to study the change of single variables instead of having to change an entire set of variables.

What cannot work in a rather unrealistic but rational setting, will not happen in reality. Therefore, early economic modeling of conflicts assumes situations of perfect and complete information. This way, Haavelmo (1954) could show that it is rational for individuals to engage in conflict. Hirshleifer (1989) then introduced contest success functions to show when it is rational to engage in conflict. Recently, scholars have begun to expand these models in order to incorporate military and strategic advantages, asymmetric information, misperceptions, group dynamics, emotions, etc. Furthermore, they tailored models to specific situations and viewpoints. Grossman (1991), for example, studied insurrections and separated the incumbents' and insurgents' views.

Accordingly, the second part of the Methodology presents the framework of production versus appropriation by Haavelmo (1954). Following the same reasoning, Tullock (1974) discusses the social welfare costs of appropriation. This model suggests that ending a conflict by installing a power monopoly is not necessarily the best solution. Afterwards, Hirshleifer's approach introduces malevolence as well as benevolence, disharmonious consumption, and misperceptions. Hirshleifer's graphical approach also introduces areas of potential settlements and minimum requirements for sustainable settlements. The following models study threats, the order of movement, information, payoff schemes that motivate to join a revolution, peaceful equilibriums under anarchy, and territory.

Game Theoretic Choices in Modeling Conflict

In terms of Game Theory, the interaction of conflicting parties is characterized by *plays*, *rounds*, and *moves*. A play can have several rounds in which the players have to make a

move. Each round requires the players to bargain, negotiate, and decide on their resource allocation. The path chosen is called a move. The end of the play generates a payoff. A dichotomous model has only one play and ends with peace or war and the respective payoffs for the players. A continuous model allows for sequential plays. A termination rule determines the end of the play, or the last round. A termination rule can include the declaration of war or a date, e.g. an ultimatum (Hirshleifer, 1995b, pp. 168-169).

Dichotomous models of conflict allow conflict to end with either peace or war. This type of analysis yields a yes or no answer on peace and war and helps to determine the correlates of conflict and the chances of victory. Researchers may use dichotomous models to study a certain situation on a small time scale. However, dichotomous models do not allow for continuous research. After the players decide on peace or war, the model assumes the conflict to be over. Continuous models, on the other hand, assume players to alternate between peace and war over long periods[7]. Both outcomes to the bargaining model are coexistent. Repeated interactions of the conflicting parties yield an equilibrium between peace and war. Continuous models inform about the intensity of conflict and the expected distribution of the resources in the dispute (Hirshleifer, 1995b, p. 168).

Information

Game Theory is about using the information at hand in order to maximize profits and minimize losses. Each player chooses a response that fits best the other player's decision.

[7] See e.g. Hirshleifer (1988) on continuing conflict.

Dominant strategies incorporate decisions that are always the best response to the other player's choice. Weak strategies are the opposite.

Full or perfect information, generally is the preferred state because the game yields rational decisions. While imperfect and incomplete information yield inferior solutions to the game. In games with imperfect information, the players do not know what decisions were made in the past which can lead to misperceptions about capabilities, outcomes, and payoff functions.

Information symmetry or asymmetry determines whether the players move simultaneously or sequentially. When moving sequentially, the last-mover has an informational advantage since it can consider the first-mover's choice and select the best response. However, the first-mover's choice may also constrain the last-mover's selection. In simultaneous games, the players do not know or chose to ignore each other's choices (Hirshleifer, 1995b, pp. 168-169).

First- and Last-mover advantages depend on the set up of the game. Efforts to increase the possibility (p_i) to win a price (P) differ between simultaneous moves and sequential moves games. The favorite has an incentive to over-commit resources and the underdog to spend less than in a sequential mover game. Being the favorite means to have a chance of victory higher than 50%: $p_i > 1/2$ (Baik & Shogren, 1992; Baye & Shin, 1999; Dixit, 1987, 1999).

Generally, game theoretic models assume that (a) the players know all potential outcomes, (b) the players know the probabilities of all potential outcomes, and (c) all

players have all information. Hence, all players are supposed to evaluate a situation equally and act according to their best-response functions.

Commitment Problems

Per definition, competition is Pareto-superior to conflict. In conflict, at least one party is engaging in unproductive actions. Therefore, peaceful settlements are the preferred outcome to conflict. However, the prospect of an agreement is necessary but not sufficient. Settlements require enforcement and often a third party needs to overcome the commitment problem (Hirshleifer, 1995b, p. 169).

Telser (1980) writes about the last-round problem: If the players know that a game has a finite amount of rounds and they know when the last round is, they will not obey to any agreement when violation yields higher profits. Violating an agreement in the last round has no implication on future rounds. Players can violate an agreement without fear repercussions.

The last-round problem suggests that infinite rounds of bargaining would encourage cooperation. However, Skaperdas and Syropoulos (1996a) suggest that resources which can be conquered now lead to increased payoffs in future rounds. Therefore, with increasing expectations about economic growth in the future, conflict becomes more attractive in the current round.

Alternating the number of opponents

Microeconomic theory tries to model the real world in the simplest way. Any distorting or distracting influences are removed from the models, and the endogenous variable is

singled out. Generally, the models start with a bilateral monopoly: one firm and one household deciding on supply and demand of products and labor force, two households specializing on the production of goods in order to trade, or two firms choosing prices or quantities in response to each other's choice. The models can then be advanced to more players: monopoly, duopoly, oligopoly, etc. Perfect competition is the last stage and incorporates many buyers and sellers. Each stage yields more restrains to the players' decisions and may allow new strategies such as cartels or unions.

Since conflict economics is based on traditional economic theory, the appropriate economic model depends on the given situation. The bilateral monopoly is appropriate for one-on-one warfare; tyrant-versus-population corresponds to the regular monopoly. Analogous to the original models, the two opponents in a bilateral monopoly influence each other's decisions. However, in the monopoly model, the tyrant influences the population, not vice versa. The population is not a price-taker because there is no exchange in pure conflict models (Hirshleifer, 1995b, p. 170).

The Technology of Conflict

The *technology* of conflict comprises models on the decisions and interactions in conflict. Each player has a set of options, e.g. production and appropriation, which yield payoffs. The amount of payoffs is determined by factors that influence the options' quality and efficiency. The models below introduce parameters and indexes to scale the decisiveness of fighting efforts, disparities in resources and investments, and vulnerabilities (Hirshleifer, 1991b). Investments in a set of options define the interactions of conflicting parties. In order to stress the broad view of the models below and acknowledge that

individual situations may differ, Hirshleifer (2000) introduces the term *Macro*technology of Conflict. Using the models' findings and intervening in conflict requires individually engineered packages.

In order to facilitate the understanding of the models below, the author tried to maintain the meaning of the parameters throughout the chapter. As a result, the parameters in the models below may vary from the way other scholars presented these models.

Production versus Appropriation

The idea of appropriation as economic activity goes back to Pareto (1909, p. 466). Pareto states that individuals can chose between investing their resources in the production or the appropriation of goods. Wars as well as revolutions can result in a redistribution of resources from the weak to the stronger. Such redistribution will not result in the society's potential maximum economic output. National wealth is maximized by exchange when every member of a society produces what he or she can produce with relative advantage.[8] However, Pareto acknowledges that appropriation may be a result of natural selection leading to a better use of the resources in the future.

Haavelmo (1954, pp. 91-98) builds on this idea by introducing an allotment function which models total economic output (I for *income*) as a function of productive and unproductive activities. Productive activities (P for *producing*) include all efforts that aim at producing a good. Unproductive efforts (F for *fighting*) aim at impeding the productive activities of others and appropriating their goods.

[8] Adam A. Smith (1776) develops and discusses this idea in great detail in his magnum opus commonly referred to as The Wealth of Nations.

$$I(P,F) \tag{0.1}$$

Player i's income I_i is a function of its productive and unproductive efforts.

$$I_i = P_i + F_i, with\, i = 1,2,...,M \tag{0.2}$$

Global income, or the maximum price to win from fighting P, is a function of each players' productive efforts. Unproductive efforts do not create more output. Fighting only results in redistribution.

$$P(P_1, P_2, ..., P_M) \tag{0.3}$$

Player i's income from fighting I_{iF} is a function of the total available income P and all players' fighting efforts. In other words, player i's share of the price P is p_i.

$$I_{iF} \equiv p_i(F_1, F_2, ..., F_M; P) \tag{0.4}$$

Accordingly, a bigger price should result, ceteris paribus, in bigger payoffs for all players.

$$\frac{\partial p_i}{\partial P} > 0 \tag{0.5}$$

The model suggests a positive relation between fighting efforts and the share of the price: If player i increases its fighting efforts, it can expect a higher share of the price.

$$\frac{\partial p_i}{\partial F_i} > 0 \tag{0.6}$$

Furthermore, increased fighting effort of player j should decrease the share of player i.

$$\frac{\partial p_i}{\partial F_j} < 0, with\, i \neq j \tag{0.7}$$

Haavelmo (1954, p. 93) suggests the following form to illustrate p_i:

$$I_{iF} = \eta(F_i - b_i \sum_{j=1}^{M} F_j) \frac{P}{\sum_{j=1}^{M} F_j}, with\, i \neq j \qquad (0.8)$$

η and b_i are constants. $b_i \sum_{j=1}^{M} F_j$ is the minimum fighting effort for player i to defend its assets. If the actual fighting effort F_i exceeds the minimum requirement, player i will make a profit from fighting. $\frac{P}{\sum_{j=1}^{M} F_j}$ accounts for decreased shares when the number of players increases.

Haavelmo (1954) concludes that players can generate income by appropriating from others. All players have to invest in fighting efforts in order to defend themselves against other players. Players will invest in fighting efforts as long as the marginal utility is better than the one from productive efforts. Generally, investing resources in fighting efforts decreases the global income. The more players are involved in a contest, the lower is the share that can be won by fighting. The marginal utility of fighting decreases. In addition, the more players, the higher are default fighting efforts to defend one's resources. Therefore, as the number of players increases, players can win less from appropriating but they still have to invest more in fighting efforts in order keep what they have.

Social Welfare Costs of Appropriation

Haavelmo (1954) already suggests that conflict lowers the social welfare, or in his terms global income. Tullock (1974) chooses a game theoretical approach to further investigate this problem.

Conflict is always pareto-inefficient even when conflict is resolved by institutions, e.g. governments, bargaining reduces social welfare. A government's decision is influenced by lobbying. That means, stakeholders have invested resources in order to lobby. These resources cannot be used to invest in productive efforts (Tullock, 1974, p. 7).

It is rational for every individual to invest in defensive efforts in order to secure their produced or appropriated goods. If no player was to invest in appropriation, everyone would be better off since all the economy's resources could be invested in productive efforts. However, if no one defends his or her goods, the return in investment of appropriating is very high. The players are trapped in a prisoners' dilemma (Tullock, 1974, p. 11).

Opposing violence only works in a state where the government and its representatives do not refrain from using force to protect everyone (Tullock, 1974, p. 12). In the absence of a government, production without defense will result in slavery. All produced goods are appropriated by thieves; recall Machiavelli's Theorem.

The optimal way of defending property is using a mixture of threats, violence, and agreements. Threats only become credible when the individual's capabilities and willingness to use violence are known. Without the prior violence, the party being subjected to the threat has no point of reference to know whether the threat is viable.

Agreements on transfers from the defender to the attacker prior to the outbreak of violence may avoid the negative effects of fighting. However, both attacker and defender need a public history of violence to render their threats credible. Furthermore, the defender sometimes needs to fight, otherwise it will face more and more attackers who seek agreements and transfers without actual fighting (Tullock, 1974, pp. 12-13).

Figure 3 shows a payoff matrix of a two-party game in which the players have to decide on whether to steal or not to steal from each other. The left part of Figure 3 shows the payoffs without police forces. If both parties chose not to steal and invest all resources in production, their payoffs are 10 each. If one party decides not to defend its produced goods, it is rational for the other one to steal. The payoffs are 2 and 18 respectively. Therefore, stealing is the dominant strategy in a society without police. The players will end up in the bottom right hand corner with payoffs of 4 (Tullock, 1974, p. 16).

	Don't steal	Steal
Don't steal	10 / 10	2 / 18
Steal	18 / 2	4 / 4

No Police

	Don't steal	Steal
Don't steal	8 / 8	7 / 4
Steal	4 / 7	4 / 4

Police

Figure 3: Payoff matrix of a two-party appropriation game with and without police forces (adopted from Tullock (1974, p. 15))

When the players decide to establish a police force, their production will be taxed to maintain the police. Hence, the payoffs when both parties chose not to steal are reduced

to 8. Now, if one party decides to steal, then their payoff is reduced from 8 to 4 because the police retaliates on behalf of the victim. The victim's overall payoff is reduced to 7. Not stealing is the dominant strategy in a society with police forces. The game's solution is the top left-hand corner when payoffs are at 8. By establishing a police force, the society moves from payoffs of 4 without police, to payoffs of 8 (Tullock, 1974, p. 16).

Tullock (1974, pp. 18-19) terms the state with police forces to be part of a cooperative government and compares its gains in total payoffs to the welfare losses of an exploitative state. Figure 4 illustrates the welfare costs of thievery and exploitation. In a society without theft, the individual might face a production frontier like P_0 and choses to produce F_0 food and consume L_0 leisure. U_0 is tangent to the chosen production point O and represents the achieved utility level. A cooperative state with police forces tries to get as close to O as possible. Due to taxes which finance the police, the cooperative state will never achieve O.

In anarchy, the individual faces another production curve P_T which represents the amount of produced food it can keep. The model assumes that if facing thievery, the producer will produce less and consume more leisure. Producing at T will yield a total amount of food of F_T. Thieves will steal a portion t and reduce the producer's income to $F_T - t$. The producer will achieve a utility level of U_T with $U_T < U_O$.

An exploitative government engages in thievery itself. The ruling elite will try to force the producer to produce close to E. At E, the producer invests all of his or her time in the production of food and does not consume leisure. The exploitative government will steal everything but the minimum income needed to exist.

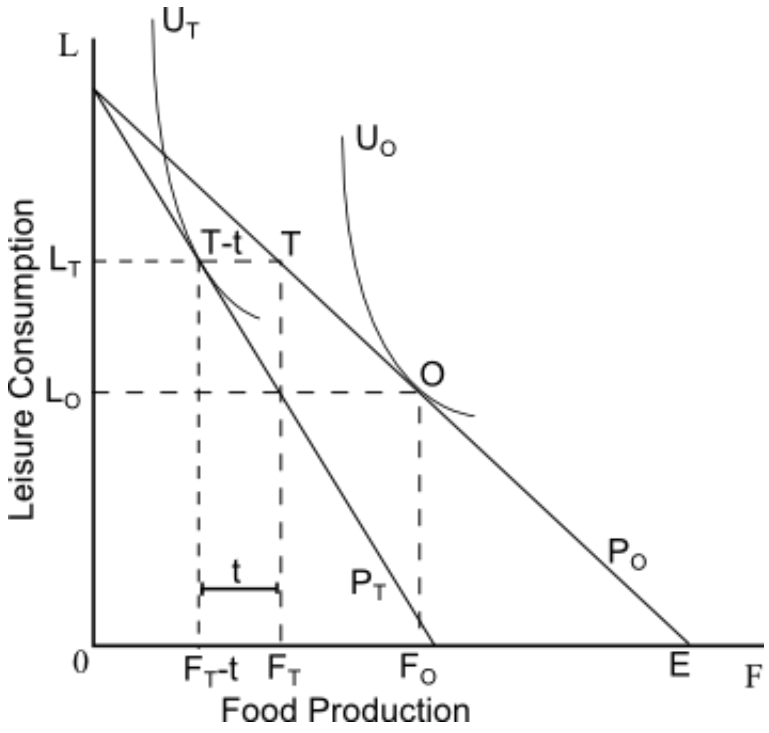

Figure 4: Welfare Costs of Thievery and Exploitation (adapted from Tullock (1974, p. 18)).

Tullock (1974, p. 20) argues that the exploitative state is stable. In order to steal from its population the elite has to make significant investments in coercion. In addition, the government will prevent others from stealing from its population. Private crime or raids by other governments would reduce the rate of returns of stealing for the exploitative government.

Both government forms, cooperative and exploitative, give the population security and certainty on the redistribution of wealth. A power monopoly is not always the best solution for a state in which each individual engages in private production, defense, and

theft. Suggesting a police force, as in the example above, is only mutually beneficial if all players can agree and share power. If a police force is a one-sided effort, there is no guarantee that the stronger side will not use the police to acquire even more wealth. Instead of a cooperative government, the state will face a rather exploitative government (Tullock, 1974, pp. 21-25).

Grossman (2002) introduces a parameter θ for the efficiency of predation which is similar to the decisiveness factor m in the models below. With increasing returns of appropriating (increasing θ), producers have to invest more into deterrence and a government's advantage of defending against appropriation due to economies of scale grows. Grossman (2002) finds that for large θ, producers are better off with a force monopoly even when it tries to maximize benefits of the ruling elite.

Preferences, Opportunities, and Perceptions

As shown by the *Review of the Literature*, conflict is often studied in the light of greed, grievances, opportunities, and hatred. The causes of conflict can be aggregated in utility functions which represent an individual's or group's preference over a set of goods (exchange theory), or over income and resource distribution (conflict theory). Utility is a function of preferences, opportunities, and perceptions. *Indifference curves* are used to illustrate levels of utility. Every combination of goods, or income distribution between the opponents, that lays on an indifference curve yields the same utility. The utility level increases the higher the indifference curve is located. Indifference curves are only defined in the non-negative quadrant of a Cartesian coordinate system. Negative amounts of goods are not allowed.

Preferences, expectations, and opportunities are an established framework to analyze the motivation of violent conflict[9] (Anderton & Carter, 2009, pp. 67-82; Collier & Hoeffler, 2004; Hirshleifer, 1987, pp. 273-285; Hirshleifer & Hirshleifer, 1998, pp. 530-535; Singh, 2007). The opposing parties can have benevolent, neutral, or malevolent preferences towards each other. In other words, their relationship is characterized by either sympathy or antipathy. The expectations about the outcome of conflict are either pessimistic or optimistic. The perceptions and uncertainty about strength and pay-offs are crucial. Finally, the groups' interests can be harmonious or opposed. This has major consequences on potentially mutually beneficial settlements (Hirshleifer & Hirshleifer, 1998, pp. 530-534). The theoretical implications of preferences, expectations, and opportunities will be discussed further below in the context of a bargaining model.

Preferences

Preferences can be benevolent, neutral, or malevolent. If the conflicting parties are benevolent towards each other, they will feel an increase in their utility not only when they receive more income but also when their opponent receives more income. Malevolent preferences infer a decrease in utility if the other party gains more income. Neutral preferences imply that there is no correlation between the opponents' income levels (Hirshleifer & Hirshleifer, 1998, pp. 530-531).

Figure 5 shows the three kinds of preferences. The negatively sloped indifference curve in Figure 5a indicates that the utility level of player B remains the same even if B loses

[9] According to my best knowledge, Hirshleifer (1985, p. 63) introduced the concepts of preferences, perceptions, opportunities, and settlement-possibility frontiers in this context.

parts of its income in order for player A to have more. The figure also shows that if A maintains its income and B gains more, they both advance to a higher utility level (an indifference curve further to the right and higher than the previous). Figure 5b shows completely inelastic preferences: A's utility level remains the same if B's income changes in any direction. The players are neutral towards income changes of their opponent. Malevolent preferences as in Figure 5c are illustrated by positively sloped indifference curves. Even though A's income remains the same ($I_{Ao} = I_{A1}$), A falls from a higher utility level (U_{A0}) to a lower utility level (U_{A1}) when B's income raises.

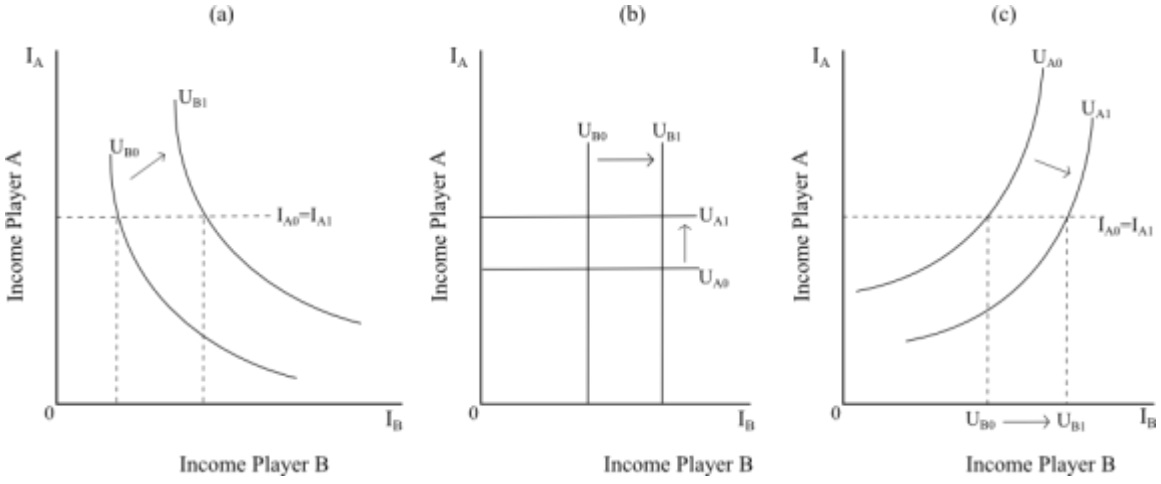

Figure 5: Preferences, (a) benevolent, (b) neutral, (c) malevolent

As will be discussed below, the shapes of the indifference curves have a significant impact on the potential for settlements of conflict. Preferences, or the attitudes of the conflicting parties towards each other, are important parts of conflict studies. Hatred and greed (malevolence) need to be accounted for in every approach to resolve conflict.

Opportunities

Opportunity is the prospect of gaining from exploiting weaker opponents. The prospects are relatively low when consumption is harmonious: all parties prosper from cooperation. The aggregated sum of available income is greater in cooperation than when one party gets all. In contrast, disharmonious consumption implies that cooperation is disadvantageous. A party maximizes its income by conquering all resources and stopping any cooperation (Hirshleifer, 1995b, pp. 172-173).

The possible gains for the opponents are restricted by the region's available resources: taxes, natural resources, etc. The aggregated gains cannot exceed the aggregated resources. Hence, the conflicting parties face a budget restriction. It will be shown below in Figure 7 why this budget restriction is also called settlement possibility frontier (SPF). Its shape depends on the harmony of consumption.

Disharmonious consumption favors conflict. When consumption is disharmonious as in Figure 6c, players A and B will decide against cooperation. Their respective maximum incomes are I_{AF} and I_{BF} (F for fighting). The amount of available resources is maximized when allocated on just one side: $I_{AF} = I_{BF} < (I_{AC} + I_{BC})$.

If the players face harmonious consumption as in Figure 6a, they will decide to cooperate and share the available resources. The respective incomes of A and B are I_{AC} and I_{BC} (C for cooperation). Cooperation maximizes the aggregated available resources: $(I_{AC} + I_{AB}) > I_{AF} = I_{BF}$ (compare Figure 6a and Figure 6c).

Figure 6b shows a neutral relationship. A and B should be indifferent between conflict and cooperation.

Generally, it is assumed that consumption is harmonious. Each player gets a share of the socially available resources and produces goods in which it has a comparative advantage. Mutually beneficial trade will yield more profits than each individual could have achieved on its own. Another argument for harmony is the law of diminishing marginal utility: The first unit of a good yields more utility than the second or any subsequent unit. The rate of utility per unit decreases and eventually turns negative. For example, whereas a person might be satisfied with one pound of butter, he or she will not feel the same joy for the tenth pound of butter. Finally, it becomes a burden when the person has to deal with 100 pounds of butter.

Nevertheless, disharmonious consumption remains an important concept. Joint production and trade may not be an option where binding agreements cannot be enforced (Hirshleifer, 1995b, p. 175).

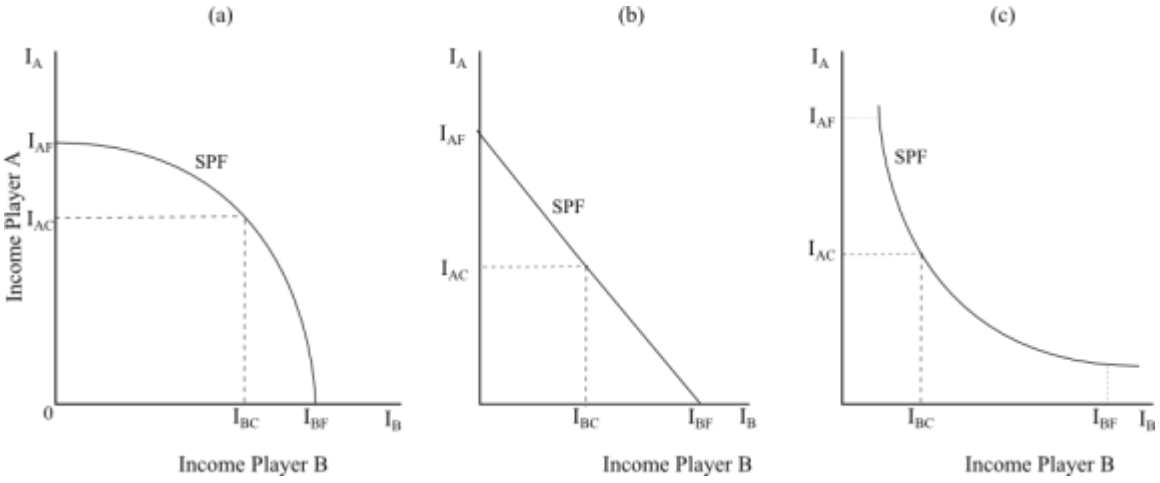

Figure 6: Settlement Possibility Frontiers (SPF), (a) harmonious, (b) neutral, (c) disharmonious

Perceptions

Before any opponent is able to decide for peace or war, each side will evaluate its own position as well as motives and capacities of its opponents. Perceptions are crucial to settlements of conflicts. If a settlement fails to exceed all expectations, it will be profitable for at least one party to decide for war.

All opponents will issue threats in order to deter attacks and to express their expectations of the income distribution after war. Hirshleifer (1995b, p. 171) distinguishes between *profitable* and *unprofitable threats*. When profitable threats are carried out, the threatening party's position is improved and the opponent is weakened. Profitable threats have to be plausible so the threatened party has no doubt about the potential for it to be carried out. When carried out, unprofitable threats damage all parties, including the issuing party. As the example of mutually assured destruction shows, both parties will be significantly hampered if they carry out the threat. Nevertheless, this strategy may deter attacks.

The variety of profitable threats available to each opponent defines the *threat point* (Friedman, 1986). The threat point marks the expected income share after war. Any settlement above the threat point will be Pareto-superior to fighting.

The discussion of Figure 7 will show why malevolence, misperceptions, and imperfect and incomplete information a dangerous to settling conflicts.

Hirshleifer's Bargaining Model

Recalling the Machiavelli and Coase Theorems as well as the discussion above, we know that individuals will only cooperate if they can expect greater benefits than from war. Any settlement has to yield each party at least as much as they expect to gain by war. Otherwise, it is not rational for any group to comply with the agreement.[10]

Figure 7 shows the expectations of two opposing players (A and B) about their respective incomes after war. Figure 7 assumes harmonious consumption as introduced in Figure 6a. Player A as an income expectation of I_A^e (e for expectation). Accordingly, B expects I_B^e. In Figure 7, A and B will only settle for incomes that lay above I_A^e and to the right of I_B^e. Therefore, the area of possible settlements lays east and north-east of the threat point P. This area is also referred to as the *area of pareto optimal settlements* since every settlement in this area will benefit at least one player without the other one falling below his minimum income in peace. The area of pareto optimal settlements is rectangular because the players' preferences (heavy dashed lines) are neutral (straight). For reasons of simplicity, the model assumes neutral preferences as in Figure 5b. Benevolent (malevolent) preferences would greatly increase (decrease) the area of pareto optimal settlements (Hirshleifer, 1985, p. 63).

The opposing parties in Figure 7 are in a dilemma. Given the players' initial income expectation of I_{A0}^e and I_{B0}^e, the threat point P_0 and the respective area of pareto optimal settlements lies to the right of the budget constrain (settlement possibility frontier).

[10] Also see Skaperdas (2006) for conflicting parties' considerations on whether to fight or bargain.

Settlement in this area is not possible because the local economy cannot provide enough resources to finance such agreements. Conflict seems inevitable.

Note that I^e_{A0} and I^e_{B0} can also suggest a first-mover advantage. Whoever strikes first could achieve his or her expected income distribution. The second mover is left with the remaining resources (Anderton & Carter, 2009, p. 78).

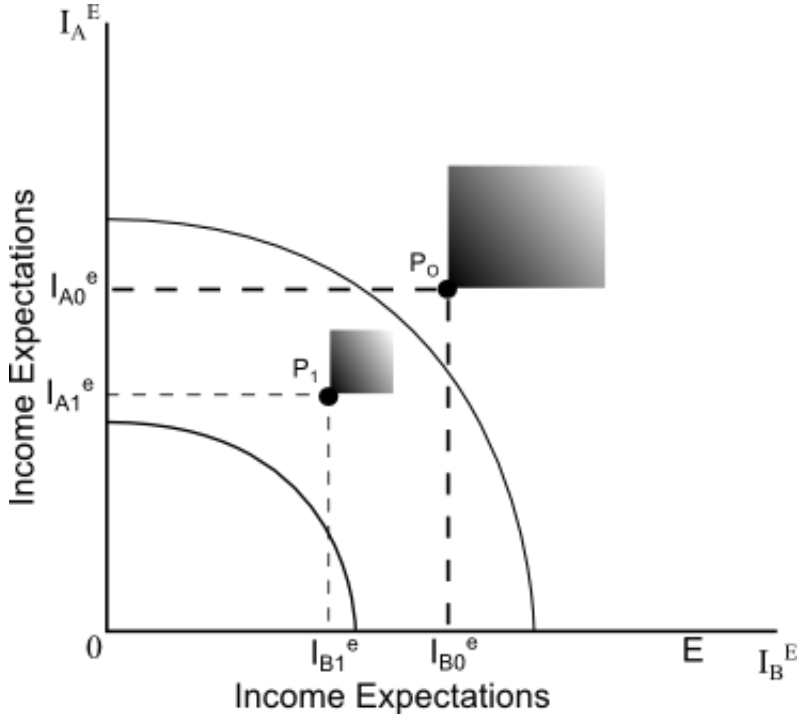

Figure 7: High payoff expectations from war render settlement impossible (adopted from Anderton and Carter (2009, pp. 79-80)).

Third party intervention is necessary when the conflicting parties are unable to achieve an agreement. Figure 8 shows how third-party intervention can correct expectations and facilitate peaceful settlement. Diplomatic intervention could aim at correcting

information. Military intervention could defend the second party against the first attacker. Both methods move the expectations down and the area of pareto optimal settlements closer to the SPF. Finally, economic intervention could subsidize the remaining difference between the socially available resources and the settlement. In Figure 8, third-parties need to subsidize the difference between S and S' (Anderton & Carter, 2009, p. 79).

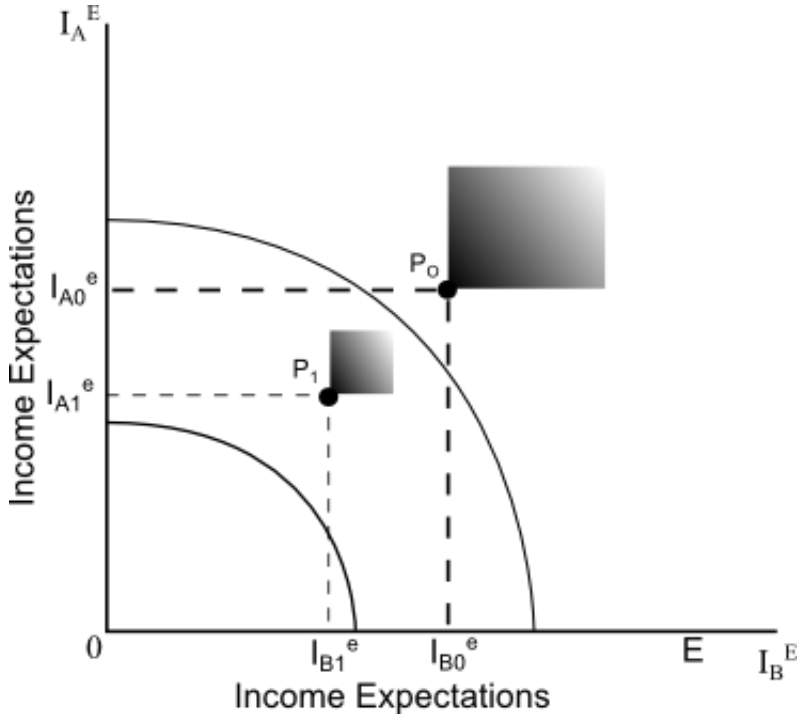

Figure 8: How third-party intervention can facilitate peaceful settlements (adopted from Anderton and Carter (2009, pp. 79-80)).

Contest Success Functions

Contest Success Functions are a common tool in the rent-seeking theory and are used to model lottery contests, litigation, and violent conflict (Hirshleifer, 1989, 1991b; Skaperdas, 1996; Tullock, 1980). Contest Success functions (CSF) describe how investments in war efforts generate a good in form of success or failure. In a continuous model, the CSF yields the proportions of the resources won by war. The dichotomous model requires the interpretation of respective probabilities of success. Hirshleifer (1989) models conflict with two forms of CSFs. The first depends upon the ratio of resources each opponent devotes towards war:

$$p_1 = \frac{F_1^m}{F_1^m + F_2^m} \quad and \quad p_2 = \frac{F_2^m}{F_1^m + F_2^m} \tag{0.9}$$

P_i stands for the proportion won by war, or alternatively, the probability of victory. Therefore, $p_1 + p_2 + \delta = 1$. δ ac $F_1 = F_2$ accounts for destruction of the available resources by war. F_i is the investment in war. F could be measured by army size or the expenditure on arms and cannot be negative: $F_i \geq 0$. M is the *decisiveness coefficient* or war effort elasticity. It measures the responsiveness of p_i to a change in levels of investments in war.

$$p_i(x_1, x_2) \equiv \begin{cases} F_i / (F_1 + F_2) & \text{if } F_1 + F_2 > 0,\ F_1 \neq F_2\text{, and } m = 1 \\ 1/2 & \text{otherwise} \end{cases} \tag{0.10}$$

As long as neither party invests anything in fighting efforts, they each obtain 50% of the price. The same is true for every situation in which both players achieve equal fighting efforts.

Differences between investments in war determine the second form of CSFs:

$$p_1 = \frac{1}{1+\exp[k(F_2 - F_1)} \; and \; p_2 = \frac{1}{1+\exp[k(F_1 - F_2)} \qquad (0.11)$$

In equation (0.11), the decisiveness coefficient is k.

In both versions of CSFs, the decisiveness coefficient is crucial to the decision for peace or war. It determines the probability of conflict and the intensity of conflict. If decisiveness is high, an opponent's share of the resources is determined by its investments in war. Low decisiveness favors peace because investments in war efforts do not have a major impact on the resource distribution (Hirshleifer, 1995b, p. 178).

Both forms of the CSF are plausible. The first, or ratio form, is applicable in war under perfect conditions: a homogenous battlefield, full and symmetric information, and inexistent fatigue. A party that does not invest in war at all loses everything. The second, or difference form, applies to non-ideal situations without full information and with save havens, heterogenic geography, inner group struggles, and exhaustion. In this case, even a party without any war efforts can retain a portion of the income (Hirshleifer, 1995b, p. 178).

Hirshleifer (1995b, p. 178) notes that low income groups have a comparative advantage in war. They do not represent a prospective target. However, for them the high income groups are attractive targets.

An Economic Model of Conflict

Every economic model incorporates optimization processes for the decision-makers and ends up in a general equilibrium in which all decisions interact. All decisions must be subject to budget restrictions. Two assumptions generally hold. First, the aggregated available income is determined by the productive activity of all opponents. Second, the investment in war efforts determines the distribution of income (Hirshleifer, 1995b, p. 179).

The economic model of conflict by Hirshleifer (1991a) combines the four parts discussed above (Hirshleifer, 1995b, pp. 179-182). First, every opponent has to allocate its initial resource endowment R_i towards productive E_i and unproductive activity F_i (F for fighting).

$$E_1 + F_1 = R_1 \quad and \quad E_2 + F_2 = R_2 \quad (0.12)$$

Second, the productive technology is modeled with an *Aggregate Production Function* which yields the total aggregated income I as a function of the combined productive efforts of all parties (equation (0.13)). For the sake of simplicity, using a *constant elasticity of substitution (CES) production function* is preferred. Constant elasticities imply constant returns to scale: Total aggregated income I always responds the same way to a change in the players production efforts. The reasoning for varying elasticities of substitution is based on increasing benefits from trade and interdependency. As economies increase cooperation, s increases and I increase more for every unit of productive efforts (Hirshleifer, 1995b, p. 180).

$$I = A(E_1^{1/s} + E_2^{1/s})^s \quad (0.13)$$

Parameter A models technological progress. As technology advances, more income can be generated with the same amount of productive efforts.

Third, the technology of conflict is modeled by a CSF. The ratio form (see equation (0.9)) is easier to use and excludes distorting factors such as imperfect information, exhaustion, etc.

Fourth, the income distribution depends on the investments in war efforts.

$$I_1 = p_1 I \ \ and \ \ I_2 = p_2 I \quad (0.14)$$

In equilibrium, each party's decision is the best response to the others' choices. Considering equations (0.12) through (0.14), the maximization problems in a two-contestant model are as follows:

$$Max I_1 = p_1(F_1, F_2) * I(E_1, E_2) \ \ s.t. \ \ E_1 + F_1 = R_1 \quad (0.15)$$

$$Max I_2 = p_2(F_1, F_2) * I(E_1, E_2) \ \ s.t. \ \ E_2 + F_2 = R_2 \quad (0.16)$$

Setting the first order conditions to zero in order to maximize I_i and assuming $F_i < R_i$, equations (0.15) and (0.16) can be written as *reaction curves*.

$$\frac{F_1}{F_2^m} = \frac{m(E_1 + E_2)}{F_1^m + F_2^m} \ \ and \ \ \frac{F_2}{F_1^m} = \frac{m(E_1 + E_2)}{F_1^m + F_2^m} \quad (0.17)$$

Using the ratio form for the CSF leads to technological process \$A\$ being cancelled out. Hence, increasing productivity does not change the ratios of productive and unproductive efforts of the opponents. Advances in technology increase the profitability of both efforts equally.

In the symmetrical case, both opponents receive equal initial resource endowments and end up with equal shares of the total available income (Hirshleifer, 1995b, pp. 181-182). In his Paradox of Power, Hirshleifer (1991a) states that even uneven distributions of initial income can lead to equal or more even shares of the aggregated income. Hirshleifer distinguishes between a strong and a weak version of his paradox of power. Opponent 1 has the largest initial income in both cases: $R_1 > R_2$.

The strong form of the paradox of power states that the opponents end up with equal shares of the aggregated social income: $I_1 = I_2$ with $I = I_1 + I_2$. The beginning income ratio $\frac{R_1}{R_2}$ has no influence on this outcome.

The weak form states that the final outcome will reduce initial inequalities of income distribution. Opponent 1 loses some of his endowment and opponent 2 improves his situation: $1 < \frac{I_1}{I_2} < \frac{R_1}{R_2}$.

With more resources, opponent 1 will allocate more towards both productive and unproductive efforts. The investment in war will be bigger than in symmetry. Opponent 2 faces two incentives that increase its war efforts. First, F_2 has to increase in order to match F_1 and provide appropriate defense. Second, with $E_1 >> E_2$, the prospects of gains through war are increased. Therefore, conflict is relatively more profitable for the underprivileged party (recall that $A = s = m = 1$).

Hirshleifer shows that the strong form of the paradox of power only holds when the complementary index s equals 1 (recall equation (0.13)). If s raises, productive

activities become more profitable. With more resources, opponent 1 will invest relatively more in production and less in fighting. p_1 increases slowly while the ratio of fighting efforts to initial resource endowment F_1 / R_1 decreases (compare Figure 9). Opponent 1's success fraction increases not as fast as its initial resource endowment:

$$0 < \Delta p_1 < \Delta \frac{R_1}{R_2} \quad with \quad A = m = 1,\ s > 1 \ and \ \frac{R_1}{R_2} > 1 \quad (0.18)$$

Even though party 1 has a better starting position, the investment incentives of complementary production and higher productivity lead to more equal income distribution after conflict. This situation changes when war becomes more decisive. With m increasing, opponent 1 can use its advantageous initial resource endowment to invest more in war efforts and appropriate parts of opponent 2's resources. For m that are not significantly greater than 1, opponent 2 will still end up with more income than it had in the beginning: $I_2 > R_2$. For $m >> 1$, appropriation becomes so lucrative for the richer party that opponent 2 ends up with less than before: $I_2 < R_2$ (Hirshleifer, 1995b, pp. 183-184).

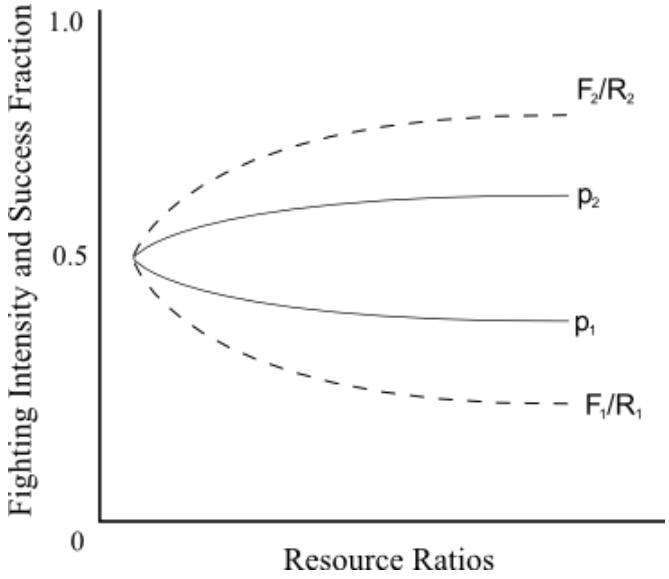

Figure 9: Fighting Efforts and Relative Success as Resource Ratios vary (s=1.25, m=1, adopted from Hirshleifer (1995b, p. 183))

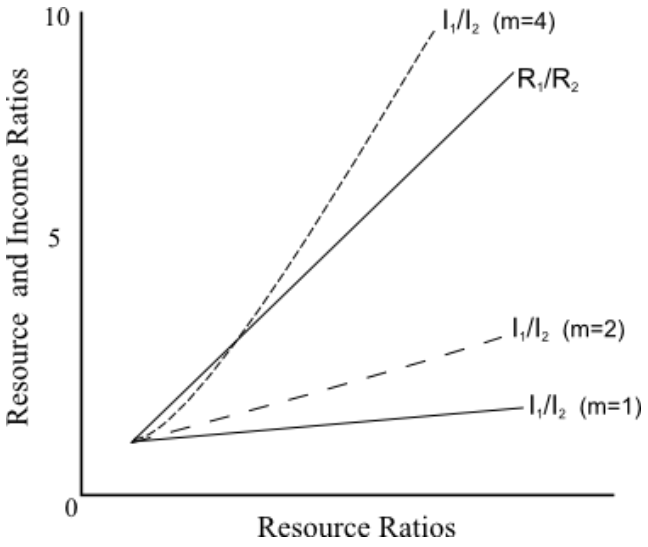

Figure 10: Income Ratio vs. Resource Ratio, as Decisiveness Parameter Varies (s=1.25, adopted from (1995b, p. 184))

A Model of Threats

The model above allowed the opponents to influence the final distribution of the social income by investing and engaging in war. Each redistribution is caused by warfare.

Hirshleifer (1995b, pp. 184-187) expands the CSF from equation (0.14) by adding a term which entails the cost of fighting $c(F_i)$ or maintenance of military investments $\gamma c(F_i)$. Depending on whether the opponents chose war or peace, the CSF alternates between two forms:

$$I_i = p_i V - c(F_i) \quad for\ war, and \quad (0.19)$$

$$I_i = p_i V - \gamma c(F_i) \quad for\ peace \quad (0.20)$$

For simplicity, the aggregated social income shall be fixed at V. The individual shares of I_i depend, as before, on the proportion won by war or the probability of victory p_i. However, the payoff is now reduced by the costs of war $c(F_i)$ if at least one opponent choses to fight. If both opponents chose peace, the individual shares are reduced by the maintenance costs of their military investments $\gamma c(F_i)$. Intuitively, ceteris paribus maintenance is less costly than full engagement: $\gamma c(F_i) < c(F_i)$. Peace is relatively more attractive than military conflict.

$$\gamma c(F_i) < c(F_i) \quad (0.21)$$

In a two-stage model, the opponents will first simultaneously commit to a level of investment in fighting. Assuming full information, the first stage reveals fighting efforts, maintenance costs, and success fractions $p_i I_i$. In the second stage, the players decide whether to attack or maintain peace. This ends the play and generates payoffs (Hirshleifer, 1995b, p. 185).

Figure 11 is adopted from Hirshleifer (1995b, pp. 185-186) who states that this model of conflict can enter an equilibrium state even when the regular reaction curves RC_1 and

RC_2 do not intersect. According to Hirshleifer, the costs of fighting can outweigh the benefits of war. Hence, at a critical point, the opponents are indifferent between fighting and peace. For any fighting effort $F_2 < F_2^*$ opponent 1 prefers war. When $F_2 = F_2^*$, opponent 1 is indifferent between war and peace. For any $F_2 > F_2^*$, opponent 1 prefers peace and an own fighting effort of $F_1 = 0$. Hirshleifer argues that when both players chose their fighting efforts simultaneously, take each other's decision into account, and prepare adequately for war $F_{1,2} >= F_{1,2}^*$ they arrive at a Nash-Cournot equilibrium[11]. Neither opponent can benefit from changing its strategy unless the other changes as well. Recall that the outcomes of this play are either peace-peace or war-war. No rational player would answer fighting with peace.

[11] Nash-equilibrium: No player can benefit by changing its choice when all other players keep their strategy.
Cournot-equilibrium: Players chose their answers simultaneously, taking the other players' decision into account.

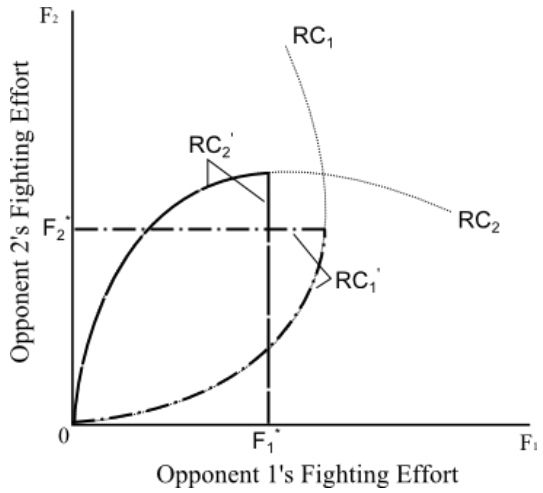

Figure 11: Fighting Efforts and Reaction Curves in the model of threats (adopted from Hirshleifer (1995b, p. 185))

This dichotomous model assumes unitary actors, neutral preferences, harmonious opportunities, and full information. In addition, it assumes that military technology does not grant the players offensive or defensive advantages. With this model, Hirshleifer (1995b) shows that sufficient investments in fighting efforts can result in peaceful outcomes.

Credible threats can deter attacks and maintain peace. However, offensive or defensive advantages, optimistic perceptions, malevolent preferences, or disharmonious opportunities can distort these results and cause war even though the costs may outweigh the benefits.

How asymmetric information can promote conflict

The commonality in the models above is that two opposing parties are in conflict and decide on fighting efforts in order to divide the prize among each other. Their decisions

and strengths are public goods. Hence, assuming that physical conflict is more expensive than simply maintaining the potential to fight as illustrated by equation (0.21), rational risk-neutral players would divide the prize in the respective portions that they could acquire through war.

Peaceful settlements are always more efficient than war. However, the discussion of Hirshleifer's models already implies that wars can occur because of misperceptions. Bester and Wärneryd (2006) develop a framework to study the likelihood of peaceful outcomes when fighting efforts are already chosen but are only publicly known. Fighting efforts are private information.

Bester and Wärneryd (2006, p. 238) find that the anticipated destruction of a fraction of the price due to war reduces the likelihood of war. Very little destruction by war corresponds to almost certain war. Furthermore, conflict is less likely when the opponents see each other as powerful (p.239). High investments of the opposing party in war efforts reduces the own chance of victory and reduces the own expected share of the price. Finally, the risk of outright conflict decreases with more accurate information about the investment in fighting efforts of the other party (p.239).

Bester and Wärneryd (2006, p. 236) state that mediation has to yield individually rational solutions in order to achieve a sustainable peaceful solution. The potential outcomes by war create a Pareto frontier for the bargaining process (p.237). This reasoning is similar to the Pareto-optimal settlement area in Hirshleifer's model (see above).

Bester and Wärneryd's model differs further from other models because the relations as described in the previous paragraphs are not monotone. Bester and Wärneryd (2006, pp.

242-244) show in a symmetric, numerical example with four types of aggression and relatively low destruction by war that war is unlikely for low aggression types and certain for high aggression types. As long as both players increase their aggression type simultaneously from the lowest to the second lowest stage, war is almost certain. However, the chances of war are lower for the third highest aggression level. In addition, chances of war decrease or remain the same when one player maintains a low level of aggression and the other player's level increases. This means that aggression has to be met with aggression in order to escalate a cold war into a hot war.

The chance of conflict depends strongly on the anticipated destruction that comes with war. War is almost certain when the destruction is marginal and the opponents have similar aggression levels. Increasing destruction not only reduces the chance of war between opponents with different aggression levels, but when reaching a critical point, chances of war decline despite equal aggression levels.

Motives When Considering To Join a Revolution

Tullock (1971) states that individuals who are to decide whether to join a revolution, its suppressors, or stay neutral must consider the existing reward and punishment systems. They do not base their decision on expectations about a public good: the success or failure of the revolution and the resulting government style and reforms.

The end of the revolution generates payoffs. Success could yield, for example, a new, more efficient government which benefits everyone in the society. Hence, the benefits of a successful revolution are a public good. In addition, the successful revolution will

reward its participants and punish its enemies. Similarly, the incumbent government will reward its supporters and punish the conspirators if the revolution fails.

The expected payoff a neutral individual faces P_N, is the likelihood of a successful revolution despite the individual being inactive L_N multiplied by the benefits of the public good generated by successful revolution P_S (Tullock, 1974, p. 36).

$$P_N = P_S * L_N \tag{0.22}$$

This model assumes that individuals can stay neutral and do not face a "If you are not with me, then you are against me" mentality. In addition, it assumes that the incumbent government is less efficient than the potential revolutionist government. Neutral individuals will not lose anything if the revolution fails.

A potential supporter of the revolution faces expected payoffs P_R that depend on this activity, public benefits, and private rewards and punishments (Tullock, 1974, p. 38).

$$P_R = P_S * (L_N + L_i) + R_i(L_N + L_i) - P_i[1-(L_N + L_i)] - L_w * I_r + E \tag{0.23}$$

The participation of individual i in the revolution increases the chances of its success and therefore the expected payoffs: $P_S * (L_N + L_i) > P_S * (L_N)$. However, Tullock (1974, p. 38) argues that individuals rarely have a major impact on insurgencies. Hence, Tullock simplifies his model by assuming that the individual's contribution is almost zero: $P_S * (L_N + L_i) \approx P_S * (L_N)$ for small L_i.

The second term from the left on the right hand side of equation (0.23) shows the expected rewards upon successful termination of the revolutionist efforts. Expected

rewards are determined by the revolution's success rate. Again, the individual's participation increases the chances of success.

Similarly, the occurrence of penalties to the individual P_i depend on the likelihood of failure of the revolution: $1-(L_N + L_i)$.

I_r accounts for injuries suffered during the revolution and L_I for their likelihood. E is a residual term to capture other positive or negative factors.

For the individual to engage in the revolution, the net payoff has to be greater than the payoff from inactivity: $P_R - P_S * L_N > 0$. Therefore, the individual considers only rewards and punishments when deciding whether it should join the revolution. The benefits from a more efficient government apply in both cases because they are non-excludable and non-rivalrous.

Similarly, if the individual considers joining the government forces, the expected payoffs P_G depend on the likelihood of success of the revolution L_N, the individual's efforts to reduce that likelihood L_i, rewards by the incumbent D_i, punishments by the revolution P_{RI}, injuries I_R, and other factors E. The expected payoff from joining the incumbent forces is (Tullock, 1974, p. 38)

$$P_G = P_S * (L_N - L_i) + D_i[1-(L_N - L_i)] - P_i(L_N - L_i)] - L_w * I_r + E \qquad (0.24)$$

Again, the individual's decision to pick a side rather than remaining neutral is guided only by rewards and punishment systems.

This result is important since it moves the romantic picture of revolting for a better cause closer to reality. Individuals join a side in order to maximize their private gains. Insurgency becomes a business activity.[12]

This conclusion becomes even more apparent when neutral individuals have to face punishments from both sides during the revolution. Kalyvas (2006) found that entire communities switched back and forth between supporting government and rebel forces in the Greek civil war according to which party currently controlled the respective geographic region. This way the people were able to maintain their businesses, acquire protection from the party in control, and to avoid punishments for supporting the "wrong" side.

A Stable, Peaceful Equilibrium in Anarchy

Hirshleifer (1995a) argues that anarchy may provide a stable system without outright conflict. Anarchy is not the absence of structure (amorphy). In amorphy, resources cannot be controlled and territory cannot be seized. Anarchy is a social structure in which the players contest over resources without effective regulation (Hirshleifer, 1995a, p. 27).

This model differs from other models of conflict as discussed above or in Hirshleifer (1988, 1991a), Skaperdas (1992), and Grossman and Kim (1994) in that it allows for a continuous conflict. Resources can be redistributed more than once (Hirshleifer, 1995a, p. 29 Footnote).

[12] See Silver (1974) for some empirical considerations with this model.

Hirshleifer assumes full information, no opportunity costs of fighting in form of foregone income from production, non-destructive fighting, no geographical factors, and no problems of group dynamics. Finally, the model is limited to a steady-state analysis (Hirshleifer, 1996, pp. 35-36). These assumptions facilitate modeling conflict in anarchy. The model could be extended to account for complex problems such as geographic advantages or asymmetric information.

For a two contestant conflict in anarchy, Hirshleifer (1995a, p. 30) assumes a linear production unction. The individually available resources are a function of productive and fighting efforts.

$$R_i = a_i E_i + b_i F_i \tag{0.25}$$

The socially available resources are the sum of individually available resources: $R \equiv R_1 + R_2$. Hence, fighting is non-destructive. a_i and b_i are the constant costs of transforming inputs into productive and fighting efforts.

Let Y_i be the income of player i, and e_i the intensity of player i's production efforts, then the production function is:

$$Y_i = E_i^h = (e_i R_i)^h \tag{0.26}$$

with

$$e_i = E_i / R_i \quad and \quad f_i = F_i / R_i \tag{0.27}$$

h is the response of Y_i to a change in E_i. Analog to e_i, f_i is the intensity of player i's fighting efforts.

The success fractions p_i with $p_1 + p_2 = 1$ represent the probability of success of controlling resources through fighting. Hence, the individually controlled resources are:

$$R_i = p_i R \tag{0.28}$$

with

$$p_i = \frac{R_i}{R} = \frac{F_i^m}{(F_i^m + F_j^m)} \tag{0.29}$$

Hirshleifer (1995a, pp. 32-34) shows that if $m \to 1$, then $p_1 / p_2 = 0$ for all $f_1 < f_2$ and $p_1 / p_2 = \infty$ for all $f_1 > f_2$. This means, as the decisiveness parameter m approaches 1, player 1's probability of success to control resources will be zero as long as his fighting intensity is smaller than player 2's fighting intensity. Similarly, player 1 will gain all resources of his fighting intensity is bigger than the one of player 2. Therefore, if m is sufficiently high, the players face a winner-takes-it-all contest. If $m < 1$, both players will obtain control of some resources even when $f_1 \neq f_2$.

The necessary conditions for stable anarchy are dynamic stability and viability. Anarchy is dynamically stable with a sufficiently low decisiveness parameter m. High m leads to the breakdown of anarchy because one player may become a hegemon. Hirshleifer (1995a, p. 33) argues that viability is given when the individual income is higher than a minimum y that is needed for survival and group integrity: $Y_i > y$.

Analog to previous studies, Hirshleifer (1995a, p. 35) finds that higher m and lower b_i lead to higher fighting levels. The higher m, the greater is the effect of a disparity in

fighting efforts. Both sides are motivated to invest more in fighting efforts in order to minimize losses.

Substituting equation (0.28) into (0.26), and solving the production function for a symmetrical case with N contesters and equal cost coefficients $a_1 = a_2 = ... = a_N$ and $b_1 = b_2 = ... = b_N$, one can see the influence of increasing numbers of contestants on fighting efforts and income (Hirshleifer, 1995a, pp. 37-39).

$$Y_i = (e_i p_i R)^h = [\frac{1-m}{a(N-m)} R]^h \tag{0.30}$$

$$Y_i = (e_i p_i R)^h = [\frac{1-m}{a(N-m)} Nr]^h \tag{0.31}$$

with

$$R \equiv Nr \tag{0.32}$$

Equation (0.30) shows that individual income will decrease when the number of players increases exogenously. Equation (0.31) suggests that the income will decrease even if N increases endogenously by increasing the socially available resources. Given that coalitions are not allowed, every player has to take every one's else fighting efforts into account in order to maximize its own payoff. Therefore, the fighting efforts have to increase in order to compensate for the increased number of adversaries.

Calculations show that a decrease in player 1's production costs increases his income but leaves everything else unchanged. On the other hand, a decrease in player 1's fighting costs increases his fighting efforts and income as well as decreases player 2's income.

Since player 2 still faces the same fighting costs, he will not respond with a 1:1 increase in fighting efforts (Hirshleifer, 1995a, pp. 39-40).

Similarly, if h raises it will not have an impact on fighting efforts. Only the income of the player affected by the change will increase. An increase of m for player 1 will increase all fighting responses of that player and increase its income. Player 2 will respond with higher fighting efforts but eventually reach a point when the gain by fighting is outweighed by the costs (Hirshleifer, 1995a, p. 40).

Changing the analysis from a Cournot to a Stackelberg equilibrium, Hirshleifer (1995a, pp. 40-41) finds that fighting efforts are generally smaller and incomes are higher. Since the follower can optimize his decision to the leader's choice, the follower can have a relative advantage. In accordance with Gal-Or (1985) Hirshleifer finds that the follower has the advantage when the reaction functions are upwards sloping and the leader has the advantage when the reaction functions are downward sloping.

Territory and Borders

Findlay (1996) develops a model of conflict in which the territory controlled by a player is the dependent variable. The model finds that improvements in military technology increase the marginal productivity of war efforts. Hence, the territory controlled should increase as well. This result is similar to the models discussed above: Fighting efforts should increase as they become less expensive or more productive.

Findlay (1996, p. 44) further suggests that improvements in production technology have ambiguous effects on war efforts. Again, higher productivity of productive efforts raises

the opportunity costs of fighting efforts. However, the increased productivity of land makes it more valuable and increases the marginal productivity of war efforts. The relative marginal products of productive and war efforts will determine which effect is dominant.

When allowing the victor to incorporate the population of the newly gained territory, both the new labor force and the increased army yield increased payoffs (Findlay, 1996, pp. 45-46).

The monotonically increasing LL' in Figure 12 illustrates the opportunity costs of warriors in terms of their respective marginal productivities as labor force. A little army (small F) reduces the labor force and its productivity only by small amounts. Reducing the labor force further by allocating even more resources toward fighting effort has increasing negative effects on the productivity of the work force.

The FF' curve represents the marginal benefits of the army's size. The concave part of FF' suggests decreasing marginal utility of army size. The reasoning for this is that an army needs to be maintained, cannot conquer or defend unlimited amounts of territory, and limits the available work force. With the first part of FF' being convex, the model allows for the argument of economies of scale: Given fixed costs for the organizational structure, the military can support an increasing amount of soldiers at reduced variable costs until more structure is required.

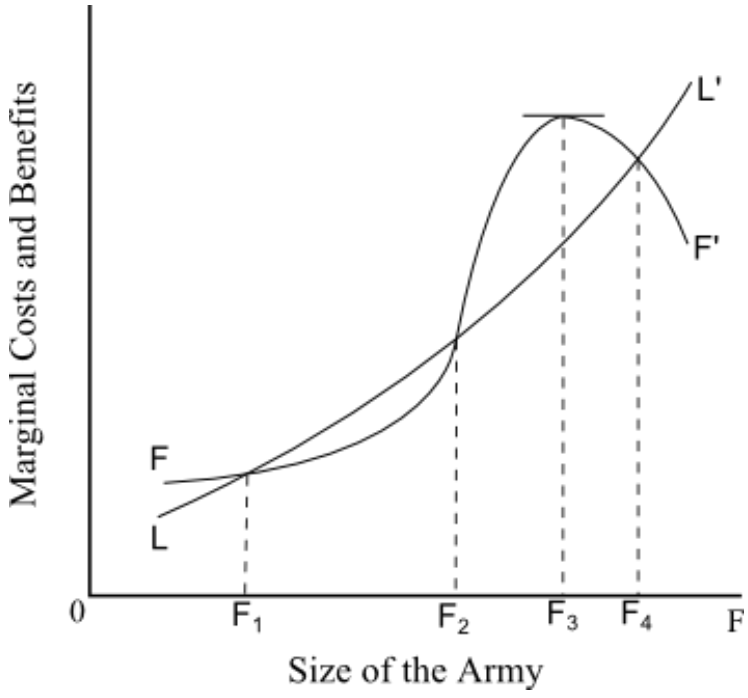

Figure 12: Optimal army size given its increasing marginal costs (adapted from Findlay (1996, p. 46)).

F_1 and F_4 are stable equilibriums. To their left, the benefit of one more soldier exceeds the costs. To their right, the costs are greater than the benefits. This is not true for F_2: The player has an incentive to profit from higher fighting efforts. F_3 is the maximum to the army size.

Given full information, the player will move to F_4. If the player does not have full information about his costs and benefits, he will not move beyond F_1. Findlay (1996, p. 47) compares this situation to the *low-level equilibrium trap*: Players are too poor to save and the resulting lack of investments inhibits economic growth. Here, if the player settles for F_1, his payoff falls short of his potential.

When adding a manufacturing sector to the model that does not need as much territory but more labor, land becomes less valuable and the opportunity costs of warfare grow further. With improvements in the productivity of the manufacturing sector, it is rational to decrease the army size and even give up some territory. On the other hand, if manufacturing is labor intensive, the prospect of increasing the labor force by increasing the controlled territory may trigger an increase in fighting efforts.

Bó and Bó (2011) suggest similar results: Positive shocks to wages in labor-intensive sectors decrease the risk of war. However, if the wages in capital-intensive sectors increase, controlling capital yields higher returns. Hence, the risk of conflict increases.

.

CHAPTER IV

FINDINGS

This chapter presents the findings from the review of the literature and the methodology. Initially, the different perspectives on civil war from the literature review are condensed in a Pressure and Release Model for Civil War. The second part situates different forms of intervention in this model and draws conclusions about the potential and limits of interventions. Finally, the suggestions and conclusions of the economic models of conflict presented in the Methodology are discussed. The essence of each problem is summarized in a *lemma*. When appropriate, examples and suggestions are provided to the reader.

The Pressure and Release Model of Civil Wars

The PAR model carries potential for the analysis of risk and intensity of civil war. Natural disasters happen when human environment and natural processes occupy the same time and space element. The intensity of natural disasters depends on mitigation efforts and is increased by unsafe conditions. A similar crunch model can be constructed for man-made disasters such as civil wars, genocides, etc.

The literature presented above suggests several pressures that push a society toward civil war. A PAR model for civil war needs to incorporate all accomplishments in this field in order to provide a comprehensive picture. However, a complete review of the controversial discussion about the causes of violent conflict is out of the reach of this work. The major factors were adopted from the original PAR model by Wisner et. al. and Hirshleifer's work on preferences, expectations, and opportunity. The discussion of the influences of natural resources, democratization, fractualization, exports, and income levels on violent conflict complement this research Collier and Hoeffler (1998); (Collier & Hoeffler, 2000). Lake and Rothchild (1996) introduce the importance of trust and fear.

The root causes in the PAR model for civil war incorporate social as well as economic pressures and fractualization. Social pressures are limited access to rights, emancipation, political power, representation, self-determination, and institutions. On the economic side, pressures exist in the access to natural resources and business opportunities. Social and economic pressures entail the progression of social vulnerability from the original PAR model and additional factors that are unique to violent conflict. The literature on violent conflict generally refers to social and economic pressures as *grievances* (Collier & Hoeffler, 2000, 2004).

Fractualization relates to identity-based conflicts which evolve around religions, ideologies, ethnicities, etc. Group dominance and political entrepreneurship channel the root causes into malevolent preferences such as mistrust and fear. Fear is also created by failing states, information failures, security dilemmas, and problems of credible commitments.

In addition to group dominance and political entrepreneurship, dynamic pressures are demographic change, urbanization, public debt, natural resource degradation, imperfect and incomplete information, public goods, and local markets and credit supply.

Unsafe conditions reflect opportunities, preferences, and perceptions that evolve from the previous stages. Low opportunity costs of war will increase the risk of violent conflict to resolve grievances. Furthermore, low opportunity costs will rebellion-as-investment and rebellion-as-business more profitable. Misperceptions about one's own or the adversary's strength or motives can lead to conflict. Misperceptions can also involve exaggerated expectations about post-conflict income distribution. Hirshleifer (1985, pp. 63-64) call this motivation *rebellion-by-mistake*.

External pressures tighten the space in which internal dynamics can evolve and conflicting parties can avoid each other. The literature suggests that international trade, world market prices, borders, spillovers from out-of-state conflicts, and pressures by foreign governments and organizations limit the chances of relief for and worsen internal pressures.

Natural hazards can destroy resources and set back development. They reduce the available income for peace settlements. Moreover, natural hazards require better engineered solutions to improve production and they impose restrictions on what economic sectors are profitable to develop. Every sector responds differently to natural hazards and therefore, has more or less resilience.

It is inherent in the concept of conflict that parties with conflicting interests occupy the same time and space element. Tackling the root causes or agreeing on a mutually

beneficial way to contest over resources and to define property rights can reduce conflict and relief pressure. Civil war occurs when internal as well as external pressures find no other form of relief.

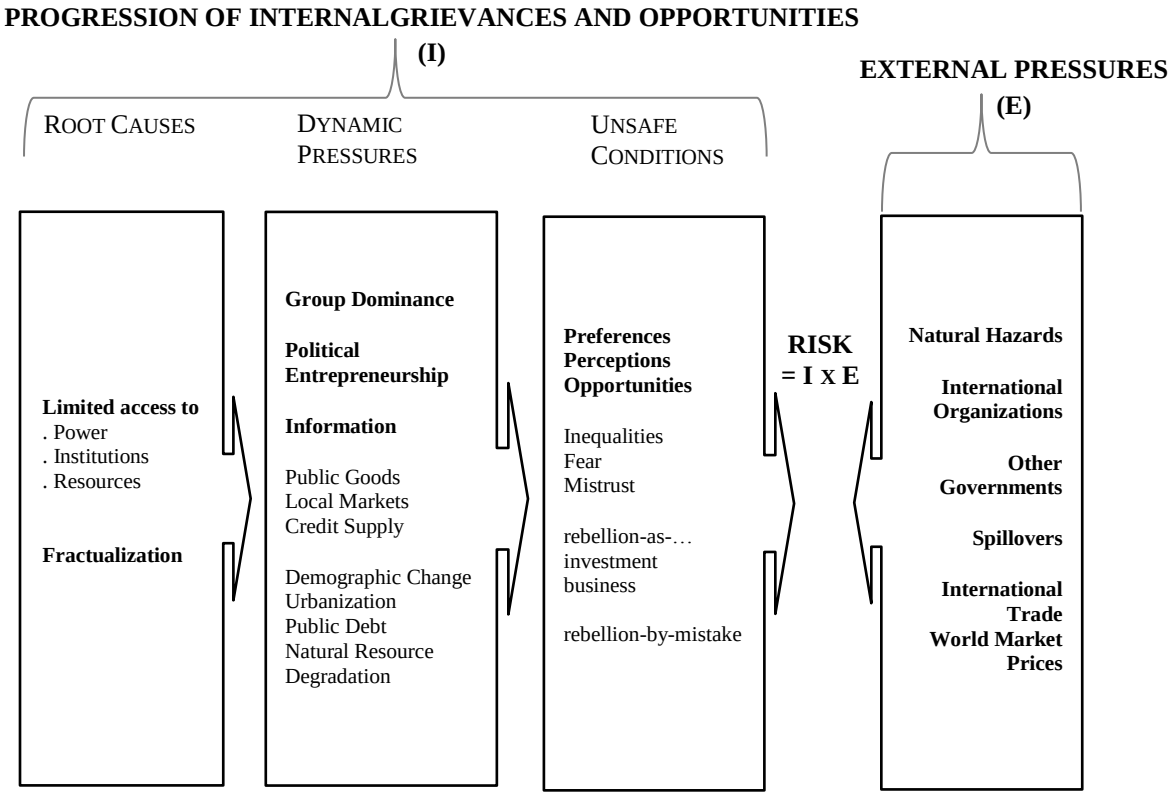

Figure 13: The PAR model for civil war

Civil war is likely to occur if either internal or external pressures are high. The most severe and intense conflict can be expected if both factors are very high.

The risk of conflict or its intensity can be reduced by releasing pressure. The most effective improvements will be achieved by tackling the root causes and influencing preferences, expectations, and opportunities. However, these will also be the ones most difficult to change. Third party intervention is required when the local population and authorities are overwhelmed with the situation.

Intervention in the PAR model for Civil War

As noted by Rothchild (1997), coercive measures are instruments of conflict management that can temporarily force a stop to conflict. They separate the belligerents and offer a time window for other instruments of intervention. Coercive measures, such as physical force, threats, or sanctions, do not reduce grievances and do not provide relief. Physical force may change the type of warfare if the belligerents have to bypass peace-keeping forces. Targeted sanctions may raise the opportunity costs of violence or lower the supply of arms. General embargoes, however, might further worsen the situation for groups that are already in need. Either way, they fail to address underlying root causes or expectations and preferences. Coercive measures cannot result in sustainable peace.

Noncoercive instruments have to complement coercive measures to allow for sustainable peace settlements. In terms of the PAR model for civil war, mediation might lower the expectations and deal with misperceptions. The effects on grievances are ambiguous. Noncoercive incentives might build up trust and a non-violent bargaining atmosphere. They might even result in an agreement to settle the dispute. However, the high ratio of renewed violence after settlements shows that diplomatic intervention alone cannot provide enough credible incentives. Otherwise, the parties would comply with the agreement either because of self-interest or fear of retaliation.

A comprehensive approach to sustainable peace has to combine the traditional methods of intervention with an incentive-based approach. Intervening third parties have to engage in economic development and state building. The provision of public goods and access to local institutions will significantly reduce grievances. Education, employment,

and increasing income levels will also increase the opportunity costs of war. Diplomatic intervention will reduce misperceptions and expectations about profits from war. Military intervention in ongoing violence can reduce its severity and create safe areas. Pre-conflict intervention may delay the outbreak of violence until the other intervention methods start working.

The next section will show what role economic incentives play in civil war as well as why and how economic incentives increase the chances of peaceful, lasting settlements.

Economic Incentives in Civil Wars

This chapter discusses and interprets problems which arise from modeling the economic incentives in civil wars. The findings below show what economic incentives exist in Civil Wars, how they influence the opponents' decision-making processes towards peace or war, and how third parties can use incentives to lead a conflict into a desired direction.

The structure of this section generally follows the logical and chronological pattern of the chapter on *The Technology of Conflict*. Since all terms and frameworks are introduced at this point, few alterations are possible whenever appropriate. Each problem is discussed separately and its essence is stated in a *lemma*.

Players can generate income either by production or appropriation. As suggested by Adam Smith and his essays on the *Division of Labor*, players should concentrate on whatever they do best. However, the economic framework of exchange theory does not account for conflict. Haavelmo (1954) fills this gap with an allotment function that accounts for productive and unproductive efforts (see equation (0.1)). Hirshleifer's

Machiaveli Theorem even claims that no individual will pass up a chance to exploit others.

> Lemma 1: *Income is a function of production and exchange, as well as thievery. It is rational for a player to appropriate from others, especially when the victim does not defend itself.*

Individuals join a revolution when the immediate benefit outweighs the risks and costs of fighting. Tullock (1971) argues that individuals do not only join a civil war because they hope to gain rights, representation, or emancipation. Given that such rights are probably public goods if the civil war ends correspondingly, even individuals that did not join the fight can benefit. Assuming that a common individual has no significant impact on the ending of a civil war, the individual does not need to join the fight even if it values rights, representation, or emancipation. If however, joining the fight bears significant immediate rewards, the individual has motivation to pick a side.

> Lemma 2: *If the payoff of a civil war such as rights, representation, or emancipation is a public good, individuals do not have an incentive to join the fight unless they are presented immediate rewards that outweigh the costs and risks of picking a side.*

Incentives to pick a side rather than to stay neutral can be economic or security incentives. Kalyvas (2006) explains how entire communities would alternate between supporting either the communist insurgents or the government forces in the Greek civil war. Supporting whoever currently controlled the territory would secure defense against raids from the other group and reduce exploitation and violence from controlling force.

Despite this, players maximize their incomes by appropriating from others, conflict is undesirable from a macroeconomic viewpoint. Conflict does not produce goods, it only leads to redistribution. Social welfare is higher in peace than it would be during conflict.

Lemma 3: *Conflict is undesirable on the social level but maximizes income on the microeconomic level.*

If property rights are not enforced, the dominant strategy of each player is to appropriate. Recalling Figure 3, appropriation yields the highest payoff: 18 for the thief and 2 for the player who is not appropriating. Knowing this, the other player will respond by appropriating as well. Compared to not appropriating, the player gains 2 more income. Regardless of the other player's decision, each player achieves a higher payoff by appropriating. The players are trapped in a prisoners' dilemma: Even though cooperation would increase individual payoffs to (10/10), the dominant strategy of appropriating traps them in a payoff of (4/4). In this example, conflict reduces social welfare from $10+10=20$ to $4+4=8$.

Lemma 4: *Without enforcement of property rights, players are trapped in a prisoners' dilemma. Conflict is the dominant strategy.*

Tullock (1980)'s way of constructing Figure 3 suggests that conflict destroys resources if both parties decide to engage in conflict. Social welfare is reduced from 20 to 8. However, if only one party were to decide in favor of conflict, social welfare would still be $20=18+2$. Instead of payoffs of (18/2) and (2/18), the reader should assume payoffs which generate less than a total payoff of 20. In order for conflict to remain the dominant

strategy, the victim's payoff needs to be less than its payoff from fighting back (here 4), and the aggressor's payoff needs to be higher than the alternative of cooperating (here 10).

Enforcing property rights changes the dominant strategy and reduces conflict. The right hand side of Figure 3 illustrates Tullock (1980)'s thought process. Again, if both parties steal, they gain a total payoff of $4+4=8$. However, if only one decides to steal, the victim has no incentive to change its decision from cooperation to appropriation. By not fighting back, its payoff decreases from 8 to7, compared to a payoff of 4 by fighting back. Punishment of appropriation makes conflict unattractive. All players choose to cooperate. Social welfare increases from $4+4=8$ without enforcement, to $8+8=16$ with enforcement. Since property rights enforcement needs to be financed, Tullock (1980) argues that some resources are still lost to conflict and the maximum of social welfare (payoff 10/10) cannot be reached.

> Lemma 5: *Enforcing property rights overcomes the prisoners' dilemma and yields higher payoffs. However, social welfare does not reach its full potential.*

Definition and enforcement of property rights are necessary but not sufficient conditions for settling conflicts. Credibility and independence of the property rights enforcing power monopoly are essential. Following the reasoning of Figure 4, individual players may be better off by defending themselves than by facing a selective or exploitative property right enforcement. Influencing the power monopoly allows a player to become a hegemon and exploit its opponents.

Lemma 6: *If conflicting parties cannot agree on an independent power monopoly to enforce property rights, they are better off defending themselves.*

This is a real world problem: Efforts of building up and supporting local security forces in Afghanistan and Iraq are inefficient because recruits act as spies for other groups, or desert after the training. Through loyal members within the new security forces, conflicting parties can undermine operations, steal intelligence and resources, and plan more efficient attacks.

Lemma 7: *If credibility and independence of the power monopoly are not guaranteed, disarmament and a shared defense force are not the first best solutions.*

When conflicting parties cannot agree on a power monopoly to settle conflicts, each player has to invest in own production and fighting efforts. Fighting efforts are used to appropriate, defend, control, and threaten. During the bargaining process, the players will choose between peace and war. Peace will only occur if both players chose not to fight. War occurs as soon as one player decides that war is more beneficial to him or her.

Lemma 8: *Conflicting parties will only settle for peace if the agreement yields each player at least what they would gain through war.*

Figure 7 demonstrates this by introducing areas of pareto-optimal settlements. In the shaded area, all settlements exceed the players' expectations from war. Ceteris paribus, the players should prefer any of the peace settlements in this area over war.

Players decide on peace or war according to their maximization problem. However, a decision for peace or war is never final. Declarations of war and peace settlement agreements are bound to a prevailing set of circumstances. When situations change, the players will renegotiate the contract. Renegotiations are common in today's society. Politicians renegotiate their contracts with the constituency after each term when they try to remain or get into office. Hence, it would be unreasonable to assume that parties in civil wars never have to renegotiate. The difference lays in their available methods of negotiating. If the previous agreement failed to install enforceable and independent instruments, the parties will have to decide between peace and war once more.

Lemma 9: *Peace and war are equal outcomes to a continuous bargaining process.*

A player's decision depends on its expectations about the generated payoff. Players will choose whatever maximizes their own payoff. As discussed above, models of conflict vary in the number of plays they allow. Dichotomous models study specific situations. The current allocation of resources and power suggests the optimal decisions and responses for each player. Optimal decisions which consider the other players' decisions, are aggregated in *reaction curves* or *reaction functions*. Continuous models enable the players to also discount their expected positions in the future and plan accordingly. This can have impacts on current decision-making processes as well as on future plans: Even if peace is the optimal decision now, at least one player could prefer war if he expects peace to weaken its position in future conflicts.

The reasoning is as follows: A player might currently face only one opponent. Settling for peace would allow both of them immediate gains which may exceed the benefits from war. However, peace allows both players to arm even further for future conflicts. Later conflicts might be more violent because of increased kill-capacity. If one party had defeated the other one, future conflicts are very unlikely because the gap of military strength would be too big. In addition, Tullock (1980) suggests that not-fighting could make the players seem less tough. Outside players might now consider starting conflicts thinking that the others will share their resources rather than fighting back.

Lemma 10: *Players may decide against peace if future expectations reduce the benefits of today's peace agreements.*

Expectations, opportunities, and preferences play a major role in settling conflict. Figure 5 illustrates benevolent, neutral, and malevolent preferences. The attitude of the conflicting parties toward each other and the appreciation of success of the other one has immediate consequences on peace settlements. When facing benevolent preferences, economic incentives towards one party will also make the other party feel better. However, malevolent preferences will attach negative impacts to economic incentives. Graphically, the different shapes of the indifference curves determine the size of the area of pareto-optimal settlements.

Lemma 11: *Malevolence (benevolence) discourages (encourages) third-party economic incentives, and limits (extends) the area of pareto-optimal peace settlements.*

If consumption is harmonious, all players profit from producing goods. Increased production of one player will benefit the other player. Social welfare is maximized when both players have large shares of the resources and invest these in producing. War is relatively more expensive and players tend to prefer peace. Disharmonious consumption, on the other hand, implies that cooperation is disadvantageous. The player is better off by claiming all resources and stopping all cooperation. Social welfare is maximized by one party having all resources. Natural resources, for example, could be such a rivalrous good that only allows the party in control to benefit. Disharmonious, neutral, or harmonious consumption determine the slope of the settlement possibility frontier (SPF).

Lemma 12: *Disharmonious (harmonious) consumption decreases (increases) the socially available income, and determines whether the economy can finance a peace settlement.*

The SPF is like a budget restriction. A peace settlement has to be within the area of pareto optimal settlements, or it is undesirable for at least one player. In addition, the settlement has to lie within the boundaries of the SPF. Otherwise, the players would agree on sharing more resources than are available.

The conflict over the oil resources in southern Nigeria, for example, demonstrates the concept of disharmonious consumption. The party receiving the rent from the mining companies is the only one to profit. If the country were to extract and refine the oil itself, more opportunities would arise for all parties involved to profit.

Suggestion 1: Reduce disharmony in consumption by creating more opportunities to profit from consumption.

Perceptions about the own and the adversary's position and strength determine the income expectations of war and the walk-away point from peace negotiations. The intersection of each party's income expectation from war determines the threat point. Any settlement above and to the right of the threat point marks a pareto optimal settlement.

Since accurate information is not readily available, perceptions are based on threats and not-fully-informed judgment. In addition, the players may be overly confident and expect higher income from war than they are actually able to achieve. Therefore, misperceptions become a great problem when determining the threat point. In the example of Figure 7, peace settlements only become possible if the threat points moves from P_0 to P_1.

> Lemma 13: *Misperceptions can push the pareto optimal settlement area to the right of the SPF and therefore, outside of the budget restriction.*

The existence of misperceptions suggests that players do not have perfect and complete information. In addition, information is not necessarily distributed symmetrically. This means that players (a) do not know all potential outcomes, and (b) do not know the probabilities of all potential outcomes.

> *Suggestion 2: Intervention has to address the quality and distribution of information before the players can fully understand their situation and options.*

The natures of preferences, opportunities, and perceptions determine the set of possible peace settlements. If the players fail to form well-informed expectations and the economic structure cannot provide enough resources to support peace settlements, the players are forced into a conflict trap. Outside assistance is needed to overcome the restriction of scarce resources.

> *Suggestion 3: Third parties could subsidize the difference between the peace settlement and the economy's budget restriction in order to free the opponents out of the conflict trap.*

The necessary intervention methods for sustainable peace settlements are military and diplomatic. The sufficient condition for peace is economic intervention. Economic incentives can subsidize the difference between the local economies resources and the peace settlement (Figure 8). Military and diplomatic intervention can help to overcome or at least reduce information asymmetry, misperceptions, first-attacker advantages, and security concerns. However, these instruments have limits and may not be able to enable peaceful settlements of conflicts on their own. Diplomatic intervention, for example, needs to be accepted and mediators have to build trust. They also face conflicting parties who have no incentive to publish their actual strength and intentions. This could make them an easy target. Military intervention on the other hand has commitment problems. Military intervention usually needs approval from intergovernmental organizations. Decision processes can be slow and biased. Furthermore, as stated above, threats only become credible if the players have a history of evidence. Even though military intervention in violent conflicts is not new, there are enough cases when the international community remained quiet.

Players can have different expectations from war. Contest Success Functions show why some players prefer conflict over peace. The marginal utility of fighting efforts, or the *decisiveness factor* m (see e.g. equation (0.9)), determines the payoff generated by the investment of one unit into fighting rather than production. Figure 10 shows how the resource ratio of two players after war varies as the decisiveness factor increases. At very high m, the winner of the conflict takes almost all of the available resources.

Lemma 14: *For some players, conflict generates more payoff than productive efforts.*

Suggestion 4: Conflict resolution needs to increase the relative benefit of productive efforts.

Decreasing the decisiveness factor m and increasing the marginal utility of production reduces the attractiveness of war relative to peace. Possible strategies include denying or hindering the access to new military technologies and weapons. Foreign aid, economic development, and state building increase the marginal utility of productive efforts and the opportunity costs of warfare.

The case of Somalia, for example, shows that weapon embargos cannot entirely prevent the supply of weapons to conflicts. However, embargos make the acquisition of weapons more difficult and therefore decrease m. On the other hand, the Rwandan Genocide in 1994 demonstrates that even relatively primitive weapons can cause significant violence.

Higher productivity can also increase war efforts. Findlay (1996) assumes a conflict over territory and distinguishes between an agricultural sector and a manufacturing sector within the economy. The agricultural sector is labor intensive. An increase in its

productivity would free up labor force which could be used to extend the production onto additional territory or increase war efforts. Territory becomes more valuable: Any given amount of territory now can produce more, hence the marginal utility of conquering additional territory increases. Therefore, higher productivity in territory intensive sectors, such as the agricultural sector, makes conflict over territory more attractive. On the other hand, improvements of productivity in sectors which require few territory reduce war efforts. If production becomes relatively more profitable, it may be rational to reduce fighting efforts and control less territory in order to free up resources for the manufacturing sector.

Lemma 15: *The economic structure of an economy matters: Improvements in productivity of territory intensive production can encourage warfare, whereas they can reduce conflict in non-territory intensive sectors.*

Third parties have to identify the disputed resource of a conflict before intervening. Encouraging only agriculture in a conflict over territory may further fuel the fighting. However, an emphasize on the manufacturing sector may lead to a diversion of resources from fighting to production.

Suggestion 5: The reason of conflict and the economic set up determine the appropriate tools of economic intervention.

Resolving Civil Wars by splitting a country into several countries is not necessarily the best solution. Following the reasoning of Figure 12, an army is necessary to control and defend territory. Every additional warrior reduces the available labor force and the

payoff of productive efforts. Each player will chose a distribution of resources between productive and fighting efforts where the marginal utilities are equal. A player's restrictions in resources or available territory can create a *low-level equilibrium trap*. When the ratio of resources necessary to defend the occupied territory is relatively big compared to the size of the territory and its productive opportunities, the player may not be able to generate sufficient payoff to reinvest and increase its welfare. Alternatively, with more territory, military expenditure is comparably higher, but so is the payoff.

Lemma 16: *Trapping conflicting parties in small territories may limit their potential for growth.*

Suggestion 6: Cooperation and shared territory may increase the productivity. In addition, a bigger army may correspond to higher security levels and a better defense against outside aggressors.

There seems to be a critical size for a state to achieve its full potential of growth and prosperity. Every country requires some sort of government and some sort of police or military force in order to provide security and stability. Such investments have fixed and variable costs. Buildings, technology, organization and structure, etc. are fixed costs. These investments are able to support a growing nation up to a certain point when they require expansion. The variable costs are the costs per individual that profits from the system. Variable costs start off by decreasing: With every additional member to the nation, the costs per individual decrease. Variable costs eventually increase and exceed the starting point when further investments in the system are needed to support a further

growing nation. From a long-term perspective, countries should not split up in order to profit from economies of scale and overcome the potential low level equilibrium trap.

Suggestion 7: In the long run, a bigger area of influence allows players to profit from economies of scale.

Luxembourg, Monaco, and former Yugoslavia are special cases. Luxembourg and Monaco both produce high-value services and due to the free movement of labor and capital in the European Union, both countries have a catchment area that exceeds their borders. The parties in former Yugoslavia, on the other hand, have profited from the break up. The political system at the time was unable and unwilling to account for the interests of all players in the conflict.

Though players cannot be forced to reduce their fighting efforts, they will do so when it is reasonable for them. Lemma 9 and 10 suggest that players could choose war if expectations about the future lead them to believe that a demonstration of power will yield security in later plays. Hirshleifer (1995b) shows that credible threats can deter attacks and yield a peaceful outcome. While arming, both players can reach points when the costs of war outweigh its benefits. In Figure 11, the fighting efforts F_1 and F_2 have to exceed F_1^* and F_2^* for both parties to prefer peace. This adds a new way to achieve stable peace.

Lemma 17: *Peace can also be achieved through a standoff, or cold war. This may satisfy current as well as future security needs.*

On a similar line of reasoning, Haavelmo (1954) noted that an increase in the number of players can also lead to a stable equilibrium. When facing more opponents, players have to invest in more fighting efforts to deter or defend what they have. Hence, the players could reach a critical level when they can defend their resources but the payoff of appropriating is marginal.

> Lemma 18: *Increasing the number of opponents decreases the payoff of appropriation but traps the players in a security dilemma. Players have to invest even more in defense which reduces global income.*

Does having more players encourage cooperation while reducing the number of players encourage splitting off of small fanatic groups? Lemmas 16 and 17 allow an interesting interpretation of lemma 18. If players have to invest more into fighting efforts as the number of players increase, small groups may face a minimum of defense investments that they cannot finance with their initial resource endowments. They would be forced to seek alliances and merge with other groups. On the other hand, when dividing a large territory with many players into small independent territories that do not have to fear outside aggression, appropriation becomes less expensive. It could now become profitable for small groups to violate agreements and start fighting on their own.

As noted in lemmas 11 through 13, malevolence, disharmony, and misperceptions can push the players into a conflict trap, even though the economic costs outweigh the benefits of conflict. Hirshleifer (1995b)'s model does not account for such factors which present a significant threat to its equilibrium solution. Nevertheless, when independent

enforcement of property rights is not possible (recall lemma 7) and future expectations require defense forces (recall lemma 10), Hirshleifer (1995b)'s suggestion may point toward a possible solution in a comprehensive conflict resolution strategy.

Suggestion 8: Conflict resolution needs to account for the players' security needs. Disarmament is not always the first-best solution.

Anticipated destruction of resources, infrastructure, etc. by war and high-perceived strength of the opponent reduce the likelihood of war. Bester and Wärneryd (2006, p. 238) reinforce lemma 17: With any side increasing its fighting efforts, the share of the contested resources rises, but the aggregated amount of resources that can be conquered decreases. Similar to Hirshleifer (1995b), the players reach a point when fighting efforts are too high to engage in a hot war. This is not the first time that the destruction by war is factored in by a model. However, Bester and Wärneryd (2006, p. 238) also include different types of aggression in their simulation. In their model, war ultimately depends on two factors: low destructiveness and aggression. Low destructiveness decreases the costs of war. The aggression levels in this model are similar to the preferences above: Low aggression levels correspond to benevolent or neutral preferences. High levels of aggression correspond to malevolent preferences. The reasoning behind the findings of probabilities of war given the levels of aggression is also similar to the models above. Low levels of aggression allow for a bigger area of possible pareto-optimal settlements. High levels of aggression minimize this area and the chance for peace. A mix of aggression levels yields more options for peaceful settlement than the last example. Finally, Bester and Wärneryd (2006, p. 238) assumed that information about the strength of the opponent is a private good. If both parties perceive each other as strong, fighting is

less likely to occur. However, the reader has to bear in mind the implications of the discussion of perceptions above: While high-perceived strength reduces war, misperceptions on own as well as the opponent's force increase the chance of war.

CHAPTER V

CONCLUSION

Civil wars are driven by a variety of factors. The many aspects and viewpoints in the review of the literature allow the construction of a pressure and release model of civil wars. Even though the limits of this work do not allow for a complete review of all research on civil wars, the tendency in the literature allows the aggregation of the influences to political, economic, and identity-based root causes that are channeled into symptoms of civil wars. The two opposing forces in this model are internal and external pressures. They can increase the pressure or cause relief. Continued pressures will inevitably cause a crunch of which conflict evolves. The model also suggests that addressing only the symptoms will not eliminate the pressures for good. Instead, it will delay and maybe worsen conflicts. Sustainable solutions involve instruments which tackle the root causes of conflict.

The framework presented here focused on the internal economic root causes and their manifestations. This work shows the impacts of economic considerations on individuals and groups when joining or starting civil wars. The models find that conflict is not only a fight for rights and emancipation, but a business opportunity. Conflict generates income and can be a profitable alternative compared to regular production. Some parties in a

conflict might even experience higher payoffs of conflict than from production. The models introduced two key reasons. A player might prefer conflict because of limited productive capabilities or because of access to advanced military technology. In both cases, the opportunity costs of conflict are very low. In addition, if the payoffs of civil wars, e.g. rights and representation, are going to be public goods, the only reason for an individual to join the fight is when immediate payoffs outweigh the costs and risks involved in fighting. Conflict is undesirable on the social level, but individuals maximize their profits by fighting and defending.

The discussion of the findings suggests that peace and war are equal outcomes to a bargaining process that lacks other instruments of settling conflict. When the independence of law enforcement and security forces is not guaranteed and the opposing parties do not have the possibility of calling in strikes, organizing new elections, or having independent judicial systems review the situation at dispute, opposing parties fall back to a bargaining process which outcomes are peace and war. Conflicting parties will only settle for peace if the agreement yields each player at least what they would gain through war.

Peace settlements are continuous processes. Conflict-settling contracts have to account for changes and developments that are not according to expectations. Moreover, peace settlements have to include arrangements and benchmarks in order to determine when and how renegotiations are needed. Peace settlements are more than a one-time shot and require lasting commitment from the mediators. Mediators can retreat from the process only when a strong and experienced bargaining atmosphere is developed in a former civil war country.

Preferences, opportunities, and perceptions may snag the conflicting parties in a conflict trap. Peace settlements may require more resources than the local economy can offer. Small territories can worsen this situation and trap the parties in low-level equilibrium traps in which they cannot achieve their full potential for growth.

The reasoning of the models discussed above opens up new ways to interpret the correlates of civil wars. Moreover, intervening third parties have a new set of instruments to end and prevent civil wars. External actions can cause immediate relief and some may even improve internal economic conditions that are part of the root causes of conflict. Third-party economic incentives can increase the opportunity costs of war and overcome the restriction of scarce resources.

This work found the following external economic triggers to be likely to prevent conflict and enable the opposing parties to settle without further conflict. First, economic development in the form of capital as well as technologies increases the marginal payoff of productive efforts and increases the opportunities of war. Investments into the economy have to be diversified. Increasing the productivity of land in territory-based conflict is deconstructive to the peace building efforts. Diversification of investments may overcome the problem of disharmonious consumption. Second, economic incentives can subsidize the difference of resources necessary to settle a conflict and available income in the economy. Third, impeding the access to military goods and technologies further increases the costs of war. Fourth, all parties in a conflict need support. Picking a side will intensify malevolence and at least one party will be better off with war. Fifth, states can be too small to achieve their full potential of growth. When possible, mediators should try to facilitate alternatives to full secession. In the medium and long

run, economies of scale are essential. Sixth, disarmament can hamper the players' capabilities to fight off future aggressors. Opponents will only agree to and enforce disarmament when their security needs are credibly satisfied by other means.

Overall, this chain of arguments shows that diplomatic and military interventions are to be complemented by economic intervention. Economic incentives can help settle conflicts and prevent violence. They should not be delayed until after or be excluded from a peace settlement. In some cases, economic intervention is necessary to render peaceful settlements of conflicts possible.

The suggestions above require a change in mindset of current intervention procedures and priorities. Investing in an economy that struggles with civil war is necessary even though it may be a nightmare for banks and rating agencies. In addition, it might prove difficult to defend in front of a donor country's constituency. Moreover, accepting that some conflicts do not allow opposing parties to install independent authorities and supporting several parties in one conflict, both are new concepts to the current black and white system of intervention. One-sided support can fuel disharmonious consumption and malevolent preferences. Forcing the opponents to adapt a certain government form may allow one party to become a hegemon. Anarchy, on the other hand, can lead to a stable equilibrium without conflict. In contrast to amorphy (absence of structure), anarchy is a social structure in which the players contest over resources without effective regulation. The discussion has shown that arming can lead to a stable non-violent solution when the costs of war, e.g. destruction, outweigh the benefits, whereas disarmament provides incentives to attack each other.

Suggestions for Future Research

Even though there can be no doubt that economic incentives can prevent and settle conflicts, further research needs to study the impacts of economic incentives on the duration of peace settlements, the reoccurrence of renegotiations and violence, and substitution behavior of parties that choose between productive and fighting efforts. In addition, research should focus not only on duration of peace settlements, but on the contracts' quality. Peace settlements are not redundant just because they tend to fail. If peace settlements fail and the opposing parties fall back to civil war, all parties involved failed to (a) account for all relevant problems, (b) agree on a procedure to settle future conflicts, and (c) include a rule or timeframe in order to determine when situations change so much that renegotiations are necessary.

When interpreting lemmas 16 through 18, the study raises the question whether large conflicts with many players encourage cooperation. When the minimum investments into defense against many players are too high for small groups, they could be motivated to seek alliances. On the other hand, when conflicts are resolved by secessions, small groups face less opponents and lower minimum costs for defense. It might then become profitable to break up their alliances and fight for their own cause. Future research could try to find empirical evidence for or against this hypothesis by searching for conflicts that were resolved by secessions and study whether big groups splintered into several small ones and former allies started fighting against each other.

Furthermore, further analysis and case studies are necessary to determine when the tools described above bear the most efficiency. As there are several phases of conflict, there

probably is some sort of spiral management system that suggests that some instruments are better than others to provide immediate relief to the pressure. Other incentives may be better suitable to facilitate long-term recovery and improve resilience. The introduction of preferences and perceptions to economic modeling is a necessary step towards understanding the psychology of conflict. Motivation research and S*piral Dynamics* could help to explain why leaders' or groups' responses to economic incentives vary from the expected values generated by the economic models. Such understanding will improve the approach of third parties towards civil wars and the formulation and packaging of intervention.

REFERENCES

Alesina, A., Baqir, R., & Easterly, W. (1999). Public Goods and Ethnic Divisions. *The Quarterly Journal of Economics, 114*(4), 1243-1284. doi: 10.1162/003355399556269

Anderton, C. H., & Carter, J. R. (2009). Principles of conflict economics : a primer for social scientists (pp. xxi, 321 p.). Cambridge ;New York: Cambridge University Press.

Ashenfelter, O., & Johnson, G. E. (1969). Bargaining Theory, Trade Unions, and Industrial Strike Activity. *The American Economic Review, 59*(1), 35-49.

Azam, J.-P. (2002). Looting and Conflict between Ethnoregional Groups: Lessons For State Formation in Africa. *Journal of Conflict Resolution, 46*(1), 131-153. doi: 10.1177/0022002702046001008

Azam, J.-P., & Hoeffler, A. (2002). Violence Against Civilians in Civil Wars: Looting or Terror? *Journal of Peace Research, 39*(4), 461-485. doi: 10.1177/0022343302039004006

Baik, K. H., & Shogren, J. F. (1992). Strategic Behavior in Contests: Comment. *The American Economic Review, 82*(1), 359-362.

Banerjee, A. V., & Duflo, E. (2003). Inequality and Growth: What Can the Data Say? *Journal of Economic Growth, 8*(3), 267-299. doi: 10.1023/a:1026205114860

Barrington, L. W. (1997). Nation" and "Nationalism": The Misuse of Key Concepts in Political Science. *PS: Political Science and Politics, 30*(4), 712-716.

Baye, M. R., & Shin, O. (1999). Strategic Behavior in Contests: Comment. *The American Economic Review, 89*(3), 691-693. doi: 10.1257/aer.89.3.691

Bénabou, R. (2000). Unequal Societies: Income Distribution and the Social Contract. *The American Economic Review, 90*(1), 96-129. doi: 10.1257/aer.90.1.96

Benhabib, J., & Rustichini, A. (1996). Social Conflict and Growth. *Journal of Economic Growth, 1*(1), 125-142. doi: 10.1007/bf00163345

Besley, T. J., & Persson, T. (2008). The Incidence of Civil War: Theory and Evidence. *National Bureau of Economic Research Working Paper Series, No. 14585*.

Bester, H., & Wärneryd, K. (2006). Conflict and the Social Contract. *Scandinavian Journal of Economics, 108*(2), 231-249. doi: 10.1111/j.1467-9442.2006.00452.x

Bó, P. D., & Bó, E. D. (2011). WORKERS, WARRIORS, AND CRIMINALS: SOCIAL CONFLICT IN GENERAL EQUILIBRIUM. *Journal of the European Economic Association, 9*(4), 646-677.

Brubaker, R., & Laitin, D. D. (1998). Ethnic and Nationalist Violence. *Annual Review of Sociology, 24*(1), 423-452. doi: 10.1146/annurev.soc.24.1.423

Buhaug, H., & Rød, J. K. (2006). Local determinants of African civil wars, 1970–2001. *Political Geography, 25*(3), 315-335. doi: 10.1016/j.polgeo.2006.02.005

Byman, D. L. (2002). *Keeping the Peace: Lasting Solutions to Ethnic Conflicts*. Baltimore: Johns Hopkins University Press.

Byman, D. L., & Seybolt, T. (2003). Humanitarian Intervention and Communal Civil Wars. *Security Studies, 13*(1), 33-78. doi: 10.1080/09636410490493859

Chagnon, N. A. (1988). Life histories, blood revenge, and warfare in a tribal population. *Science (New York, N.Y.), 239*(4843), 985-992. doi: 10.1126/science.239.4843.985

Chandra, K. (2006). WHAT IS ETHNIC IDENTITY AND DOES IT MATTER? *Annual Review of Political Science, 9*(1), 397-424. doi: 10.1146/annurev.polisci.9.062404.170715

Cheung, N. K.-W. (2007). At Risk: Natural Hazards, People's Vulnerability and Disasters - by Ben Wisner, Piers Blaikie, Terry Cannon, and Ian Davis. *Geographical Journal, 173*(2), 189-190. doi: 10.1111/j.1475-4959.2007.00244_3.x

Coase, R. H. (1960). The Problem of Social Cost. *Journal of Law and Economics, 3*(1), 1-44. doi: 10.1086/466560

Coghlan, B., Brennan, R. J., Ngoy, P., Dofara, D., Otto, B., Clements, M., & Stewart, T. (2006). Mortality in the Democratic Republic of Congo: a nationwide survey. *The Lancet, 367*(9504), 44-51. doi: 10.1016/s0140-6736(06)67923-3

Collier, P. (2000). Rebellion as a Quasi-Criminal Activity. *The Journal of Conflict Resolution, 44*(6), 839-853. doi: 10.1177/0022002700044006008

Collier, P., & Hoeffler, A. (1998). On Economic Causes of Civil War. *Oxford Economic Papers, 50*(4), 563-573. doi: 10.1093/oep/50.4.563

Collier, P., & Hoeffler, A. (2000). *Greed and grievance in civil war* (Vol. 2355.). Washington, DC U6 - ctx_ver=Z39.88-2004&ctx_enc=info%3Aofi%2Fenc%3AUTF-8&rfr_id=info:sid/summon.serialssolutions.com&rft_val_fmt=info:ofi/fmt:kev:mtx:book&rft.genre=book&rft.title=Greed+and+grievance+in+civil+war&rft.au=Collier%2C+Paul&rft.au=Hoeffler%2C+Anke&rft.date=2000-01-01&rft.pub=World+Bank%2C+Development+Research+Group&rft.volume=2355.&rft.externalDocID=1106921 U7 - Book U8 - FETCH-okstate_catalog_11069211: World Bank, Development Research Group.

Collier, P., & Hoeffler, A. (2004). Greed and Grievance in Civil War. *Oxford Economic Papers, 56*(4), 563-595. doi: 10.1093/oep/gpf064

Collier, P., Hoeffler, A., & Söderbom, M. (2004). On the Duration of Civil War. *Journal of Peace Research, 41*(3), 253-273. doi: 10.1177/0022343304043769

Collier, P., & World Bank. (2003). Breaking the conflict trap: civil war and development policy. New York: Oxford University Press.

de Quervain, D. J. F., Fischbacher, U., Treyer, V., Schellhammer, M., Schnyder, U., Buck, A., & Fehr, E. (2004). The neural basis of altruistic punishment. *Science (New York, N.Y.), 305*(5688), 1254-1258. doi: 10.1126/science.1100735

Deacon, R. T. (1996). Deforestation, Investment, and Political Stability. In M. R. Garfinkel & S. Skaperdas (Eds.), *The Political Economy of Conflict and Appropriation* (pp. 131-156). Cambridge Cambridge University Press

Dixit, A. (1987). Strategic Behavior in Contests. *The American Economic Review, 77*(5), 891-898.

Dixit, A. (1999). Strategic Behavior in Contests: Reply. *The American Economic Review, 89*(3), 694-694. doi: 10.1257/aer.89.3.694

Dixon, W. J. (1996). Third-Party Techniques for Preventing Conflict Escalation and Promoting Peaceful Settlement. *International Organization, 50*(4), 653-681.

Elbadawi, I. A., & Sambanis, N. (2000). External interventions and the duration of civil wars (Vol. 2433). Washington, D.C U6 - ctx_ver=Z39.88-2004&ctx_enc=info%3Aofi%2Fenc%3AUTF-8&rfr_id=info:sid/summon.serialssolutions.com&rft_val_fmt=info:ofi/fmt:kev:mtx:dc&rft.title=External+interventions+and+the+duration+of+civil+wars&rft.creator=Elbadawi%2C+Ibrahim+A&rft.creator=Sambanis%2C+Nicholas&rft.date=2000-01-01&rft.pub=World+Bank%2C+Development+Research+Group%2C+Public+Economics&rft.volume=2433&rft.externalDocID=1149538 U7 - Government

Document U8 - FETCH-okstate_catalog_11495381: World Bank, Development Research Group, Public Economics.

Elbadawi, I. A., & Sambanis, N. (2002). How Much War Will we see?: Explaining the Prevalence of Civil War. *Journal of Conflict Resolution, 46*(3), 307-334. doi: 10.1177/0022002702046003001

Englebert, P., & Ron, J. (2004). Primary Commodities and War: Congo-Brazzaville's Ambivalent Resource Curse. *Comparative Politics, 37*(1), 61-81.

Enterline, A. J., Balch-Lindsay, D., & Joyce, K. A. (2008). Third-Party Intervention and the Civil War Process. *Journal of Peace Research, 45*(3), 345-363. doi: 10.1177/0022343308088815

Esteban, J.-M., & Ray, D. (1994). On the Measurement of Polarization. *Econometrica, 62*(4), 819-851.

Evans, G., & Sahnoun, M. (2002). The Responsibility to Protect. *Foreign Affairs, 81*(6), 99-110.

Fafchamps, M. (2000). Ethnicity and credit in African manufacturing. *Journal of Development Economics, 61*(1), 205-235. doi: 10.1016/s0304-3878(99)00068-1

Fearon, J. D. (1995). Rationalist Explanations for War. *International Organization, 49*(3), 379.

Fearon, J. D. (2003). Ethnic Structure and Cultural Diversity by Country. *Journal of Economic Growth, 8*(2), 195-222.

Fearon, J. D., & Laitin, D. D. (2000). *Ordinary language and external validity: specifying concepts in the study of ethnicity*. Univ. Penn., Philadelphia.

Fearon, J. D., & Laitin, D. D. (2003). Ethnicity, Insurgency, and Civil War. *American Political Science Review, 97*(1), 75-90. doi: 10.1017/s0003055403000534

Findlay, R. (1996). Towards a Model of Territorial Expansion and the Limits of Empire. In M. R. Garfinkel & S. Skaperdas (Eds.), *The Political Economy of Conflict and Appropriation* (pp. 41-56). Cambridge Cambridge University Press

Findley, M. G., & Teo, T. K. (2006). Rethinking Third-Party Interventions into Civil Wars: An Actor-Centric Approach. *The Journal of Politics, 68*(4), 828-837. doi: 10.1111/j.1468-2508.2006.00473.x

Friedman, J. W. (1986). *Game Theory with Applications to Economics*. USA: Oxford University Press.

Gal-Or, E. (1985). First Mover and Second Mover Advantages. *International Economic Review, 26*(3), 649-653.

Garfinkel, M. R., & Skaperdas, S. (2012). Economic Perspectives on Peace and Conflict. In M. R. S. Garfinkel, Stergios (Ed.), *The Oxford Handbook of the Economics of Peace and Conflict*. USA: Oxford University Press.

Gent, S. E. (2008). Going in When It Counts: Military Intervention and the Outcome of Civil Conflicts. *International Studies Quarterly, 52*(4), 713-735. doi: 10.1111/j.1468-2478.2008.00523.x

Gilley, B. (2004). Against the Concept of Ethnic Conflict. *Third World Quarterly, 25*(6), 1155-1166. doi: 10.1080/0143659042000256959

Glaeser, E. L. (2005). The Political Economy of Hatred. *The Quarterly Journal of Economics, 120*(1), 45-86. doi: 10.1162/0033553053327434

Gonzales, F. M. (2012). The use of coercion in society: insecure property rights, conflict and economic backwardness. In M. R. Garfinkel & S. Skaperdas (Eds.), *The Oxford Handbook of the Economics of Peace and Conflict*. USA: Oxford University Press.

Gould, J. P. (1973). The Economics of Legal Conflicts. *The Journal of Legal Studies, 2*(2), 279-300. doi: 10.1086/467499

Greig, J. M. (2001). Moments of Opportunity: Recognizing Conditions of Ripeness for International Mediation between Enduring Rivals. *The Journal of Conflict Resolution, 45*(6), 691-718. doi: 10.1177/0022002701045006001

Grossman, H. I. (1991). A General Equilibrium Model of Insurrections. *The American Economic Review, 81*(4), 912-921.

Grossman, H. I. (2002). Make us a king": anarchy, predation, and the state. *European Journal of Political Economy, 18*(1), 31-46. doi: 10.1016/s0176-2680(01)00067-2

Gurr, T. R. (1970). *Why Men Rebel*. Princeton, N.J.: Princeton University Press.

Haavelmo, T. (1954). A study in the theory of economic evolution (pp. 114 p.). Amsterdam: North-Holland Pub. Co.

Hirshleifer, J. (1985). The Expanding Domain of Economics. *The American Economic Review, 75*(6), 53-68.

Hirshleifer, J. (1987). Economic behaviour in adversity (pp. ix, 310 p.). Chicago: University of Chicago Press.

Hirshleifer, J. (1988). The Analytics of Continuing Conflict. *Synthese, 76*(2), 201-233. doi: 10.1007/bf00869589

Hirshleifer, J. (1989). Conflict and rent-seeking success functions: Ratio vs. difference models of relative success. *Public Choice, 63*(2), 101-112. doi: 10.1007/bf00153394

Hirshleifer, J. (1991a). The Paradox Of Power. *Economics and Politics, 3*(3), 177-200.

Hirshleifer, J. (1991b). The Technology of Conflict as an Economic Activity. *The American Economic Review, 81*(2), 130-134.

Hirshleifer, J. (1994). The dark side of the force: Western Economic Association International 1993 presidential address. *Economic Inquiry, 32*(1), 1-10. doi: 10.1111/j.1465-7295.1994.tb01309.x

Hirshleifer, J. (1995a). Anarchy and its Breakdown. *The Journal of Political Economy, 103*(1), 26-52. doi: 10.1086/261974

Hirshleifer, J. (1995b). Theorizing about conflict. In K. Hartley & T. Sandler (Eds.), *Handbook of Defense Economics* (Vol. 1, pp. 165-189): Elsevier.

Hirshleifer, J. (1996). Anarchy and its Breakdown. In M. R. Garfinkel & S. Skaperdas (Eds.), *The Political Economy of Conflict and Appropriation* (pp. 15-40). Cambridge Cambridge University Press

Hirshleifer, J. (2000). The Macrotechnology of Conflict. *The Journal of Conflict Resolution, 44*(6), 773-792. doi: 10.1177/0022002700044006004

Hirshleifer, J., & Hirshleifer, D. A. (1998). *Price theory and applications*. Upper Saddle River, N.J: Prentice Hall.

Horowitz, D. L. (1985). *Ethnic groups in conflict*. Berkeley: University of California Press.

Hutchinson, J., & Smith, A. D. (1996). *Ethnicity*. Oxford, UK: Oxford Univ. Press.

Jesse, N. G., & Williams, K. P. (2010). *Ethnic conflict: a systematic approach to cases of conflict*. Washington, DC: CQ Press.

Judah, T. (2000). *Kosovo: war and revenge*. New Haven: Yale University Press.

Kalyvas, S. N. (2006). *The logic of violence in civil war*. Cambridge: Cambridge University Press.

Kaufmann, C. D. (1996). Possible and Impossible Solutions to Ethnic Civil Wars. *International Security, 20*(4), 136-175.

Kaufmann, C. D. (1998). When all else fails. *International Security, 23*(2), 120.

Kim, S. H., & Smith, R. H. (1993). Revenge and Conflict Escalation. *Negotiation Journal, 9*(1), 37-43. doi: 10.1111/j.1571-9979.1993.tb00688.x

Knutson, B. (2004). Sweet Revenge? *Science, 305*(5688), 1246-1247.

Kydd, A. (2003). Which Side Are You On? Bias, Credibility, and Mediation. *American Journal of Political Science, 47*(4), 597-611. doi: 10.1111/1540-5907.00042

Lake, D. A., & Rothchild, D. (1996). Containing Fear: The Origins and Management of Ethnic Conflict. *International Security, 21*(2), 41-75.

Licklider, R. (1995). The Consequences of Negotiated Settlements in Civil Wars, 1945-1993. *The American Political Science Review, 89*(3), 681-690.

Lockyer, A. (2011). Foreign intervention and warfare in civil wars. *Review of International Studies, 37*(5), 1-28. doi: 10.1017/s0260210510001488

Mehlum, H., Moene, K., & Torvik, R. (2005). Crime induced poverty traps. *Journal of Development Economics, 77*(2), 325-340. doi: 10.1016/j.jdeveco.2004.05.002

Miguel, E., Satyanath, S., & Sergenti, E. (2004). Economic Shocks and Civil Conflict: An Instrumental Variables Approach. *Journal of Political Economy, 112*(4), 725-753. doi: 10.1086/421174

Muller, E. N., & Opp, K.-D. (1986). Rational Choice and Rebellious Collective Action. *The American Political Science Review, 80*(2), 471-487.

Murdie, A., & Davis, D. R. (2010). Problematic Potential: The Human Rights Consequences of Peacekeeping Interventions in Civil Wars. *Human Rights Quarterly, 32*(1), 49-72.

Nicholson, M. (1992). *Rationality and the analysis of international conflict*. Cambridge ;: Press Syndicate of the University of Cambridge.

Oliver-Smith, A. (1999). What is a Disaster? In A. Oliver-Smith & S. M. Hoffman (Eds.), *The angry earth: disaster in anthropological perspective* (pp. 18-34). New York: Routledge.

Olson, M. (1965). *The logic of collective action: public goods and the theory of groups [by] Mancur Olson, Jr* (Vol. 124). Cambridge, Mass U6 - ctx_ver=Z39.88-2004&ctx_enc=info%3Aofi%2Fenc%3AUTF-8&rfr_id=info:sid/summon.serialssolutions.com&rft_val_fmt=info:ofi/fmt:kev:mtx:book&rft.genre=book&rft.title=The+logic+of+collective+action&rft.au=Olson%2C+Mancur&rft.date=1965-01-01&rft.pub=Harvard+University+Press&rft.volume=124&rft.externalDocID=466425 U7 - Book U8 - FETCH-okstate_catalog_4664251: Harvard University Press.

Pareto, V. (1909). *Manuel d'économie politique*.

Petersen, R. D. (2002). *Understanding Ethnic Violence: Fear, Hatred, and Resentment in*

Twentieth-Century Eastern Europe: Cambridge University Press.

Polachek, S. W. (1980). Conflict and Trade. *The Journal of Conflict Resolution, 24*(1), 55-78.

Posen, B. R. (1993). The Security Dilemma and Ethnic Conflict. *Survival, 35*(1), 27-47.

Priest, G. L., & Klein, B. (1984). The Selection of Disputes for Litigation. *The Journal of Legal Studies, 13*(1), 1-55. doi: 10.1086/467732

Quarantelli, E. L. (1995). What is a Disaster? (Editor's Introduction). *International Journal of Mass Emergencies and Disasters, 13*(3), 221-229.

Regan, P. M. (1996). Conditions of Successful Third-Party Intervention in Intrastate Conflicts. *The Journal of Conflict Resolution, 40*(2), 336-359. doi: 10.1177/0022002796040002006

Regan, P. M. (1998). Choosing to Intervene: Outside Interventions in Internal Conflicts. *The Journal of Politics, 60*(3), 754-779. doi: 10.2307/2647647

Regan, P. M. (2002). Third-party Interventions and the Duration of Intrastate Conflicts. *Journal of Conflict Resolution, 46*(1), 55-73. doi: 10.1177/0022002702046001004

Regan, P. M. (2010). Interventions into Civil Wars: A Retrospective Survey with Prospective Ideas. *Civil Wars, 12*(4), 456-476. doi: 10.1080/13698249.2010.534632

Regan, P. M., & Aydin, A. (2006). Diplomacy and Other Forms of Intervention in Civil Wars. *The Journal of Conflict Resolution, 50*(5), 736-756. doi: 10.1177/0022002706291579

Regan, P. M., Frank, R. W., & Aydin, A. (2009). Diplomatic Interventions and Civil War: A New Dataset. *Journal of Peace Research, 46*(1), 135-146. doi: 10.1177/0022343308098408

Regan, P. M., & Stam, A. C. (2000). In the Nick of Time: Conflict Management, Mediation Timing, and the Duration of Interstate Disputes. *International Studies Quarterly, 44*(2), 239-260. doi: 10.1111/0020-8833.00157

Richardson, L. F. (1960). *Statistics of deadly quarrels*. Pittsburgh: Boxwood Press.

Rosenau, J. N. (1968). The Concept of Intervention. *Journal of International Affairs, 22*, 165-176.

Rosenau, J. N. (1969). Intervention as a Scientific Concept. *The Journal of Conflict Resolution, 13*(2), 149-171. doi: 10.1177/002200276901300201

Rothchild, D. S. (1997). *Managing ethnic conflict in Africa: pressures and incentives for cooperation*. Washington, D.C: Brookings Institution Press.

Rothchild, D. S. (2003). Third-Party Incentives and the Phases of Conflict Prevention. In C. L. Sriram, K. Wermester & I. P. Academy (Eds.), *From Promise to Practice: Strengthening Un Capacities for the Prevention of Violent Conflict*: Lynne Rienner Publishers.

Rothchild, D. S., & Emmanuel, N. (2010). Soft Intervention in Africa: US Efforts to Generate Support for Peace. In M. Hoddie & C. A. Hartzell (Eds.), *Strengthening peace in post civil war states : transforming spoilers into stakeholders* (pp. x, 246 p.). Chicago: University of Chicago Press.

Rubin, B. R., & Campbell, S. P. (1998). Introduction: Experiences in Prevention. In B. R. Rubin & N. Y. Center for Preventive Action. Conference New York (Eds.), *Cases and strategies for preventive action*. New York: Century Foundation Press.

Runkel, M., & Amegashie, J. A. (2012). The Paradox of Revenge in Conflicts. *Journal of Conflict Resolution, 56*(2), 313-330. doi: 10.1177/0022002711420971

Sambanis, N. (2000). Partition as a Solution to Ethnic War: An Empirical Critique of the Theoretical Literature. *World Politics, 52*(4), 437-483. doi: 10.1017/s0043887100020074

Sambanis, N. (2004). What Is Civil War? Conceptual and Empirical Complexities of an Operational Definition. *The Journal of Conflict Resolution, 48*(6), 814-858. doi: 10.1177/0022002704269355

Silver, M. (1974). Political Revolution and Repression: An Economic Approach. *Public Choice, 17*(1), 63-71. doi: 10.1007/bf01718997

Singh, T. B. (2007). Poverty, Economics and Conflict Management. In Cedric H. Grant & R. Mark Kirton (Eds.), *Governance, Conflict Analysis and Conflict Resolution* (pp. 397-412). Jamaica: Ian Randle Publishers.

Skaperdas, S. (1996). Contest success functions. *Economic Theory, 7*(2), 283-290. doi: 10.1007/bf01213906

Skaperdas, S. (2006). Bargaining versus Fighting. *Defence and Peace Economics, 17*(6), 657-676. doi: 10.1080/10242690601025617

Skaperdas, S., & Syropoulos, C. (1996a). Can the shadow of the future harm cooperation? *Journal of Economic Behavior and Organization, 29*(3), 355-372. doi: 10.1016/0167-2681(95)00077-1

Skaperdas, S., & Syropoulos, C. (1996b). Competitive Trade With Conflict. In M. R. Garfinkel & S. Skaperdas (Eds.), *The Political Economy of Conflict and Appropriation* (pp. 73-96). Cambridge Cambridge University Press

Small, M., & Singer, J. D. (1982). *Resort To Arms: International and Civil Wars, 186-1980*. University of Michigan: Sage Publications.

Smith, A. (1776). *An Inquiry Into the Nature and Causes of the Wealth of Nations*. London, GBR: Printed for A. Strahan; and T. Cadell.

Smith, A. D. (2010). *Nationalism*. Cambridge: Polity Press.

Taydas, Z., Enia, J., & James, P. (2011). Why do civil wars occur? Another look at the theoretical dichotomy of opportunity versus grievance. *Review of International Studies, 37*(5), 2627-2650. doi: 10.1017/s026021051100012x

Telser, L. G. (1980). A Theory of Self-Enforcing Agreements. *The Journal of Business, 53*(1), 27-44. doi: 10.1086/296069

Thies, C. G. (2010). Of rulers, rebels, and revenue: State capacity, civil war onset, and primary commodities. *Journal of Peace Research, 47*(3), 321-332. doi: 10.1177/0022343310361841

Tullock, G. (1971). The Paradox of Revolution. *Public Choice, 11*(1), 89-99. doi: 10.1007/bf01726214

Tullock, G. (1974). *The social dilemma : the economics of war and revolution*. Blacksburg, Va.: Univ. Publ.

Tullock, G. (1980). Efficient rent seeking. In J. M. Buchanan, R. D. Tollison & G. Tullock (Eds.), *Toward a theory of the rent-seeking society* (Vol. no. 4.). College Station, TX: Texas A & M University.

VITA

Moritz Peter Rissmann

Candidate for the Degree of

Master of Science

Thesis: ECONOMIC INCENTIVES IN CIVIL WAR PEACE SETTLEMENTS: A GAME THEORETIC APPROACH

Major Field: International Studies

Biographical:

Education:

Completed the requirements for the Master of Science in International Studies at Oklahoma State University, Stillwater OK, United States, in December 2012.

Completed the requirements for the Bachelor of Science in Applied Economics at Budapest University of Technology and Economics, Hungary, in December 2010.

Completed the requirements for the Bachelor of Arts in European Economic Studies at Otto-Friedrich University of Bamberg, Germany, in December 2010.

Experience:

Graduate Research Assistant at Oklahoma State University, *United States,*
Lufthansa German Airlines, *Germany,*
Law & Tax Attorney Office Rissmann and Lange, *Germany,*
Research Assistant at Andrássy Gyula University Budapest, *Hungary*

Professional Memberships:

NASBITE Certified Global Business Professionals,
Phi Kappa Phi Honor Society,
Golden Key International Honour Society,
Phi Beta Delta Honor Society for International Scholars,
Sigma Iota Rho Honor Society for International Studies,
European Economic Studies Alumni Association