

Civil conflict and its causes

by Arne Schollaert

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Members of the Doctoral Jury

Prof. Dr. Dirk Van de gaer, supervisor (Ghent University, CORE)

Prof. Dr. Paul Collier (Oxford University, CSAE)

Prof. Dr. Stefan Dercon (Oxford University, CSAE)

Prof. Dr. Jean-Philippe Platteau (University of Namur, FUNDP)

Prof. Dr. Glenn Rayp (Ghent University)

Prof. Dr. Freddy Heylen (Ghent University)

Prof. Dr. Roland Paemeleire, dean (Ghent University)

Prof. Dr. Patrick Van Kenhove, academic secretary (Ghent University)



“Tell me, where is your mother, Michael? Have you ever seen her terrified? No child should see this. It is the end of childhood, when you see your mother’s face slacken, her eyes dead. When she is defeated by simply seeing the threat approaching. When she does not believe she can save you.

*—This is the end, my mother said. —They mean to kill us all.
Achak, I am so sorry. But we will not make it through this day.”*

What is the what
Eggers [2006, p. 85–86]

... to all achaks.

aan lune en wiebe,
droommeisje.

aan dirk.

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PREFACE

At the outset of my doctoral research, I intended to study the causes of what I then believed was a particular class of conflicts: so-called ethnic conflicts. Very quickly, however, I found myself analysing conflicts in a Third World setting, with a focus on some plausible microeconomic mechanisms that underlie those conflicts. All along, I sensed that I could not grasp the distinguishing characteristics of *ethnic* conflicts. In Chapter 1, I explain why I believe to have been right in focusing on the economic, rather than the ethnic character of a considerable share of today's conflicts. The subsequent chapters deal with microeconomic foundations of civil conflict.

In Chapters 2 and 3, with Dirk Van de gaer, we study political areas in which two – ostensibly distinguishable – groups determine whether or not to cooperate with the other group. Although it is a standard set-up in the literature, it entails two nontrivial assumptions: first, it assumes that a country is populated by exactly two groups, and second, it assumes that groups manage to overcome the within-group coordination and free-riding problems. The principal motive for these simplifying assumptions is not particularly high-minded: multiple-player games are just not as tractable as two-player games. Fortunately, however, the assumptions can also be rationalised on more honourable grounds. Needless to say that conflicts may involve more than two parties. But from Collier and Hoeffler [2004] we know that especially ethnic dominance – where a dominant ethnic group (with a small majority) faces an ethnic minority (whether or not a coalition of ethnic groups) – makes countries conflict-prone. To study the mechanisms underlying such cases, a two-player set-up is probably not inadequate. Moreover, extensive conflict research shows that a sizeable share of contemporary communally based conflicts is indeed fought between two groups (Gurr [1994]). That groups manage to overcome the free-riding and coordination problem, may seem an even stronger assumption. There is, however, considerable support in the literature, especially in the context of ethnic groups, in favour of successful within-group coordination: sufficient levels of social control within ethnic groups and strong ethnic norms, supported by coercion, can unify a group's actions (see, among others, Roemer [1985]; Robinson [2001]; Gates [2002]; Bhavnani [2006]).

A more fundamental critique on considering two immutable groups, I believe, follows from the discussion on ethnicity in Chapter 1, from which we know that ethnic group boundaries are permeable and mutable. Therefore, in Chapter 4, with Thomas Demuyne, we endogenise the number and size of the contending groups and, thus, allow for groups to be formed – whether or not ethnically – for joint rent seeking.

Chapter 1. '*Ethnic, a deceptive label*' contains a conceptual discussion on the (academic) use of *ethnic* as a discriminating label of civil conflicts. Whether it is by facilitating the provision of public goods, or by motivating for the participation in life-threatening civil wars, the economic and political salience of ethnicity lies in its potential to mobilise for collective action. In a conflict where ethnicity matters, therefore, it need not necessarily be the 'engine that powers the conflict.' It may just as well serve merely as a binding

and mobilising device in the pursuit of a group's common goals. Therefore, I argue that 'ethnic' is not accurate enough as a distinguishing label in the context of civil conflict. Moreover, considering this conceptual flaw, I also advocate against the academic use of 'ethnic conflict' from a normative perspective. Without overstating its importance, I believe that by reifying the belief in a common ethnic history – thus fostering the cultivation or even creation of common myths – and considering the pejorative connotation (Western) public opinion attaches to an ethnically labelled conflict,¹ such academic labelling entails potential misuse by both local and international policy makers. Therefore, I argue for a disambiguation of the concept. It would, for example, be both helpful and desirable to distinguish between an *instrumental* ethnic conflict and a *primordial* ethnic conflict.

Chapter 2. In '*Natural resources and civil conflict*' we study how the economic structure of a country may affect strategic interaction between its inhabitants. As discussed above, we consider two identifiable groups who choose whether or not to cooperate with members of the other group. The key contribution of this chapter is that we propose a categorisation of economies based on the degree to which conflict and segregation harm their productivity, and we demonstrate its usefulness in explaining conflict. By eliminating dominated strategies, and assuming exogenous beliefs in the trustworthiness of the other group, we show that especially economies that heavily depend on the *robust*² resource extraction sectors are conflict-prone. Furthermore, we show that the manipulation of trust is most effective in subsistence and plantation economies and that especially the latter will be prone to segregation.

Chapter 3. In '*How to prevent conflict*' we build on the model of Chapter 2 to study the effectiveness and predictability of four – external – policy tools to prevent conflict. We consider two types of boycotts, the manipulation of the balance of power and confidence building. Here too, we assume the societal costs of conflict and segregation to depend on the type of economic activity the country mainly depends on. Groups are assumed to be imperfectly informed on the cooperativeness of the other group. We study whether foreign intervention can induce Bayesian Nash equilibria, where both groups choose to cooperate and whether it can prevent equilibria where both choose to fight, and how easy it is to predict the effects of such external intervention. We show that a boycott that materialises as soon as one of the parties chooses not to cooperate is the only instrument that is unconditionally effective. Besides entailing moral issues of having to choose sides, both trust building and power politics are less effective. Moreover, although it is currently the most acclaimed policy instrument by e.g. the United Nations, the outcomes of trust building can be highly unpredictable.

Chapter 4. In '*International commodity prices*' we focus on a specific labour market situation, endemic to underdeveloped rural sub-Saharan Africa. We consider an economy

¹Ethnic conflict is popularly viewed as the inevitable consequence of irrational, innate ethnic loathing, as tribal and ancient-old hatred

²Robust resources encompass two established concepts in the literature: the highly concentrated and easily controlled *point* resources (like oil or kimberlite diamonds) and inexpensively harvested and easily smuggled *lootable* resources (like coltan or alluvial diamonds). See Chapter 2 for a more detailed discussion on robust resources.

with an agricultural sector that produces an internationally traded and priced tropical good (coffee or cocoa, for instance), a mining sector with monopolistic profits and a rebel sector that preys on the mining sector. Conflict only emerges if the mining sector generates enough excess profits for at least two rebel groups to be viable. Therefore, as stated above, the number of competing rebel groups is endogenously determined. First, we show that not only the price of mineral resources matters. Prices of internationally traded and priced tropical agricultural commodities matter just as much: a drop in those prices increases the attractiveness of other ‘economic’ activities such as rebellion or warfare and can, therefore, trigger civil conflict. Furthermore, we show that civil war carries a non-reversible component within it: by damaging agricultural productivity, it lowers market wages and, therefore, increases the profits in the mining sector. These higher profits in the mining sector, in turn, lower the threshold mineral prices above which conflict becomes lucrative for more than one rebel group.

General conclusion

“The purpose of studying civil conflict is of course to identify its causes. Ultimately, a better understanding of the circumstances that are conducive to civil conflict should enable governments and the international community to prevent it from erupting or at least to prevent it from reoccurring.” (Chapter 1, first sentences.) Ideally, therefore, this study contributes to a better understanding of *Civil conflict and its causes*. It should be acknowledged that the following general conclusions, which I draw from my doctoral research, go considerably beyond the much narrower conclusions which economic modelling typically allows for. I am confident, however, that, if handled cautiously, they remain pertinent from a policy point of view.

It is beyond doubt that ethnicity matters in many contemporary civil conflicts and that it may affect group behaviour and interaction through several fundamentally distinct channels. Remarkably, however, there is very little (if any) empirical or theoretical substantiation of the view most widely held among – notably Western – policy makers, reporters and the general public, viz. that ethnic conflicts are *driven* by irrational, tribal or ancient old hatreds. We argue that the discrepancy between the academic concept and its popular perception may entail local and international political opportunism. In addition, by failing to discriminate between the various types of civil conflicts where contending groups have aligned ethnically, ‘ethnic conflict’ is also totally ineffectual as an analytic concept. The conceptual discussion in Chapter 1 therefore calls on the academic world to distinguish between different types of ethnic conflicts.

Although the subsequent chapters deal with civil conflict from a microeconomic perspective, each chapter implicitly also comprises some aspect of (ethnic) mobilisation. For example, when considering optimising behaviour at group level, especially when groups antagonise, one considers ‘representative’ group members and assumes that the groups have managed to overcome the problems of coordination and free-riding. In a more general interpretation, therefore, Chapters 2 and 4 establish the economic prerequisites for deliberate (ethnic) mobilisation by some political elite to be successful and lucrative. Predatory elites are expected to be particularly prevalent in robust resource-dependent economies, while especially poor and tropical agricultural

commodity-dependent economies appear vulnerable the cultivation of (ethnic) distrust. Chapter 3, in turn, examines the tools which the international community has at its disposal to prevent an area from polarising (ethnically). Against the current international bias in favour of 'soft' intervention policies like confidence building, a credible threat of an economic boycott appears to be more effective.

Obviously, in a model where political entrepreneurs can instigate conflict strategies, a credible boycott discounts their potential gains from (ethnically) mobilising part of the population to their own benefit. Essentially, what Collier [2007, p. 149] advocates with 'a charter for budget transparency' would have a comparable effect: whether they are imposed by the international community (boycott) or institutionalised by national consensus or law (charter), to prevent groups from (violently) polarising in their attempt to further private or groups' goals, there is a need for stringent mechanisms that discourage or inhibit embezzlement, appropriation or a skewed allocation of public resources.

Finally, from Chapters 2 and 4 we know that excessive dependence on either robust resources or tropical agricultural commodities makes countries (especially ethnically diverse ones) utterly susceptible to civil conflict. Therefore, to safeguard countries from civil conflict, this dissertation unambiguously argues in favour of a structural diversification of the economic activity.

Although fostering economic diversification undoubtedly belongs to the core responsibilities of local authorities, there are disquieting reasons why the international community too should feel concerned. First, however well-intentioned, it is conceivable that the Fair Trade movement's stimuli to the production of, e.g., coffee or cocoa, exacerbate Third World countries' dependence on tropical agricultural commodities and, thus, contribute to their proneness to conflict. Moreover, combined, First World export subsidies and the system of tariff escalation increase primary commodity dependence and inhibit the development of a secondary industry in the Third World. More fundamentally, therefore, First World agricultural policy undeniably produces a fertile ground for civil conflict in the Third World and, thus, imposes a highly underestimated cost on its resource-rich, but tropical agricultural commodity-dependent, countries.

*"Herein lies the attractiveness of ethnic agitation: its ease and accessibility.
The Other is visible, everyone can recognize and remember his image.
One doesn't have to read books, think, discuss: it is enough just to look."*

The Shadow of the Sun
Kapuściński [2001, p. 86]

1.1 Introduction

The purpose of studying civil conflict is of course to identify its causes. Ultimately, a better understanding of the circumstances that are conducive to civil conflict should enable governments and the international community to prevent it from erupting or at least to prevent it from reoccurring. A recent example of international involvement in the Great Lakes region shows how an incorrect assessment, a misunderstanding of the drivers of a conflict, can have devastating consequences. Devoid of any moral or critical judgement (I am aware of the hindsight bias), it seems fair to say that World Bank and IMF pressure for economic and political reforms on the Hutu regime in the early 1990s (in favour of more – notably Tutsi – political rights) contributed to the rise in popularity of the extremist Hutu factions and to the extreme politicisation of ethnic identity in Rwanda.

The focus of this paper is twofold. First, I argue that *ethnic* may not always be a suitable discriminating label for internal conflicts: mostly, it lacks the necessary accuracy to point to a distinguishing characteristic of the conflict. Then, given the potential misuse such labelling may entail, I question whether using *ethnic* as a discriminating label in academic research is advisable. Therefore, I advocate disambiguation: it would be both helpful and desirable to distinguish between, for example, an '*instrumental* ethnic conflict' and a '*primordial* ethnic conflict.'

In Section 1.2, I briefly review the literature on the role of ethnicity in economic development. From this literature, it should be clear that ethnicity influences economic advancement through its potential to mobilise for collective action. In Section 1.3, therefore, after defining the core concepts of this paper (*ethnic identity* and *ethnic conflict*), I review the dominant theories on the potential mechanisms through which ethnic identification, polarisation and politicisation may occur. After this review, in Section 1.4, I elaborate on the problematic nature of ethnicity as a characterising concept of civil conflicts. In Section 1.5, a short narrative of the recent history of Rwanda and the build-up towards the 1994 genocide serve as a tragic illustration of the preceding discussion. Finally, in Section 1.6, I summarise my principal arguments against the prevailing use of *ethnic* as an academic label for internal conflicts.

1.2 The role of ethnicity in economic development

In a seminal paper, Easterly and Levine [1997] show that ethnically diverse countries grow significantly slower. Subsequent empirical research quite robustly confirms that the ethnic composition of a country matters to its economic development. Theoretically, there appear to be two plausible channels through which ethnic diversity might indeed hamper economic development.

Easterly and Levine find a strong and robust empirical link between ethnic diversity and public policy choices: heterogeneous societies find it difficult to agree on growth enhancing policies and on the provision of (certain) public goods. Among many others, Alesina et al. [1999] come to similar conclusions: ethnic diversity hampers effective collective action and (political) cooperation. Collier and Gunning [1999]; Collier [2000] and Alesina and La Ferrara [2005] too, in their respective review papers, find evidence for the negative effect of ethnic diversity or fragmentation on the provision of public goods, but their results are conditional: rich countries with full democratic rights seem to find ways to overcome the ‘diversity-handicap.’

The second channel is more of interest to the current analysis: to the extent that ethnic diversity increases the risk for civil conflict, the ethnic composition of a country influences its economic development. Extensive literature, pioneered by Collier and Hoeffler [1998, 2004], examines the potential link between ethnic divisions and civil conflict. Collier and Hoeffler find a non-monotonic relation between the degree of ethnic diversity and civil conflict, where both highly fractionalised and homogeneous societies are on the safe side, and ethnic dominance makes society conflict-prone. Fearon and Laitin [2003], on the other hand, argue that after controlling for per capita income, the alleged significant relation between ethnic diversity and civil violence disappears. Montalvo and Reynal-Querol [2005a,b], however, claim that the weak empirical support for the link between ethnicity and conflict is due to measurement errors: instead of focusing on polarisation, most empirical studies have used an index that measures fractionalisation. In sum, again, there appears to be substantial evidence for a conditional impact of ethnicity on civil conflict.

Irrespective of which channel would be the most relevant one, it is obvious that it is its potential to mobilise for collective action – be it contributing to the provision of a public good or participating in a life-threatening civil war – that makes ethnicity a politically and economically salient phenomenon. Instead of dealing with the consequences of ethnic diversity, therefore, the remainder of this article will be concerned with the causes of ethnic identification, polarisation and politicisation.

1.3 Drivers of ethnic consciousness

Labelling a conflict as an ethnic one implies that ethnicity plays a fundamental role in the conflict. Therefore, it is instructive to review the dominant theories on ethnic identification and politicisation: what are the underlying mechanisms that induce popular ethnic awareness and lead to ethnic polarisation? What drives people to identify themselves with a certain ethnic marker to such an extent that violence against ‘the other’ seems acceptable, inevitable or even imperative?

Definitions

Evidently, in order to analyse and understand a subject, it should be properly defined. The lively academic debate on ethnicity as a concept and its relation to conflict, however, suggests conceptual ambiguity:¹ neither *ethnicity* (*ethnic identity*)² nor *ethnic conflict* appear to be apparent concepts. The common practice among social scientists to stipulate a definition of the concept as it will be understood throughout their analysis, evidences this ambiguity.

I believe that a proper definition is especially indispensable when a concept also commonly occurs in ordinary language. Therefore, I define *ethnic identity* and *ethnic conflict* as they ought to be understood in this paper. Importantly, however, in Section 1.4 I elaborate on the nontrivial relation between these definitions and their ordinary language interpretation.

The definitions used here are borrowed from, respectively, Chandra [2006] and Gilley [2004]. These are very intelligible and fairly standard and inclusive definitions:

ethnic identity: is a subset of the “identity categories in which eligibility for membership is determined by attributes associated with, or believed to be associated with, descent,” in which the attributes “include those acquired genetically (skin-colour, gender, height, etc.), through cultural and historical inheritance (e.g., name, language, place of birth, etc.), or in the course of one’s lifetime as markers of such an inheritance (e.g., last name or tribal markers)” Chandra [2006, p. 398/400].³

ethnic conflict: is a hostile and violent “political or social conflict involving one or more groups which are identified by some marker of ethnic identity” (Gilley [2004, p. 1155]).

Dominant theories on ethnic identification

As a categorisation of theories that explain the origin of ethnic groups, the polarisation and politicisation of ethnic identity, and the emergence of conflict and violence against such groups, I find the primordial – instrumental categorisation somewhat unsatisfactory in two senses.⁴ First, to the extent that even primordial sentiments can be manipulated and exploited, all theories contain an *instrumental* aspect. Second, the *instrumental* category makes no distinction between self-interested individuals that use ethnicity as an instrument to further their personal goals, and individuals that follow self-interested entrepreneurs who foster ethnic sentiments in the pursuit of the entrepreneur’s goals. It is important to note that I distinguish between an *individual* and an *entrepreneur*, the latter being an individual that manipulates other individuals in order to advance his own in-

¹To cite just a few recent articles: Le Vine [1997], ‘Conceptualizing ethnicity and ethnic conflict’; Crawford and Lipschutz [1999], ‘The Myth of Ethnic Conflict’; Hale [2004], ‘Explaining Ethnicity’; Gilley [2004], ‘Against the concept of ethnic conflict’ and Chandra [2006], ‘What is ethnic identity and does it matter?’

²Note that I will use the terms ‘ethnic identity’ and ‘ethnicity’ interchangeably throughout the paper.

³See Fearon [1999] for an in-depth discussion on the meaning of ‘identity.’

⁴Note that the primordial – instrumental categorisation of *theories* (that I find unsatisfactory) is not to be confounded with what I advocate in the Introduction and in Section 1.6, which is the primordial – instrumental categorisation of *civil conflicts*.

terests. I return to this issue in Section 1.3, where I elaborate on the distinctive elements of the different theories that matter most for the current discussion.

Instead, I chose to categorise the theories by the assumed nature of the individual's (*not* the entrepreneur's) choice process: rational (self-interested) versus non-rational responses (see, resp., Lake and Rothchild [1996] and Kaufman [2001]).

Rational choice

The self-interest view considers group formation as an individual's rational choice in the pursuit of his own interests. Here, the lower costs of information and group formation attributed to ethnic ties make ethnicity an attractive instrument. We can distinguish two types of 'rational' theories:

Modernisation: increased interaction. A first potential driver of ethnic polarisation is economic modernisation. The growing social and economic interethnic interaction that follows from various types of socio-economic processes, like economic development, industrialisation and urbanisation, is assumed to increase ethnic self-consciousness (Young [1983]; Newman [1991]).

According to the modernisation theory, ethnic groups are the result of strategic behaviour of individuals who form a ('minimal winning') coalition (Bates [1983]) – a type of interest group – to advance common political and economic interests. The process of economic modernisation, according to Connor [1973], will merge previously isolated ethnic groups who will compete for the same public goods and scarce resources.

Furthermore, increased interaction in a new socio-economic context will also reveal barriers (real or not) to upward advancement (Gellner [1983]) and, thus, create a fertile breeding ground for the politicisation of ethnic identity, orchestrated by political elites.

Modernisation theory, therefore, categorises as an instrumentalist theory in two senses: ethnic identity is a useful instrument to the individual's private goals and to an entrepreneur that mobilises people to pursue his private goals.

Emerging anarchy: personal fears. A second type of explanation for the polarisation of ethnic identities builds on the 'security dilemma': one group's measures to increase its own security may trigger reactions from the other group which, in the end, make both groups less secure (Posen [1993]). Where states are weak or totally absent, the so-called 'emerging anarchy' where the state is no longer credible as the sole and legitimate policing power, groups' uncertainty about their security and survival makes them willing to invest in protection. The rationale builds on personal fears and requires a certain degree of risk aversion of the individual, a positive dislike for being killed, as it were.

Lake and Rothchild [1996] discuss both intra- and inter-group strategic interactions that contribute to the escalation of interethnic contention when the state fails to guarantee security. For a peaceful settlement of communal rivalries to fail, at least one of three dilemmas must exist: either information failures, problems of credible commitment or incentives to pre-empt must exist. When acquiring information is too costly, or when groups have an incentive to misrepresent their intentions, information failures can cause competition (e.g. the struggle for scarce resources or state control) to become conflictual. Furthermore, when one group can not credibly commit to a mutually advantageous

agreement, the other group may have an incentive to incur high costs of conflict now, to avoid exploitation or extermination in the future. And finally, when offensive military technology has an advantage over defensive technology, the military build-up in a security dilemma may create incentives to 'strike first' (Jervis [1978]).

Essentially, personal fears that emerge from the failing state create the circumstances in which malicious leaders and peer pressure can cause rapid polarisation between groups. A hostile interpretation of history and overemphasising group myths allows ethnic activists and political entrepreneurs to polarise and mobilise the masses by exploiting their fear and their desire to belong to a group (Horowitz [1985]; Kuran [1998]).

Two variants of this theory dispute that a failing state would suffice to arouse the type of fears from which mass violence can erupt. They attribute an *initiating* role to predatory political entrepreneurs and armed thugs.

Elite predation. According to de Figueiredo Jr. and Weingast [1999], emerging anarchy is insufficient to explain mass violence. The core of the predatory-elites explanation is that for the masses to engage in (extremely costly) violent activities, they must fear for their lives. In his ultimate 'gamble' to retain power, a weakened political leader may, therefore, initiate violence in order to provoke extreme fears within the population. Such extreme fears of being killed will then 'rationalise' the killing option. Although the strategy is risky (its success highly depends on [latent] pre-existing fear and on the people's incapability to determine who initiated the violence), since the "costs are borne by the citizenry," it may well be worthwhile (de Figueiredo Jr. and Weingast [1999, p. 263]).

Armed thugs. Again building on the emerging anarchy and, thus, personal fears, Brass [1997] and Mueller [2000] suggest yet another explanation for the popular involvement in violence: ethnic or ideological rhetoric by the political entrepreneurs provide a convenient banner for local bandits, thieves, thugs and opportunists who, in their pursuit of private agendas, compel essentially moderate ordinary people to participate in the violence.

Non-rational response

Instead of being the outcome of rational *calculations* of its self-interest, some theories assume that an individual's choices are non-rational *responses* (Sears et al. [1979]; Elster [1996]). Two theories build on non-rational motives for the identification by ethnic markers:

Primordialism. The most controversial (and highly contested) 'emotional' view is that ethnic identity is ascriptive and unchangeable, that ethnic identity markers, characteristics that determine ethnic group membership, are biologically and even genetically 'fixed.' The motivation for ethnic affiliation stems from the primordial human urge or instinct for survival, and violence simply derives from antipathy towards the 'other.' The more moderate view on primordialism is that, rather than the 'primordial ties' themselves, it is the fact that groups perceive their ties to be primordial that influences their actual behaviour. Shils [1957, pp. 133–134] talks about an "element of intense mutual

attachment, independent of primordial ties.” In evolutionary terms, primordialism assumes that “humans have evolved a nepotism instinct that now seizes on any major physical differences between people to produce group formation” (Hale [2004, p. 460]).

Currently, primordialism seems to have lost most (if not all) of its proponents: the point being that the claim that ethnic identities are genetically fixed and immutable is overwhelmingly rejected by factual evidence.⁵

In its modern form, however, even the primordial view acknowledges an instrumental element of ethnicity. Van Evera [2001, p. 20] concedes that ethnic identity is probably ‘not stamped on our genes,’ but argues that since the reconstruction of ethnic identity is extremely slow and hardly ever happens – especially not once a conflict has erupted – it can ‘seldom serve as a remedy for ethnic conflict today.’ Being hardwired, however, it can serve as a mobilising tool for ethnically based collective action.

Symbolic politics. Rational choice theory assumes that individuals have a *stable* set of ordered preferences on which their utility maximisation is based. The ‘symbolist theory of choice’ (Kaufman [2006]) – the most recent theory for explaining ethnic identity as a group creating phenomenon – in contrast, assumes that emotions, rather so than rational calculations, motivate people’s behaviour.

The argument builds on two assumptions that, together, make ethnic identity emotionally laden: the first is that, through conditioning (exposure to symbols, history, myth), people acquire a *relatively stable* set of emotions that guides their affective responses (Sears et al. [1979]); the second, that relying on group loyalties is evolutionary favoured over egoism (Kaufman [2001]). An individual’s emotions are, therefore, malleable (albeit only slowly) and ethnic identity is embedded in an individual’s set of emotional preferences.

The degree to which a group cultivates its shared culture and stimulates a common interpretation of history – the so-called “myth-symbol complex”⁶ – plays a pivotal role in explaining ethnic identity polarisation and ethnic conflict. On the one hand, because it conditions an individual’s emotions and, therefore, determines an individual’s responses to political choices. On the other hand, because it can be manipulated and, thus, provides political entrepreneurs or predatory elites with a tool to arouse mass involvement and support.

The symbolic theory, like the elite-predation theory, requires a security dilemma, an opportunity to mobilise and widespread fears for victimisation. Here, however, by being embedded in the group’s myth-symbol complex, fears are explicitly connected to emotions. Furthermore, Kaufman [2006] adds a third necessary condition for ethnic conflict: the prevalence of myths that justify ethnic hostility. If there is a myth, a shared belief of a righteous claim on a certain territory as the group’s ‘homeland,’ this myth will justify the use of violence to defend or claim that territory. With these preconditions fulfilled, either a new opportunity (e.g. state failure) or an intensification of fear and hostility (through the manipulation of symbols and myths) can trigger ethnic conflict.

⁵See Fearon and Laitin [2000b] for a brief review of the evidence against primordialism.

⁶After Anthony Smith, as referred to in Kaufman [2006, p. 50].

Synthesis

What I hope to have shown by the preceding categorisation of the prominent theories, is that each theory qualifies as an instrumentalist theory in the broad sense. In accordance with the general – both empirical and theoretical – economic consensus (see Section 1.2), each theory allows for ethnic identification to serve as a tool, an instrument that facilitates collective action. The fundamental difference between the types of theoretical explanations, in my opinion, lies in the nature of the individual's motives: the rational explanation assumes individuals to *calculate* their costs and benefits, while the non-rational explanations assume individuals to *respond*, primordially or emotionally. This distinction also illustrates the second issue raised in Section 1.3: according to the rational theories, as an instrument, ethnicity not only serves an external manipulator. Ethnic group membership can also be the outcome of an individual's rational choice.

Most relevant to the central focus of this paper, however, are the extent to which ethnic affiliation is considered to be innate and immutable, and the potential role the different theories attribute to (political) entrepreneurs in the manipulation or even creation of ethnic consciousness. Both issues, I believe, are pretty straightforward: except for primordialism, there is no theoretical support for the innateness of ethnic preferences, and, as stated above, each of the theoretical explanations allows for the manipulation of such preferences by all sorts of entrepreneurs.

1.4 Against the concept

The ambiguity about ethnic conflict as a concept, I believe, stems from the fact that although it is a very well-known concept that most people will use correctly, there is no such thing as a popular *definition* of it: the content of 'ethnicity' is time and context specific. As Banton [2000, p. 482] puts it, the mere "presence in a language of a word does not mean that there is some thing which corresponds to that word."

However, although it lacks a proper popular definition, in a Third World context, ethnic conflict has a clear – but 'primitive' and therefore pejorative – connotation in both ordinary language and (Western) journalistic discourse: it is commonly associated with age-old animosities, with ancient tribal hatred and it evokes irrational enmities 'seething since time immemorial' (Snyder [1993, p. 5]). A popular catchword for – especially African – communally based contention is 'tribalism' (Young and Mirzeler [2002, p. 108]).

To illustrate the discrepancy between a standard theoretical definition of ethnic conflict and its popular counterpart, it is useful to decompose the academic definition I posit in Section 1.3 according to the types of conflict it covers: the first, and most intuitive, category are conflicts that are *motivated* by feelings of overt ethnic loathing. A second category are conflicts where ethnic identity is a criterion of group selection, where it is used to create internal cohesion and differentiation from other (ethnic) groups in order to pursue common (non-ethnic) goals. Finally, conflicts may be labelled ethnic if they are fought in the interest or in the name of an ethnic group (Fearon and Laitin [2000a]).

From this decomposition it should be clear that although they differ substantially, by the first category, the theoretical definition encompasses the popular interpretation. Therefore, on top of the pejorative connotation of the concept, there is a caveat: however careful scholars define their subject, the media and the public opinion will naturally be

inclined to envisage ethnicity in itself, ancient hatred towards the ‘other,’ as the motivating purpose of contention. A problem with labelling a conflict *ethnic*, in other words, lies in the fact that there is very little (if any) empirical evidence or theoretical underpinning for what is commonly understood by that label (Fearon and Laitin [2000b]; Kaufman [2006]).

Besides this popular misconception and the pejorative connotation attached to it, ethnic conflict also has a conceptual flaw: it fails to “point to a distinctive causal explanation” for certain types of conflict (Gilley [2004, p. 1158]). Besides asserting that these are all instances where groups have aligned along (alleged) ethnic markers, it is highly questionable that calling the Rwandan genocide, the Balkan war and the conflict in Southern Sudan *ethnic* conflicts, contributes to a better understanding of the causes of these conflicts, of the dissimilarities between these conflicts and non-ethnic ones. It is, in other words, debatable whether focusing on ethnicity contributes to make more efficacious causal inferences, especially when ethnic consciousness is not the driver of the conflict.

1.5 Rwanda

The Rwandan genocide and the build-up towards it, provide a tragic illustration of the preceding discussion. I start with a short narrative on the history of Rwanda, after which I elaborate on the interplay between economic pressures and ethnic politicisation. In Section 1.5, I discuss the more plausible mechanisms through which ethnicity in Rwanda got politicised to such a level that it ‘rationalised’ widespread violence.

A brief history of Rwanda

Bantu peasants and Nilo-Hamitic aristocrats are among the world’s most notorious ethnic groups. Better known as *Hutus* and *Tutsis*, they were the key actors in one of the most horrifying events in modern history, in what is generally considered to be the archetype of contemporary ethnic conflict: the 1994 genocide in Rwanda, where, officially, about a million people were killed.

In spite of the well-documented fact that the initial violence was not ethnically inspired but rather political – within hours after the killing of President Habyarimana, ‘the “enemies” of the regime’ (both moderate Hutus and Tutsis) were killed (Newbury [1998, p. 80]) – the perception of Rwanda as a country divided by ‘ancient tribal hatred’ and of the Rwandan slaughtering as a ‘crónica de un genocidio anunciado’ remains among policy-makers and Western media. It is, therefore, useful to briefly narrate the history of Rwanda.

There is considerable (academic) debate on the true nature and the timing of ethnic polarisation in Rwanda (see, e.g., Chrétien [1994]; de Waal [1997]; Newbury and Newbury [1999]; Taylor [2004]; Vansina [2005]; Platteau [2008]). Since the subject of debate is not essential to the current analysis, I tried to remain as close as possible to the most general consensus on the history of Rwanda.

Modern Rwanda has its economic, social and political roots in the former Nyiginya Kingdom, which emerged early 17th century (Vansina [2005]). The ruling class and aris-

ocracy were clearly dominated by the Tutsi lineage, while the cultivators and servants were predominantly labelled 'Hutu' (another socio-economic step down the ladder were the Twa). This distinction, however, was not mutually 'exclusive': there was significant upward and downward mobility (Maquet [1954]). Just as one could 'leave the condition of being Hutu' and become part of the ruling elite and, thus, integrate in the Tutsi lineage (for example through intermarriage), a Tutsi could lose his status and become a cultivator (for example by losing his cattle wealth). Being a Tutsi, in other words, referred to the privileges and status one held.

A first rigidification and polarisation of ethnicity in Rwanda occurred at the end of the 19th century, when cultivators (by definition Hutus) were ordered to provide labour to the ruling elite (the wealthy class, predominantly Tutsis). A second, and decisive rigidification occurred under Belgian colonial rule (1919–1962). By issuing identity cards that sealed one's ethnicity, and by ruling indirectly through the local authority of the Tutsi minority,⁷ the coloniser clearly rigidified and polarised the Rwandan traditional society and portrayed the Tutsis as the apparent agents of colonisation (Newbury [1993]). In spite of these waves of rigidification, it is interesting to note 'how quickly and drastically such seemingly 'fixed' identities can change'⁸ (Waters [1995, p. 343]).

Furthermore, under Belgian colonial rule, the Rwandan economy was transformed from a barter and gift economy to a commercialised cash-crop economy, focused on the export-oriented production of coffee (Hintjens [2001]). Tutsi chiefs were granted the authority to levy Hutu peasant labour contributions to the coffee plantations (Kamola [2007]). Besides increasing the Rwandan economic dependence on international coffee prices as a source of foreign currency, this structural economic transformation further enforced ethnic segregation and, thus, Hutu (and Twa) grievances and it contributed to the further perpetuation of the 'Hamitic Myth,' the cultural myth of Tutsi superiority⁹ (Prunier [1995]).

Increasing international pressure and domestic opposition urged colonial administration to gradually provide Hutus with more (especially educational) opportunities, which led to even more domestic Hutu opposition and, by the end of colonisation, the highly propagated myth of 'Hutu revolution' which waged until 1962 (see Des Forges [1999] for an interesting account on the Hutu myth-creation). The Hutu revolt started with the toppling of the (Tutsi) monarchy in 1959 and culminated in independence, with a Hutu, Grégoire Kayibanda, as the first president. Those three years of Hutu revolution marked the start of the so-called history of ethnic violence in Rwanda: a series of attacks and reprisals in the Northern provinces (by then, Belgium had switched sides and backed the Hutu) led to the assassination of thousands and the displacement of hundreds of thousands of Rwandan Tutsis (Hintjens [2001]).

⁷About 15% of the total population are Tutsis, 84% are Hutus and about 1% are Twa, who were de facto neglected.

⁸Allegedly, 'many Tutsi concealed their ethnicity and had their national identity cards marked 'Hutu'' (Taylor [2004, p. 369, note 2.]).

⁹The Hamitic Myth derives from the Hamitic Hypothesis that "states that everything of value ever found in Africa was brought there by the Hamites, allegedly a branch of the Caucasian race" (Sanders [1969, p. 521]). This racist myth holds that Africa was initially exclusively inhabited by 'Negroes' who were "incapable of discriminating or abstract thought" (MacGaffey [1978, p. 111]) and that Caucasoid Hamites gradually 'upgraded' the African population. The Tutsis, according to the Hamitic Myth, are Hamites, the Hutus Negroes.

After the Hutu revolution, many Tutsis were forced into exile in several waves of Hutu hostilities which were justified by a reversal of the Hamitic myth (Tutsis were now pictured as 'foreigners'). Expelled from their home country and mostly unwanted in the host country, the (growing) Tutsi community in exile in the neighbouring countries grew increasingly militant and visible. This increasing external threat of invasion, compounded with the history of Hutu oppression during the Tutsi-monarchy, and a history of recurrent hostilities and overt discrimination against the Tutsis during Hutu-rule, set the stage for a culture of fear on both sides (Newbury [1995]; Eriksson [1996]).

Another well-established (but far less publicised) fault line in Rwanda is the socio-political (clearly non-ethnic) inter-elite north-south Hutu-division. Under Kayibanda, the southern Hutu elite seized control over the administration and the coffee industry, the two most valuable resources of the Rwandan economy. When Habyarimana took over in 1972, the coffee economy was further developed and, in turn, so designed as to optimally serve the interests of the northern elites. Thus, although initially neither Kayibanda nor Habyarimana pursued an outspoken ethnic political agenda, the systematic patronising of their regional kin eventually resulted in a further politicisation of ethnicity in Rwanda: to divert the inevitable inter-elite grievances their respective presidencies elicited, both regimes 'played the ethnic card' on several occasions, by explicitly and 'repeatedly articulating the Tutsis as a common enemy' (Kamola [2007, p. 581]). The chronic exploitation of the common enemy gradually deepened the cleavages and further enforced the prevalence of fear.

The socio-economic context on the eve of the 1994 genocide

In retrospect, it is possible to identify some key events that contributed to a precarious socio-economic context in the early 1990s.

From the late 1980s, Rwanda faced serious economic decline. Two consecutive collapses in the international coffee prices, a first of 42% in 1986 and a second of 50% in 1989¹⁰ (by then, coffee was the country's main export product) and the increasing war efforts in response to the growing threat of insurgency by the Tutsi-diaspora, resulted in a severe economic crisis which especially hit the rural dwellers and the urban poor. Pressure for economic reforms by the World Bank and the IMF further exacerbated economic austerity and deepened internal grievances.

International pressure to end the intensifying cleavages in the northern provinces increased. Habyarimana was put under severe pressure by the international community and by the moderate Hutu-opposition to accept power sharing with the insurgents, the Tutsis from the RPF. By the time the contending parties were negotiating a peace agreement in Arusha (August 1993), some successful RPF military offensives had substantially increased that party's bargaining power, which resulted in a relatively favourable peace settlement on their behalf. This further increased political polarisation among moderate and extremist Hutus, the latter blaming Habyarimana for these 'unfavourable' agreements and calling for a more radical attitude towards the Tutsis.

Finally, the murdering of the Hutu president of Burundi, Melchior Ndadaye, in October 1993, allegedly by Tutsis from within the army, further nurtured fear among the Hutu

¹⁰In 1986 prices dropped from 204 to 118 US cents/pound and in 1989 from 126 to 63 US cents/pound (Composite Indicator Prices from the International Coffee Organization: <http://www.ico.org/>).

population for renewed Tutsi dominance in Rwanda. The mutual killings that erupted in Burundi, up to 100.000 casualties in the first three months after the coup, also generated an exodus towards Rwanda, an influx of hundreds of thousands impoverished and often traumatised Hutu refugees that further polarised the Rwandan political and civil society (Uvin [1999]; Ngaruko and Nkurunziza [2000]).

Uncovering the mechanism

In this section I briefly discuss the 1994 genocide in Rwanda within the framework of the two most plausible theories for this case: first, from the brief history of Rwanda in Section 1.5, it should be clear that primordialism does not provide a satisfactory explanation of the Rwandan genocide. Furthermore, in retrospect we know that political elites played an essential role in the creation of fears and myths. Therefore, although from Section 1.3 we know that all theories other than primordialism may explain (part of) the genocide, especially the 'rational' elite predation theory (fears) and the 'emotional' symbolic politics theory (fears and myths) appear relevant.

Elite predation in Rwanda. Was there an 'ultimate gamble for resurrection' in Rwanda? Was there an incumbent elite that was losing (or feared to lose) control over the state apparatus and was willing to *gamble*, willing to plunge the country into mayhem and bloodshed in order to retain power?

The argument is fairly simple: economic decline, pressure for democratisation, consecutive (and increasingly successful) RPF invasions and, ultimately, the Arusha Peace Accords which dramatically weakened the Habyarimana-regime internally, raised the stakes for gambling (de Figueiredo Jr. and Weingast [1999]).

With intensified mutual distrust and a legacy of fear (of Tutsi-oppression and Hutu-violence), sharpened by the murdering of president Ndadaye in Burundi and by recurring violent clashes between the Rwandan army and the RPF, the instigation of violence by the incumbent elite (the extremist Hutu faction) may indeed have been that elite's ultimate gamble for resurrection.

Symbolic politics in Rwanda. The symbolic politics theory requires hostile myths, extreme ethnic fears and an opportunity to mobilise. Then, chauvinist manipulation of ethnic symbols can trigger an emotional response by the masses, a willingness to murder in order not to be murdered (Kaufman [2006]).

Obviously, both sides intensely cultivated their hostile myths: the Hamitic myth of Tutsi superiority that justifies 'natural' Tutsi-rule, and the myth of Hutu-revolution that glorifies the legitimate reclaiming of Rwanda by its original inhabitants. Moreover, during the more than 30 years of independence, both sides – the Tutsis by emphasising the recurrent Hutu hostilities and permanent discrimination, and the Hutus by propagating the fear for oppression by the Tutsis who claim to be superior – repeatedly "called on history to claim the rightness of their cause," thus feeding ethnic fears (Newbury [1995, p. 13]). Finally, being in charge, the Hutu regime obviously had an opportunity to mobilise the masses and they took it: the infamous hate radio 'Radio Télévision Libre des Mille Collines' proved to be an extremely effective tool.

The prerequisites for successful chauvinist manipulation of symbols, in order to evoke group mythology, therefore, appeared to be present indeed. On the Tutsi side, the physical appearance of Paul Kagame clearly appealed to the Hamitic-myth of tall and superior Tutsis. The Hutus, from their side, revived the horror of Tutsi oppression with slogans, cartoons, pamphlets, etc. using words like slavery, feudalism and bloody emasculation.

1.6 Concluding remarks

By exploring the Rwandan case in such detail I had no intention of siding with either of the proposed theoretical explanations. I merely hope to have exhibited that primordialism is by no means a suitable explanation for the 1994 atrocities, neither from a historical nor from an theoretical point of view. It is impossible to substantiate the claim – a view so massively propagated by Western media and by prominent policy makers, both during and in the aftermath of the genocide – that the genocide was the result of a centuries-old feud, pure tribalism, innate ethnic dislikes, etc. between the Hutus and the Tutsis.

Therefore, considering that labelling a conflict ethnic does not seem to contribute to a more focused analysis of a particular type of internal conflicts, and acknowledging that international reporting reaches citizens (and certainly political entrepreneurs) in the developing world (Collier [2007, pp. 22/147]), I conclude by summarising the three principal arguments against the use of ethnic as a discriminating label in the analysis of civil conflict.

First, the academic use of ethnicity, however accurately framed it may be, reifies the concept and propels its – far less accurate – use in a more general (Western) discourse. Thereby, it propagates or even establishes a public consciousness susceptible to ethnically framed aspirations (Fearon and Laitin [2000b]). It is this consciousness to which perfidious and unscrupulous (political) entrepreneurs appeal when seeking support from the diaspora (King and Melvin [1999]; Carter [2007]), the international community and even humanitarian organisations (Maren [1999]; Griffin [2000]).

Second, labelling communal tension as ethnic may contribute to the creation of a common ethnic history, a common myth, even in cases where ethnic boundaries were clearly constructed. As we saw in Section 1.3 and Section 1.5, the cultivation, celebration and exploitation of such myths can have appalling consequences (Newbury [1995]; de Figueiredo Jr. and Weingast [1999]; Kaufman [2006]).

Finally, the contemptuous image and – especially – the sense of inevitability the ethnic label evokes (primitive, tribal, irrational, etc.) makes the general opinion (the electorate) receptive to a political discourse that advocates *laissez-faire*, a discourse that justifies non-intervention if the stakes are low. For instance, Mr. Bush Sr. who calls the war in the Balkans “a complex, convoluted conflict that grows out of age-old animosities,” and infers from it that “the violence will not end overnight, whatever pressure and means the international community brings to bear” (Rosenthal [August 7th, 1992]), or the Clinton Administration that instructs its spokesmen not to call the mass killings in Rwanda a ‘genocide,’ but rather tribal conflicts erupting from ancient hatreds (Jehl [1994]; Wharton Jr. [1994]), illustrate that a *primordial* interpretation of the conflict, linking such outbreaks of violence to age-old enmities, is not as rash or innocent as it may look: it seems to free

policy makers, political entrepreneurs or elites and the international community from its responsibilities (Brass [1997]). Or, like Sadowski [1998, p. 13] formulates it: "The claim that ethnic conflicts have deep roots has long been a standard argument for not getting involved."

Moreover, I hope to have illustrated that even though it may be accurately defined in academic research, using a concept that lacks an accurate *popular* definition, may not be without consequences. Therefore, in the same way as we distinguish between 'murder in the first degree' (a deliberate killing with robbery for instance) and 'manslaughter' (for example in the heat of passion) even though both may have been committed with a knife, I believe that academic research on civil conflict should be more accurate in distinguishing between conflicts with a fundamentally different motive. Be it merely as a tentative suggestion, I believe that distinguishing between, for example, an *instrumental ethnic conflict* – where ethnicity serves as a mobilising or antagonising tool, an instrument in the pursuit of economic or political goals – and a *primordial ethnic conflict* – where ethnic dislikes drive the conflict – would both serve the academic debate and circumvent the possible abuse '*ethnic conflict*' entails.

With Dirk Van de gaer

2.1 Introduction

This paper studies how the type of natural resources present in a country may affect group behaviour and the effectiveness of trust manipulation in that country. To this end, we develop a game in which we consider two risk-neutral utility maximising identifiable groups and examine how their behaviour is influenced by natural resources and how these resources determine the impact of the group's belief that the other group will cooperate (the level of trust) and of foreign intervention, through the manipulation of the balance of power between groups on the occurrence of conflict.

We consider two groups that decide on whether or not to accept a group neutral allocation of value added, i.e. on whether or not to invest in arms and claim a preferential treatment of the own group. In this, conflict stems from utility-maximising decisions by the groups: when the perceived economic opportunities from non-cooperation outweigh those of cooperating, 'conflict' is the rational strategy. If only one group claims a preferential treatment in the allocation of value added, society becomes stratified, with that group dominant. In our model such an asymmetric equilibrium, which has received little attention in the literature so far, occurs for some economies.¹ Following a mechanism similar to the sparse network mechanism described by Humphreys [2005], stratification hampers interaction between groups and decreases trade and social capital. These societal costs decrease the value added that is to be distributed. If both groups claim a preferential treatment, war results. Infrastructure is then destroyed, which results in additional costs for society, a further decrease of value added. The size of the stakes thus depends on societal costs of conflict. As Weingast [1998, p. 163] puts it, "the fundamental economic puzzle of ethnification concerns its huge costs": stratified economies are plagued by discrimination, repression, and their economic cost, and war-torn countries are ravaged by devastating humanitarian catastrophes, psychological traumas and a disrupted growth generating apparatus. Therefore, we believe that by theorising the occurrence of stratified and conflictual societies, this paper deals with a fundamental issue.

We postulate that the magnitude of societal costs of conflict is determined by the presence and the type of natural resources and by the structure of the economic activity. Our typology distinguishes four types of economies. In diversified economies trade is essential in creating value added. Therefore, they face high costs of stratification and war. In subsistence economies, economic activity heavily depends on subsistence agriculture and local trade. Stratification costs hamper local trade, but the additional costs of war can be limited. In support of these assumptions, Miguel and Roland [2006, p. 19] attribute the absence of long term economic consequences and, more importantly, the quicker recov-

¹The partial cooperation equilibrium in Skaperdas [1992], where only one of the players invests in arms, is similar to our asymmetric equilibrium.

ery of the Vietnamese economy from extensive U.S. bombing between 1965–1975 than the Japanese and German recovery from Allied bombing during World War II (Davis and Weinstein [2002]; Brakman et al. [2004]), to the predominantly agrarian nature of the Vietnamese economy. Economies that depend on capital and labour intensive agriculture of geographically spread crops like cotton, tobacco, tea, bananas, rubber, sugar, etc. (hereafter, plantation economies² (Pryor [1982])), face limited stratification costs but incur large costs of war. Finally, we single out economies that depend on resources that can continue to generate value added even if society is stratified or if other parts of the country face war; we call these economies ‘robust resource dependent.’ This new concept covers two known concepts: point resources like oil or kimberlite diamonds, which are highly concentrated and easily controlled (Auty [2001] and Le Billon [2001]), and lootable resources like coltan or alluvial diamonds, which are inexpensively harvested and easily smuggled (Ross [2003]). Therefore, supported by Guidolin and La Ferrara [2007] who show that certain sectors may even benefit from war (alluvial diamond mining, for instance), we assume that robust resource dependent economies have low costs of stratification and war. In Section 2.2 we further elaborate on the relevance of the type of economic activity for the equilibrium. Note, however, the analogy with Collier’s [1999, p. 179] partial ranking of sectors with respect to their degree of war-vulnerability: in a diversified economy value added is predominantly created in ‘war-vulnerable’ sectors, while the subsistence economies essentially depend on ‘war-invulnerable’ sectors. Therefore, although we differentiate between costs of segregation and costs of conflict, to the extent that we further disaggregate the ‘unclassified’ group, our typology could be viewed as a refinement of Collier’s.³

We model a game under incomplete information. We assume rational behaviour where groups know their own payoff, and since the game is symmetric, they also know the other group’s payoff. Groups know, furthermore, that no group will ever choose, irrespective of its beliefs, a strategy which yields, for every action of the other player, a lower payoff than another strategy (a so-called dominated strategy). Therefore, the natural solution is to eliminate dominated strategies. In a similar way as Wood [2003], when the equilibrium concepts fails to generate a unique equilibrium, the equilibrium is determined by each player’s exogenous belief that the other player will choose the cooperative strategy. The reason we keep beliefs exogenous is threefold: first, in a dynamic setting, as the repeated nature of the game reveals information about the other player’s chosen strategy, it is reasonable to assume that players form correct – and thus equilibrium – beliefs in the long run. In a static setting, however, the ‘information updating mechanism’ is absent.⁴ Equilibrium beliefs seem, furthermore, rather ill-suited to explain certain historical facts. Often “groups involved in protracted conflicts ... end to read different newspapers (often in different languages), attend different religious institutions ... and listen to different sets of politicians who profit from heightening fear, distrust, and antagonism.” (Malhotra and Liyanage [2005, p. 912]). Groups, therefore, may not have enough

²Note that these plantation economies are closely related to the diffuse resource dependent economies in Auty [2001] and Le Billon [2001].

³The classification in Collier [1999] serves to derive testable predictions on the impact of civil war on the composition of GDP. Although our model is static, it should be clear that the typology we propose could serve a similar purpose.

⁴Our two-stage game is a static game since the second stage offers no new information to the game.

adequate information to develop equilibrium beliefs. Finally, by keeping beliefs exogenous, we overcome the multiplicity of Nash equilibria. Where elimination of dominated strategies fails to generate a unique equilibrium, there are three Nash equilibria: two in pure strategies and one in mixed strategies. Exogenous beliefs allow us to characterise a unique equilibrium outcome for all the parameter values we consider.

The core focus of this paper is the interaction between the type of natural resources, which determines the societal costs of conflict, and the occurrence of conflict. The innovation of our approach is that we link the composition of a country's value-creating activities to its proneness to civil conflict. We show that especially robust resource dependent economies are conflict prone. Furthermore, our model predicts that foreign intervention, aimed at influencing the balance of power between two groups in case of conflict, will be more effective in resource dependent economies.⁵ We also show that trust manipulation can only be effective in subsistence and plantation economies. Finally, we show that stratified societies tend to occur in plantation economies.

Our paper builds on two lively debates in development research which have attracted the attention of economists, political scientists and sociologists: the causal mechanism that links natural resources to civil conflicts and the possible connection between ethnic diversity and social conflicts or civil wars.

In two seminal papers, Collier and Hoeffler [1998, 2004], the prominent representatives of the economic branch of the resource – war literature, demonstrate the role of opportunity costs for rebellion and potential rents from lootable resources. The political branch finds the empirical results unconvincing. Instead, political scientists postulate a prominent role for the quality of institutions in the mechanism that links natural resources to conflict. According to – among others – Fearon and Laitin [2003] the need for a strong bureaucratic system to raise tax revenues is less urgent for oil producing states, which, as a consequence, develop weaker state structures within which rebellion is a more alluring strategy.⁶ These factors also play a role in our model. Opportunity costs play a role because they determine the private costs of conflict. Lootable resources belong to the category of robust resources and play a role through what we labelled societal costs of conflict. In weak states the probability that a rebellion is successful is larger, i.e., the balance of power is more in favour of rebellion than in strong states.

Recently, the ethnic diversity 'curse' has been given a new impetus by Montalvo and Reynal-Querol [2005]: their index of fractionalisation overcomes the weak explanatory power of ethnic diversity on the incidence of civil conflicts, found by several other recent studies. The ethnic character of these conflicts, however, is debatable. The term 'ethnic conflict' suggests that ethnic preferences or sentiments are the 'engine that powers' the conflict (Brogan [1989]; Banton [2000]; Bhavnani [2006]), which need not necessarily be the case. Since ethnic mobilisation is well known as a highly efficient form of collective action for individuals or elites to pursue private interests (Banton [2000]; Fenton [2004]), it might as well be that manipulated ethnic awareness, rather than ethnic sentiments or deeply set hatred, powers the conflict. We believe that our mechanism (trust manipulation) describes how and under what conditions ethnic awareness affects the occurrence

⁵In a companion paper we study other types of intervention besides changing the balance of power (see Schollaert and Van de gaer [2008]).

⁶Both the political and economic branch tend to agree on the negative impact of primary commodity dependence on political stability (Sachs and Warner [2001], Ron [2005]).

of conflict.

Two player games have been extensively studied in the literature on conflict. Seminal papers by Skaperdas [1992] and Hirshleifer [1995] primarily focus on the fighting technology, how technological aspects of conflict affect the equilibrium strategies of contending groups. Azam [2002] formulates a general equilibrium model of conflict between ethnoregional groups in which decisions about the allocation of group members over production, fighting and looting are determined in a simultaneous game by warlords heading both groups. Wood [2003] develops a model with two groups to analyse the conditions under which a civil war settlement, once reached, is self-enforcing and robust to actor's confidence that the other will abide by the agreement. Addison et al. [2002] construct a model in which a government and a rebel group decide to undertake peaceful actions, which affect the probability of peace. While in these papers, and especially the latter, there is some discussion on certain aspects of the role played by a country's type of natural resources, none of them discusses their influence on societal costs of conflict and the effectiveness of trust manipulation and foreign intervention to the extent we do in the present paper.

Finally, conceptually, we can summarise the three contributions of our paper to the literature on the role of natural resources in civil conflict as follows: first, we identify robust resources as a pertinent type for analysing the resource – conflict link: low costs of stratification and conflict explain why *both* point and lootable resource dependent economies are susceptible to conflict. Second, besides opportunity costs and the quality of institutions, we establish the manipulation of trust as a third possible mechanism through which natural resource abundance can elicit conflict in subsistence and plantation economies. Finally, our model allows for the existence of asymmetric (stratified) equilibria and shows that such equilibria are most likely to occur in plantation economies.

In Section 3.2 we formalise the basic assumptions and the corresponding payoffs of the model. Section 2.3 analyses the unique equilibria that result from the iterated elimination of dominated strategies and in Section 2.4 we discuss the impact of exogenous trust on the resulting equilibria. Finally, Section 4.7 presents our conclusions.

2.2 Assumptions and payoffs

Assumptions

Let two groups, K and L , account for the total population at working age with α and $(1 - \alpha)$ their respective population shares. As usual in the literature (Robinson [2001]), we abstract from the within-group coordination and free-riding problems.⁷

We model how the value added will be distributed. We consider a two stage game where average value added per worker equals Y . In the first stage, groups either cooperate with (C) or fight (F) the other group. By cooperating, the group accepts a group neutral distribution of value added. By fighting, the group claims a preferential treatment of its members in the distribution of value added. We get four potential outcomes

⁷This can be rationalised, see e.g. Roemer [1985]. See also Bhavnani [2006] for how ethnic norms, supported by coercion, can unify a group's actions.

of the game: both cooperate, (C, C) ; K fights and L cooperates, (F, C) ; K cooperates and L fights, (C, F) ; and (F, F) when both fight. This corresponds to the following societies:

(C, C) : fully integrated society	(C, F) : stratified society (L dominates)
(F, C) : stratified society (K dominates)	(F, F) : conflictual society

In the second stage the value added is distributed. In this sense, as in Roemer [1985], ‘conflict’ is treated as a redistribution problem. We keep this stage utterly simple. If both groups cooperate, the distribution is random and on average everybody gets Y . If only one group fights, this group becomes dominant: it seizes political and economic power and apportions the value created in the economy. We assume that all members of the dominant group receive the same share of the value added.

Finally, to resolve the conflict in a conflictual society, we include an exogenous variable ρ (resp. $[1 - \rho]$) that reflects the probability that group K (resp. L) will manage to appropriate the value added. This situation, where both groups invest in arms, can be referred to as war: “the two players engage in open conflict with a probabilistic result” (Skaperdas [1992, p. 722]). ρ is a measure of relative power of group K and allows for different interpretations like, for example, a negotiated division of the value added, or the outcome of a winner-take-all contest, with ρ as the player’s probability of winning (Neary [1997]). Therefore, ρ is an obvious channel through which interested parties can manipulate the outcome of the game: intervention can change relative power and, consequently, the optimal strategies. In order to analyse the effects of changes in ρ , we keep it exogenous.⁸

We assign two types of costs to fighting and conflict. First, stratified and conflictual societies suffer societal costs. In a stratified society, the per capita value created by the productive sector (per capita national income) is reduced to $\delta_1 Y$. The robustness coefficient δ_1 ($0 < \delta_1 < 1$) is inversely related to a wide range of stratification costs like, e.g., the misallocation of resources (less trade, misallocation of talent), the negative incentive effects of nepotism and discrimination, a lower social capital stock, etc. We assume that these costs are lower (i.e. δ_1 is higher) for societies that depend on the exploitation of natural resources than for diversified or subsistent economies.

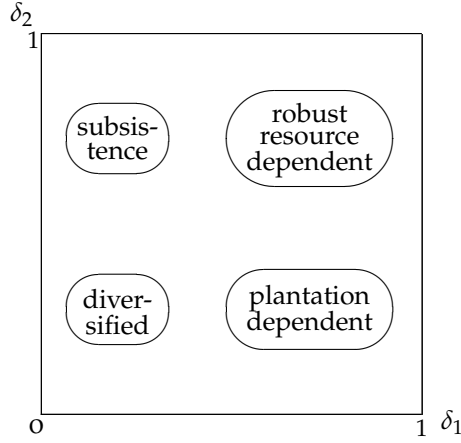
In a conflictual society (‘war’) all economic activity gets disrupted and infrastructure destructed.⁹ Therefore, we assume costs to be even higher: per capita national income is reduced to $\delta_1 \delta_2 Y$, where δ_2 ($0 < \delta_2 < 1$) is a second robustness coefficient. It is inversely related to the additional implosion of national income due to conflict. The magnitude of societal costs of stratification and conflict crucially depends on the kind of economic activity that generates high value added. As stated in the introduction, we posit that these costs are lower for robust resource dependent and subsistent societies than for plantation-dependent or diversified societies. Figure 2.1 summarises the relation between the structure of the economy and the societal costs of conflict.

Second, the fighting strategy carries a private cost. To implement preferential treatment in the second stage, a group needs to be able to enforce it, for example by purchasing arms and spending time and effort (income foregone) in enforcement. This entails a

⁸Partly endogenising it, by making it dependent on α , complicates some comparative statics, but does not change the qualitative results of the model.

⁹Hirshleifer [1988, p. 205] calls it *battle damage*.

Figure 2.1: Typology of economies



private cost for each member of the group equal to $c > 0$. Without this expenditure, the execution of the separation strategy in the second stage is not credible since the dominant group has no means to enforce its dominance.¹⁰

The payoff matrix

Without loss of generality, the symmetric nature of the game allows us to focus on the case where $\alpha < 1/2$, such that K is the smaller group. The following matrix summarises the payoffs of the game. Straightforward calculation shows that individuals' payoffs are:¹¹

		(L)	
		C	F
K	C	$Y \quad (Y)$	$0 \quad \left(\frac{1}{(1-\alpha)} \delta_1 Y - c \right)$
	F	$\frac{1}{\alpha} \delta_1 Y - c \quad (0)$	$\frac{\rho}{\alpha} \delta_1 \delta_2 Y - c \quad \left(\frac{(1-\rho)}{(1-\alpha)} \delta_1 \delta_2 Y - c \right)$

2.3 Characterisation of the equilibria

In this section we focus on the parameter values for which the elimination of dominated strategies results in a unique equilibrium.

Elimination of dominated strategies

Let $H \in \{K, L\}$ and $X, Z \in \{C, F\}$. $u_H(X, Z)$ then represents the average payoff for a worker of group H if group K plays strategy X and L plays strategy Z . The dominated

¹⁰Due to the higher national income in such countries, private costs of conflict, in terms of foregone earnings, can be assumed to be higher in diversified economies. In our model, however, it is c/Y that matters. So, as long as this remains similar for all types of economies, the only interaction with natural resources occurs through the societal costs of conflict.

¹¹By assuming that individual's utility functions are linear in income, we assume that they are risk neutral.

strategies can be eliminated directly. For player K strategy C dominates strategy F if and only if the following inequalities hold true:

$$u_K(C, C) > u_K(F, C) \Leftrightarrow \delta_1 < \alpha(1 + c/Y) = \delta_{1_K}^*, \quad (2.1)$$

$$u_K(C, F) > u_K(F, F) \Leftrightarrow \delta_2 < \frac{\alpha}{\rho} \frac{1}{\delta_1} \frac{c}{Y} = \delta_{2_K}^*(\delta_1). \quad (2.2)$$

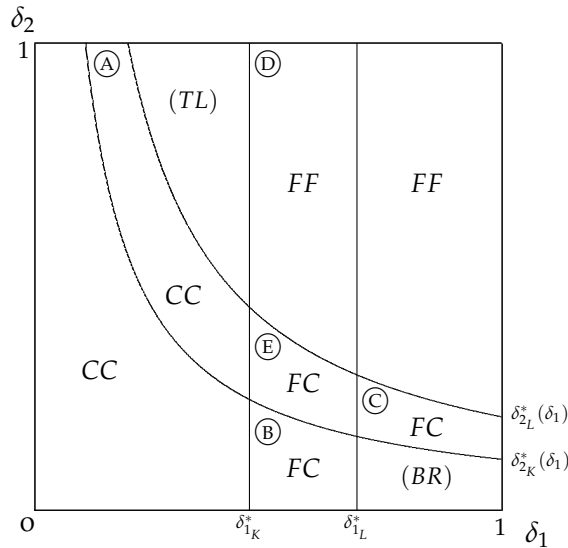
For player L strategy C dominates strategy F if and only if we have:

$$u_L(C, C) > u_L(C, F) \Leftrightarrow \delta_1 < (1 - \alpha)(1 + c/Y) = \delta_{1_L}^*, \quad (2.3)$$

$$u_L(F, C) > u_L(F, F) \Leftrightarrow \delta_2 < \frac{1 - \alpha}{1 - \rho} \frac{1}{\delta_1} \frac{c}{Y} = \delta_{2_L}^*(\delta_1). \quad (2.4)$$

$\delta_{1_K}^*$ and $\delta_{1_L}^*$ are critical values of δ_1 for which, if $\delta_1 < \delta_{1_H}^*$, player H chooses to cooperate if the other player cooperates. $\delta_{2_K}^*$ and $\delta_{2_L}^*$ are critical values of δ_2 for which, if $\delta_2 < \delta_{2_H}^*$, player H chooses to cooperate if the other player fights. $\delta_{1_H}^*$ is increasing in c/Y and in the size of group H ; $\delta_{2_H}^*$ is increasing in c/Y and in the size of the group relative to its power in a conflictual society, and decreasing in δ_1 .

Figure 2.2: $\alpha < 1/2$; $\alpha < \rho$ and $c/Y < \frac{\alpha(1-\rho)}{(1-\alpha)-\alpha(1-\rho)}$



In Figure 3.1 we trace out the respective areas for which the elimination of dominated strategies generates a unique equilibrium.¹² We can see that for sufficiently low robustness coefficients (δ_1, δ_2) , the cooperative equilibrium (a fully integrated society) will come about. This is the area where the cooperative strategy dominates the conflict strategy for both players. Analogously, for high values of δ_1 and δ_2 fighting dominates cooperating

¹²Figure 3.1 is the most general case containing all the possible areas the model can cover. We need several restrictions on c/Y to obtain this case. We need for all $H \in \{K, L\}$: $\delta_{1_H}^* < 1$ and $\delta_{2_L}^*(\delta_{1_K}^*) < 1$. The latter requires that $c/Y < \frac{\alpha(1-\rho)}{(1-\alpha)-\alpha(1-\rho)}$. The two other restrictions are satisfied automatically if this restriction holds, given that we consider the case where $\alpha < 1/2$ and $\alpha < \rho$.

for both players and the non-cooperative equilibrium (a conflictual society) results. Now, consider the area where $\delta_1 < \delta_{1K}^*$ and $\delta_{2K}^* < \delta_2 < \delta_{2L}^*$ (area ④). Equation (2.3) and (2.4) respectively show that L prefers to cooperate both when K cooperates¹³ and when K fights. Player K knows that cooperation dominates fighting for L , so K eliminates L 's fighting strategy from the game. Then, given that L will cooperate, K will also do so ($\delta_1 < \delta_{1K}^*$). Therefore, the cooperative equilibrium results. Similarly, within the areas determined by $\delta_{1K}^* < \delta_1 < \delta_{1L}^*$ or by $\delta_{2K}^* < \delta_2 < \delta_{2L}^*$, elimination of dominated strategies results in the unique equilibrium indicated in Figure 3.1. Finally, within TL and BR elimination of dominated strategies does not generate a unique equilibrium. In Section 2.4 we show that in these areas expectations matter for both players. We first summarise our discussion:

Proposition 1. *Society will be*

- . *fully integrated if $\delta_1 < \delta_{1K}^*$ and $\delta_2 < \delta_{2L}^*(\delta_1)$;*
- . *stratified with the smallest group dominant if*

$$\delta_{1K}^* < \delta_1 < \delta_{1L}^* \text{ and } \delta_2 < \delta_{2L}^*(\delta_1), \text{ or}$$

$$\delta_{1L}^* < \delta_1 \text{ and } \delta_{2K}^*(\delta_1) < \delta_2 < \delta_{2L}^*(\delta_1);$$
- . *conflictual if $\delta_1 > \delta_{1K}^*$ and $\delta_2 > \delta_{2L}^*(\delta_1)$.*

In order to provide some intuition on the role of expectations, define π_{LC}^e (π_{KC}^e) as the probability with which player K (L) expects L (K) to be cooperative. In areas ④, ⑤ and ⑥, $\delta_1 < \delta_{1L}^*$ and $\delta_2 < \delta_{2L}^*$. This implies that irrespective of K 's strategy, L cooperates. With full information on the payoffs, player K knows that player L 's strategy does not depend on his beliefs, so that $\pi_{LC}^e = 1$ and, therefore, Equation (2.1) describes his choice problem. $\delta_1 < \delta_{1K}^*$ in area ④ and $\delta_1 > \delta_{1K}^*$ in area ⑤ and ⑥ imply that K cooperates in ④ and fights in ⑤ and ⑥. Analogously, in areas ③ and ④, $\delta_1 > \delta_{1K}^*$ and $\delta_2 > \delta_{2K}^*$ implies that K fights in both areas: $\pi_{KC}^e = 0$. Hence, with $\delta_2 < \delta_{2L}^*$ in area ③ and $\delta_2 > \delta_{2L}^*$ in area ④, L cooperates in the former area and fights in the latter.

Interestingly, cooperation by one of the players not necessarily induces cooperation by the other: in ⑤, while K knows that L cooperates, K will fight; and in ③, although L knows that K will fight, L still cooperates. This proves our claim that stratified societies can be the result of optimal strategic choice by each group.

Overview of the model

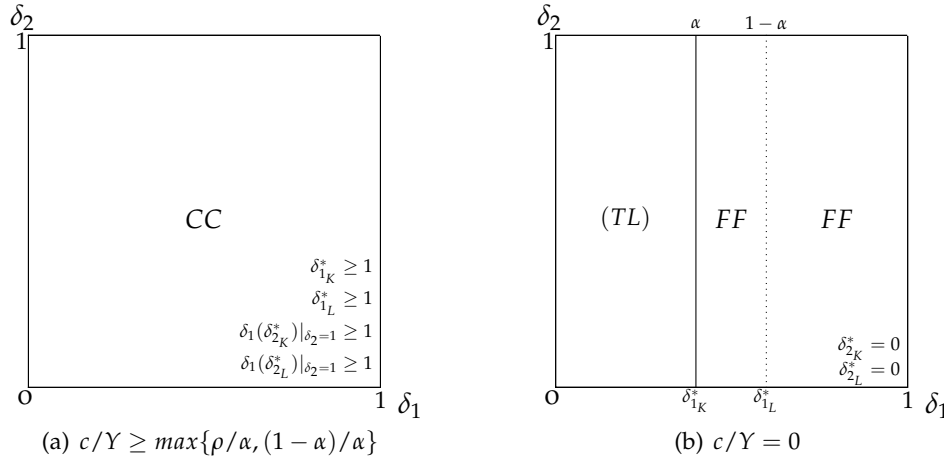
The game produces nine equilibrium areas, two of which are, so far, undetermined: TL and BR . These areas will be discussed in Section 2.4. In the other seven, the elimination of dominated strategies in a two stage game generates a unique equilibrium.

Which types of equilibrium areas the game produces, is determined by the size of c/Y relative to δ_1 and δ_2 : as c/Y rises, all the critical-value functions shift up, or to the right. Hence, as c/Y increases, areas disappear. This confirms that Figure 3.1 can be viewed as the general case: as armament costs rise, one by one, equilibrium areas

¹³ $\alpha < 1/2 \Rightarrow \delta_{1K}^* < \delta_{1L}^*$ so that $\delta_1 < \delta_{1K}^* \Rightarrow \delta_1 < \delta_{1L}^*$.

disappear from the $(\delta_1 \times \delta_2)$ -space. $c/Y \geq \max\{\rho/\alpha, (1-\alpha)/\alpha\}$ makes $\delta_{1K}^*, \delta_{1L}^*, \delta_{2K}^* (1)$ and $\delta_{2L}^* (1)$ all greater than one, so that only the mutual cooperative equilibrium remains (cf. Figure 2.3(a)). On the other hand, as c/Y becomes 0, three areas remain: two conflict areas and one area where the outcome is so far undetermined (for $\delta_1 < \delta_{1K}^*$) (cf. Figure 2.3(b)).

Figure 2.3: Limiting cases of Figure 3.1



Before turning to the analysis of *TL* and *BR*, we briefly summarise and discuss the three core properties of the model presented so far. We also discuss some empirical and case study evidence on the effects we identified.

First, the robustness coefficients δ_1 and δ_2 determine the relative attractiveness of the strategies. Thus, different δ 's lead to different equilibrium strategies. Consider three economies that only differ in the structure of their productive sector. The first highly depends on oil extraction or mining (robust resources), the second on tobacco (plantation economy) and the third is a fully diversified economy. Due to the nature of these economies (cf. Figure 2.1), all other parameter values being equal, it is quite possible that (*FF*), (*FC*) and (*CC*) are their respective unique equilibria.

Corollary 1. *All other parameters being equal, diversified economies will be fully integrated, robust resource dependent economies will be conflictual and especially plantation economies can be stratified.*

Following an in-depth discussion of thirteen civil wars, Ross [2004, p. 50] concludes that “resource wealth contributed to the outbreak of conflict in five of the thirteen cases.” The economy of those five countries relied heavily, if not uniquely, on robust resources. We associated high values of δ_1 and δ_2 with such economies, making the (*FF*) equilibrium a likely occurrence.

The DRC is a prototype of such a highly mineral-dependent country. Obviously, the role of scarce resources in the 1998–2003 war and atrocities in the eastern region can hardly be overestimated. As a UN report¹⁴ concludes: “The conflict in the DRC has

¹⁴Report of the Panel of Experts on the Illegal Exploitation of Natural Resources and Other Forms of Wealth of the DRC, 12 April 2001, §213.

become mainly about access, control and trade of five key mineral resources: coltan, diamonds, copper, cobalt and gold. The wealth of the country is appealing and hard to resist in the context of lawlessness and the weakness of the central authority.” Moreover the Kahuzi-Biega National Park in South Kivu reportedly hosted 15000 ‘diggers’ in 2002. Obviously, the production of coltan, a lootable resource, remained profitable throughout the 6-year war, which indicates that δ_1 and δ_2 were high in the DRC (Moyroud and Katunga [2002]).

Sierra Leone provides a striking example of a highly robust resource dependent, yet conflict-torn country. Alluvial diamond mining has undoubtedly played a prominent role in (triggering) Sierra Leone’s horrifying war: “The point of the war may not actually have been to win it, but to engage in profitable crime under the cover of warfare. Diamonds, in fact, have fuelled Sierra Leone’s conflict, destabilising the country for the better part of three decades, stealing its patrimony and robbing an entire generation of children, putting the country dead last on the UNDP Human Development Index” (Smillie et al. [2000, p. 1]).

In the Sudan, the discovery of considerable oil reserves, oil being a typical robust resource, played a key role. After oil was discovered in 1980, Khartoum reneged on a peace pact, suggesting at least, that oil revenues provide funds to, for instance, sustain oppression or fuel rebellion or war (Renner [2002]; Switzer [2002]). Among others, Fearon and Laitin [2003] and Collier and Hoeffler [2004] find empirical support for the impact of oil dependence on the onset of civil war.

We associated high values of δ_1 and low values of δ_2 (low costs of stratification, high costs of conflict) with plantation economies, economies where capital and labour intensive (staple) agriculture creates a substantial share of the value added. In such a society the stratified (FC) equilibrium is more likely to occur. Both the economic history of western colonisation and the Ante-Bellum South of the United States corroborate this theoretical result. Rubber, sugar, tea and the likes made up the lion’s share of the total value created in most of the Colonial economies.¹⁵ Not one of these can claim not to have been a stratified society. The highly cotton-dependent southern US, the so-called Cotton States, too were characterised by deep segregation.

δ_1, δ_2 : **econometric evidence.** Collier and Hoeffler [2004] measure the effect of the structure of the economy on the risk of civil war outbreak by the ratio of primary commodity exports to GDP. They find this variable to be highly significant in a non-monotonous way (an inverted U-shape). Economies with a high ratio are typically resource dependent economies, situated more to the right hand side in the $\delta_1 \times \delta_2$ plane (see Figure 2.1), and are, therefore, indeed more characterised by conflict than diversified and subsistence economies. Others claim that more pertinent variables are required for the analysis of conflict: Lujala et al. [2005] find that the exploitation of alluvial diamonds is positively related to the probability of the outbreak and incidence of ethnic conflict; Fearon [2005] suggests that the risk of primary commodities is confined to oil extraction: governments extract much larger rents from oil than from other commodities which, therefore, limits the need for a strong bureaucratic system to raise tax revenues and en-

¹⁵Note that in most of the colonial states, with a very small dominant group (very small α), the area where stratification is an equilibrium is very large.

genders weaker governments. However, Collier and Hoeffler [2005] find that when both are included in a regression to explain the onset of civil war, estimated rents are insignificant while the ratio of primary commodity exports to GDP remains highly significant.

Humphreys [2005] explicitly tests the importance of the weakness of economic integration for conflict risks by including the share of agriculture in national income as a measure of economic structure. He finds it to be positively related to the probability of the onset of civil war, which confirms one of the predictions of our model: the economies situated above and to the right of diversified economies in Figure 2.1 have a higher probability of civil war. In addition, also conform the predictions of our model, he finds that oil and diamond producing economies (both robust resources) are more conflict-prone than subsistence and plantation economies.

To summarise, it seems fair to conclude that the results of these econometric studies corroborate the predictions of our theoretical model. Moreover, in line with the evidence of Ross's [2004] analysis of thirteen cases, the aforementioned conflicts demonstrate that Le Billon's [2001] typology, in which he lists civil wars and determines the types of resources that dominate those civil war-plagued countries, completed with lootable resources, is a powerful tool for elucidating the causes of civil conflict.

Second, the private cost of choosing the conflict strategy, c , shapes the parameter space: low private costs, e.g. $c/Y \rightarrow 0$, induce the players to defect or choose the conflict strategy (cf. Figure 2.3(b)). In contrast, very high private costs ($c/Y \geq \max\{\rho/\alpha, (1-\alpha)/\alpha\}$) make the cooperative strategy more attractive for both players (cf. Figure 2.3(a)). Recall that c also contains foregone income.

Corollary 2. *Higher private costs of conflict increase the area of the parameter space where society is fully integrated and decrease the area where society is conflictual.*

Collier and Hoeffler [2004] propose three proxies for this variable: income per capita, male secondary school enrolment and the growth rate of the economy, all three measured prior to the outbreak of conflict. Due to the high correlation between the first two, they are not included in the same regression as explanatory variables for the risk of civil war onset. However, each taken separately in a regression which includes lagged growth is highly significant. The economic and statistical significance of the latter has been confirmed by, among others, Miguel et al. [2004]. Even though Fearon and Laitin [2003] view the significance of lagged per capita income as an indicator for weak state (administrative, police and military) capabilities which induce war, we believe that the *joint* significance of the pre-conflict level of per capita income and its rate of growth provides support for the importance of opportunity costs.¹⁶

Finally, ρ plays a noticeable role. Starting from Figure 3.1, with $\alpha < \rho$, decreasing ρ increases δ_{2K}^* and decreases δ_{2L}^* , thereby increasing both the conflictual-society area and the cooperative-society area. Moreover, this only affects economies with low costs of stratification (high δ_1), which are the resource dependent economies (see Figure 2.1). Therefore,

¹⁶Note that, as was pointed out to us by Jean-Philippe Platteau, through its impact on diversification and specialisation, growth may also cause a country to relocate within the $\delta_1 \times \delta_2$ -space. However, since such diversification and specialisation would be expected to take time to significantly alter the composition of GDP, we believe that the empirical evidence in Collier and Hoeffler [2004] still provides (albeit partial) support for the pertinence of opportunity costs of fighting.

we expect foreign intervention (aimed at shifting the balance of power between ethnic groups) to occur more frequently in resource dependent economies.¹⁷

Corollary 3. *Foreign intervention through the manipulation of the balance of power (ρ) is more effective in robust resource dependent and plantation economies than in diversified and subsistence economies.*

The literature on the effect of outside intervention on the duration of conflict primarily focuses on the effect of interventions after conflict occurs (e.g. Regan [2002], Collier et al. [2004]). Since ours is a simultaneous game, we analyse the ex ante effects of foreign intervention.

Case studies provide ample proof of the role interested parties play in civil conflicts of, especially, resource dependent economies. Obviously, oil extraction in Sudan would be impossible without the likes of Chevron (U.S.), Lundin (Sweden), Talisman (Canada), Petronas (Malaysia) and many others. But, apparently, these multinationals also played a non-negligible role in the resurgence of conflict. The 1972 'Addis Ababa Agreement,' by which Southern Sudan was granted considerable autonomy and which brought about a decade of relative peace, was de facto suspended in 1980, shortly after extensive oil reserves were discovered around Bentiu, when former president Numeiri redrew the borders between north and south. He created a new state, Unity State, which was "allegedly to be shared as an asset for both regions, but in practice brought oil-producing areas under central government jurisdiction, effectively disenfranchising the south" (Goldsmith et al. [2002, p. 223]). With or without their knowing, by 'sponsoring' the Numeiri government, oil producing companies clearly altered the balance of power in the Sudan in favour of this government.

Foreign investors' role in Sierra Leone's tragedy seemingly differ in kind, but not in nature and consequences. Just to name one, Branch Energy, a small Canadian mining firm, introduced the government of Sierra Leone to (Island of Man-registered) security firm 'Executive Outcomes.' The engagement of Executive Outcomes by the government caused such a shift in the balance of power that within weeks the Revolutionary United Front (a Sierra Leonean Rebel movement) was pushed back and the major diamond areas were cleared. Could it be coincidence that shortly hereafter, Branch Energy secured a 25 year lease on Sierra Leonean diamond concessions? (Smillie et al. [2000])

Finally, the history of the DRC since the toppling of former President Mobutu is probably the most infamous illustration of economically motivated interference and intrusion by foreign governments and corporations. From the start of his invasion in Zaire in 1996, Laurent Kabila managed to raise funds for his military operations by granting "lucrative contracts in the east of the DRC" (Montague [2002, pp. 106–110]). Apparently, although he was just a rebel leader and in control of only a small part of the country, Uganda, Rwanda and many international corporations had their bets on Laurent Kabila. Executives of, among others, Bechtel Corporations, American Mineral Fields, De Beers Consolidated Mines Ltd. 'formed outright alliances with the AFDL,'¹⁸ providing satellite studies, infra-red maps, the use of a private jet, etc. Their betting on Kabila obviously affected the balance of power in his favour.

¹⁷In Schollaert and Van de gaer [2008] we focus on the impact of foreign interested parties.

¹⁸AFDL is the 'Alliance des Forces Démocratiques pour la Libération du Congo.'

2.4 Strategic Behaviour with Exogenous Trust

In this section we have a closer look at the impact of trust on the strategy-choice in the two areas in which eliminating dominated strategies does not generate a unique equilibrium: *TL* and *BR*.

The strategy-choice depends on the expected utility of both strategies. When neither player has a dominated strategy, players use their probability beliefs on the opponent's willingness to cooperate to assess the expected utility of their own strategies. This way, what we call 'inter-group trust' enters the analysis. 'Trust,' in our model, is the *belief* one player has about the other player's probability of choosing strategy *C*, i.e., the degree to which a player is confident that the other player will be cooperative. Trust is, therefore, defined in a same way as in Wood [2003].

We define $u_K^e(C, \cdot)$ as player *K*'s expected utility of cooperating and $u_K^e(F, \cdot)$ as his expected utility of fighting:¹⁹

$$\begin{cases} u_K^e(C, \cdot) &= \pi_{L_C}^e u_K(C, C) + (1 - \pi_{L_C}^e) u_K(C, F), \\ u_K^e(F, \cdot) &= \pi_{L_C}^e u_K(F, C) + (1 - \pi_{L_C}^e) u_K(F, F), \end{cases}$$

where $\pi_{L_C}^e$ is player *K*'s expectation of the probability that *L* will cooperate.

Solving the equation $u_K^e(C, \cdot) = u_K^e(F, \cdot)$ shows that player *K* will be indifferent to his two strategies for:

$$\pi_{L_C}^e = \pi_{L_C}^* = \frac{\rho\delta_1\delta_2 - \alpha(c/Y)}{\rho\delta_1\delta_2 - (\delta_1 - \alpha)}. \quad (2.5)$$

$\pi_{K_C}^e$ is defined similarly. Note that $\pi_{L_C}^*$ and $\pi_{K_C}^*$ are equal to the Nash equilibrium belief of player *L*, resp. *K*, in mixed strategies and that $\pi_{L_C}^*$ and $\pi_{K_C}^*$ only take values between zero and one within the *TL* and *BR*-areas.

Rearranging terms and expressing the equation for $\pi_{L_C}^*$ in terms of utility yields:

$$\pi_{L_C}^* [u_K(C, C) - u_K(F, C)] + (1 - \pi_{L_C}^*) [u_K(C, F) - u_K(F, F)] = 0. \quad (2.6)$$

With expectations equal to $\pi_{L_C}^*$, we can interpret the first term in Equation (2.6), $\pi_{L_C}^* [u_K(C, C) - u_K(F, C)]$, as 'the expected advantage of cooperating when the other player cooperates' and the second term, $(1 - \pi_{L_C}^*) [u_K(C, F) - u_K(F, F)]$, as 'the expected advantage of cooperating when the other player fights.'

In the *TL* area $[u_K(C, C) - u_K(F, C)]$, henceforth A^{CC} , is positive and $[u_K(C, F) - u_K(F, F)]$, henceforth A^{CF} , is negative. Note that

$$u_K^e(C, \cdot) \geq (\leq) u_K^e(F, \cdot) \Leftrightarrow \pi_{L_C}^e A^{CC} + (1 - \pi_{L_C}^e) A^{CF} \geq (\leq) 0. \quad (2.7)$$

Therefore, if e.g. $\pi_{L_C}^e > \pi_{L_C}^*$, the weight of the positive term in (2.7) is larger than in (2.6) and the weight of the negative term is smaller and, consequently, $\pi_{L_C}^e A^{CC} + (1 - \pi_{L_C}^e) A^{CF}$ is positive. As a result, *K* will cooperate if his level of trust is above the critical level $\pi_{L_C}^*$. Other cases can be established similarly, yielding:

¹⁹Since the analysis for both players is analogous, we only consider player *K* from now on.

Proposition 2. *Importance of trust:*

. If $\delta_1 < \delta_{1K}^*$ and $\delta_2 > \delta_{2L}^*(\delta_1)$, then,

- (a) if $\pi_{LC}^e > \pi_{LC}^*$ and $\pi_{KC}^e > \pi_{KC}^*$, society will be fully integrated;
- (b) if $\pi_{LC}^e > \pi_{LC}^*$ and $\pi_{KC}^e < \pi_{KC}^*$, L will dominate in a stratified economy;
- (c) if $\pi_{LC}^e < \pi_{LC}^*$ and $\pi_{KC}^e > \pi_{KC}^*$, K will dominate in a stratified economy;
- (d) if $\pi_{LC}^e < \pi_{LC}^*$ and $\pi_{KC}^e < \pi_{KC}^*$, society will be conflictual.

. If $\delta_1 > \delta_{1L}^*$ and $\delta_2 < \delta_{2K}^*(\delta_1)$, the inequalities in the antecedents of (a), (b), (c) and (d) have to be reversed.

Combining Proposition 1 and 2 allows us to characterise a unique equilibrium for each area in Figure 3.1, for different values of π_{LC}^e and π_{KC}^e . Figure 2.4 shows four panels: panel (a), with trustful exogenous beliefs from both groups, panel (d) in which both have suspicious beliefs, and panel (b) and (c) showing one trustful and one suspicious player.

Note, first, that when elimination of dominated strategies fails to generate a unique equilibrium, the unique equilibrium of the game is determined by the levels of trust players have in each others' willingness to cooperate. Obviously, this shows that if trust can be measured, the equilibrium of our model is determined. Furthermore, Proposition 2 asserts that the level of trustfulness has opposite implications in the *TL* and *BR*-area. A priori, one might expect that the cooperative equilibrium arises when both groups have trustful beliefs. This, however, is only true in the *TL*-area. The high value of δ_1 in the *BR*-area means that, if the other player cooperates, not much damage is done when *K* fights, so that the expected advantage of cooperating when the other player cooperates is negative. The low value of δ_2 implies that a lot of damage is done when *K* fights if the other player fights, so that the expected advantage of cooperating when the other player fights is positive. The trustful attitude of *K* means that *K* will consider it very likely that *L* cooperates, so that the negative term dominates and he decides not to cooperate. Put differently, in *BR* payoffs are such that a high trust in the cooperative nature of the other agent induces an attempt to capture the entire surplus for the own group. However, if both act this way, society will be conflictual instead of stratified.

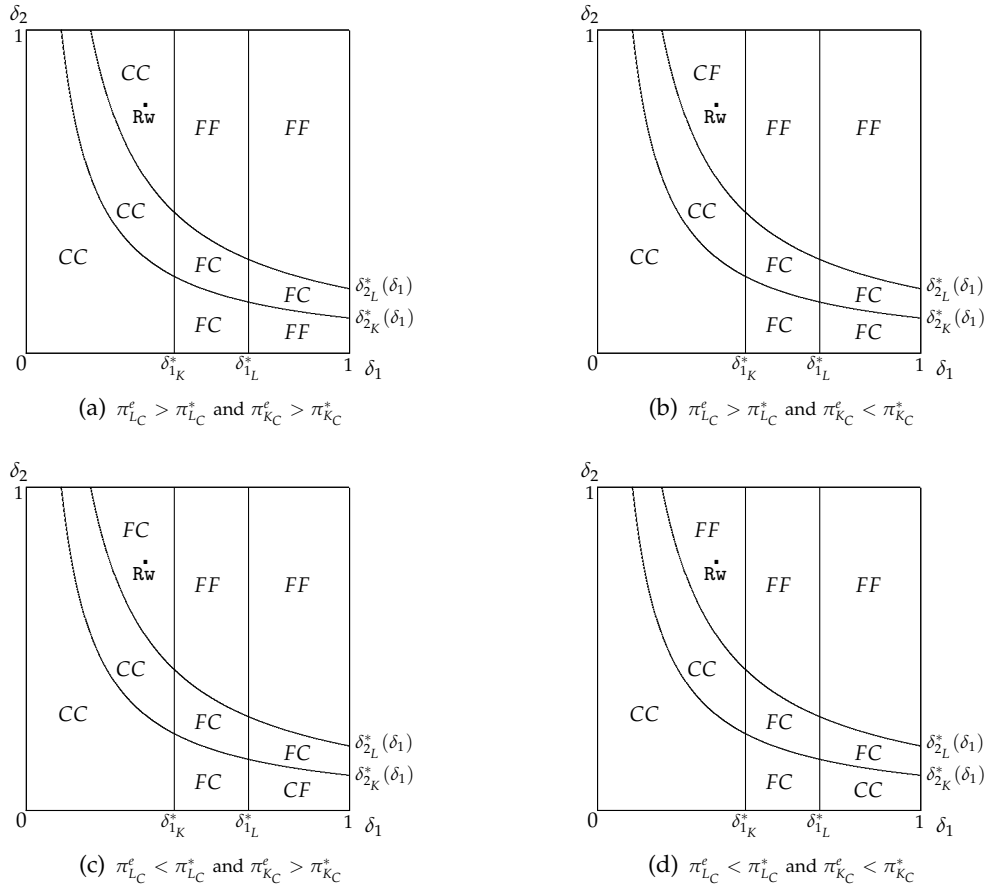
Our model shows that trust manipulation will only be effective in areas where neither player has a dominated strategy: trust only matters within *TL* and *BR*.

Corollary 4. *Manipulation of trust can only be effective in subsistence and plantation economies.*

We believe that civil conflicts in typical plantation economies (*BR*) like, among others, Côte d'Ivoire (cocoa) and Sri Lanka (rice; rubber; tea); and in predominantly subsistent economies (*TL*) like Burundi and Rwanda, provide this result with tragic 'case support.' Apparently, trust manipulation, or as Horowitz [1985] calls it, 'ethnic outbidding' especially strikes subsistence and plantation economies.

To illustrate the mechanism through which the manipulation of trust may change a society, we discuss the Rwandan case in more detail. It should be noted, however, that we do not claim to provide a unique or comprehensive explanation for the 1994 genocide

Figure 2.4: Types of equilibria with exogenous trust



in Rwanda. Clearly, the impact of decreasing opportunity costs of fighting²⁰ (probably among many other factors) should not be underestimated. The ensuing discussion, in other words, only aims to demonstrate how the manipulation of trust may have added to the disastrous polarisation of the Rwandan society.

The Rwandan society in the run-up to the '94 genocide allows us to illustrate the embittering impact of inter-ethnic distrust in the context of our model. With its densely populated economy depending on subsistence farming, small-scale coffee production and local trade, it is reasonable to assume that Rwanda was indeed in a region where trust determined the outcome of the game (Le Billon [2001]; André and Platteau [1998]; Uvin [1996]), i.e. the *TL*-region (Rw in Figure 2.4). Prior to the eruption of civil conflict (Figure 2.4(a): $\pi_{L_C}^e > \pi_{L_C}^*$ and $\pi_{K_C}^e > \pi_{K_C}^*$), economic regress (due to population growth and widespread misallocation of resources) threatened the ruling classes (here, the large group *L*: the Hutus). In order to maintain their privileged position and to divert popular

²⁰With too few non-agricultural income opportunities and limited possibilities of emigration, it is very likely that the Malthusian trap in which Rwanda was caught (André and Platteau [1998]) significantly decreased the opportunity costs of fighting. See Section 2.3 for a discussion of the role of the opportunity costs of fighting (c/Y) in this model.

discontent, the ruling regimes resorted to “the revival of ethnic hatred” (Uvin [1997, p. 109]). Extremist and racist discourse at political meetings and through the media (Rwanda, Media Case [2004])²¹ were not only tolerated, but actively supported by the ruling elite who tried (and managed) to manipulate trust among ethnic groups: Hutus’ expectation on the trustworthiness of the Tutsis, $\pi_{K_C}^e$, decreased and eventually got below $\pi_{K_C}^*$. Fighting became the utility maximising strategy for the Hutus: Rwanda moved from panel 2.4(a) to panel 2.4(b). Thus, hateful propaganda against a certain ethnic group clearly served as an ultimate “tool for power to the elite” (Uvin [1997, p. 109]). Hence, by undermining trust, active and purposeful ethnic polarisation is likely to have been the spark that initially triggered aggressive repression: the Hutu trust-level was insufficient to sustain a cooperative equilibrium. A similar argument rationalises the transition from repression to outright civil war: a downwards shift (below $\pi_{L_C}^*$) in Tutsi belief in the cooperative behaviour of the Hutus took Rwanda from panel 2.4(b) to panel 2.4(d). Then, Kofi Annan’s public condemning of “the use of hate media which is fuelling the tensions, xenophobia and inciting violent acts”²² asserts the importance of trust manipulation.

2.5 Conclusions

Our model considers societies populated by two identifiable groups. National income is assumed to be optimised when group behaviour is unaffected by social affiliation. If, on the contrary, agents preferably or solely interact with agents of the same group, this is assumed to be costly and to limit a country’s economic potential. If both groups claim a favourable treatment in the assignment of value added, internal conflict results and national income shrinks even more. Furthermore, we assume that the opportunity costs of choosing a non-cooperative strategy are determined by the type of economic activity that creates value added in a country: **(i)** limited interaction restrains economic output to a lesser extent in natural resource dependent and plantation economies than in diversified or heterogeneous subsistent economies; and **(ii)** societal costs of war are smaller for robust resource dependent and subsistent economies than for plantation and diversified economies.

We characterise the equilibrium-strategies by eliminating dominated strategies. We show that: **(i)** robust resource dependent economies are particularly prone to conflict, more so than subsistent and diversified economies, due to the low societal costs of stratification and war; **(ii)** foreign intervention, by manipulating the balance of power between groups, is more effective in resource dependent economies; **(iii)** manipulating trust will only be effective in subsistence and plantation economies; and **(iv)** plantation economies tend to be stratified. We reported case study and econometric evidence corroborating these results.

In our model, therefore, ethnic diversity might indeed appear as a curse: since many of the war-torn countries highly depend on the exploitation of natural resources, and

²¹Comments on ‘Case No. ICTR-99-52-T’: “The United Nations established the International Criminal Tribunal for Rwanda to hold accountable the persons most responsible for Rwanda’s three-month genocide ... [T]he founder [...] of [...] an extremist newspaper that published pieces ‘brimming’ with ‘contempt and hatred for the Tutsi ethnic group,’ sometimes “calling for the extermination of the Tutsis.”

²²New York, 11 November 2004 – Statement attributable to the Spokesman for the Secretary-General.

since this type of economic activity is characterised by a low opportunity cost of fighting, cooperating might not be an equilibrium strategy among identifiable groups. However, we show that rather than originating from ethnic sentiments or deeply set hatred, the apparently 'ethnic' conflict serves as a convenient excuse which hides economic motives (Mueller [2000]): with high natural (robust) resource dependence it proves to be a utility-maximising and equilibrium strategy to let ethnic affiliation guide economic interaction.

With Dirk Van de gaer

3.1 Introduction

That social stratification and civil strife are economically pernicious is beyond doubt. Some scholars even claim that they constitute two of the core obstacles to the economic take-off of developing countries (Azam et al. [2001], Murdoch and Sandler [2002]). Conflict prevention constitutes, therefore, a natural first step in foreign assistance to third-world development. Surprisingly, scholarly attention has primarily focused on ex-post third-party intervention,¹ i.e. after a conflict has emerged. In contrast, our focus is ex ante: how to prevent conflict and stimulate cooperation by outside intervention taken before the players choose their strategies.

This paper presents a game-theoretical analysis of the effectiveness of different types of third-party intervention in preventing social stratification or civil conflict. Society is assumed to be composed of two (identifiable/ethnic) groups that decide to cooperate, i.e. to accept a group neutral allocation of value added, or to fight, i.e. to invest in arms and claim a preferential treatment of group members in the allocation of value added. We study whether third-party intervention can induce a Bayesian Nash (BN) equilibrium where both groups choose the cooperative strategy ('cooperative equilibrium') and discourage a BN equilibrium where both choose to fight ('fighting equilibrium'). We think of third-party or outside intervention as international and coordinated intervention as it would, for example, be implemented by the United Nations. We will, therefore, use 'the UN' as a metaphor for all types of internationally coordinated intervention.

We consider three types of policies for the UN. A first policy is a credible threat by the UN to punish the country through a boycott of its international trade. We analyse the effectiveness of two different types of boycott. The first type hits the country as soon as one of the parties chooses a fighting strategy by investing in arms and appropriating the value added of the economy. We call this a 'strong' boycott. The second type only punishes mutual fighting: it is implemented when both parties invest in arms and claim the country's riches, leading to a civil war. This type of boycott will be referred to as the 'weak' boycott. A second policy is power politics, by which the balance of power between groups in the case of conflict is altered before players choose their strategies (cf. Porsholt [1966]). Finally, before players choose their strategies, the UN can try to reinforce trust between the parties by enacting trust building policies (cf. Kydd [2000]).

In modelling terms, this boils down to the following. Boycotts decrease the value added that can be distributed among groups. The strong boycott decreases this value added as soon as one of the groups chooses the fighting strategy and a weak boycott leads to a decrease in value added only if both groups choose to fight. Power politics influences the probability that a group wins in case of full conflict. Finally, to model the effect of

¹See, among others, Betts [1994], Mandell [1996], Regan [1996, 1998], Doyle and Sambanis [2000], Boyce [2002].

trust building, we formulate our game as a game with two groups under imperfect information. A group is either of the opportunistic type whose strategy depends on its payoffs, or of the good type who always cooperates. Groups are informed about their own type, but they are uncertain about the type of the other group. Trust building policies attempt to increase the beliefs that the other group is of the good type.

We find the following. A strong boycott can always ensure that the cooperative equilibrium is the only equilibrium. Consequently, it can preclude the fighting equilibrium without any restriction on the costs of fighting. Neither the weak boycott, power politics nor trust building has the potential to induce the cooperative equilibrium. For a certain range of parameter values, however, they can turn a situation with multiple equilibria (a cooperative, a fighting and a mixed strategy equilibrium) into one where the cooperative equilibrium is unique. Furthermore, under certain restrictions on the costs of fighting, they can rule out the fighting equilibrium. The restrictions are the same for weak boycotts and power politics and can be lower for trust manipulation for certain economies. Furthermore, the impact of boycotts is much easier to predict than that of power politics and trust building and when using the latter two to prevent the fighting equilibrium, the UN might have to decide which group to favour at the expense of the other group.

In analysing the effects of the four types of intervention we ignore the problem of implementation. Boycotts are only effective if implemented by an important fraction of the (potential) trading partners. Every individual country, however, has an incentive to free-ride. Consequently, boycotts of countries are often circumvented, it might be challenging to enforce a boycott effectively. For example, in a very original study, DellaVigna and La Ferrara [2008] provide convincing evidence for both the effectiveness and the ineffectiveness of weapon embargoes: they show that weapon embargoes are only effective where weapon-making firms face high legal and reputational costs. Manipulating trust is not straightforward either. For instance, using a signalling game, Leeson [2007] shows that state-imposed homogeneity in behaviour may reduce the possibility to signal trustworthiness by investing in creating homogeneity with outsiders and, therefore, hamper mutually advantageous trade between groups. Furthermore, changing the balance of power in conflicts might be very hard too. There are several cases in which private firms or individual countries sponsor certain factions in exchange for lucrative contracts when the faction rises to power (Smillie et al. [2000]; Montague [2002]; Samset [2002]). We argue elsewhere (Schollaert and Van de gaer [2008]) that for certain types of economies these private incentives can be substantial. Such action might, evidently, counter UN efforts. The question we ask ignores these issues of implementation: we analyse the effectiveness of different types of intervention in the absence of such problems. Evidently, in reality there may well be a trade-off between effectiveness and implementability.

The paper is organised as follows: Section 3.2 presents the core assumptions of the model and calculates players' (expected) payoffs. Section 3.3 develops the theoretical model and Section 3.4 conducts a technical analysis of the respective types of intervention. In Section 3.5 intervention tools are compared in terms of effectiveness and straightforwardness and Section 4.7 presents conclusions.

3.2 Assumptions and payoffs

Let the population be split into two groups, K and L , with α and $(1 - \alpha)$ their respective population share. Without loss of generality, we assume that group K is not larger than group L : $0 < \alpha \leq 1/2$. We follow Hirshleifer [1995] and exclude the within-group coordination and free-riding problem.²

The economy has two sectors: a productive sector and a subsistence sector. The productive sector is the part of the economy that creates a high value added (mining, trade, services), while small-scale agriculture or traditional trades are typical subsistence activities. We normalise the value created in the subsistence sector at zero, so that national income per capita equals the value created by the productive sector, Y . The issue at stake is the division of the value added created in the economy between the two population groups. One could easily think of several mechanisms through which this could occur: taxing all value added and distributing it among own group members, employing only group members in the productive sector (possibly combined with taxes or subsidies in order to serve all group members), etc. We leave the mechanism through which it occurs open.

We consider a two stage game.³ In the first stage, groups have the following strategy space: either they choose to cooperate (C) with the other group, or they choose to fight (F). The cooperative strategy means that the group does not claim any preferential treatment in the division of value added. The fighting strategy means that a group aims at a preferential treatment of its members. We will, furthermore, assume that if a player is indifferent between cooperating and fighting, i.e. if his expected utility of cooperating equals his expected utility of fighting, he will choose to cooperate.

Groups can be of two types: they can be good or opportunistic. The former always plays C. The strategy of the latter depends on its pay-off. First nature decides to which type each group belongs and groups only know their own type with certainty. This information is used to form π_g^L and π_g^K , respectively group K 's and group L 's belief that the other group is of the good type, after their own type has been revealed. A higher value of π_g^L (π_g^K) means that group K (L) has more trust in the cooperativeness of group L . Trust building policies attempt to influence π_g^L and π_g^K . Denote by $\pi_{c|o}^L$ ($\pi_{c|o}^K$) player K 's belief that L (K) will be cooperative if he is of the opportunistic type, while $p_{c|o}^L$ ($p_{c|o}^K$) is the actual probability that L (K) will be cooperative if he is of the opportunistic type.

After the groups decide their strategy, the game enters its second stage in which the value added will be distributed. We keep this stage as simple as possible. If both groups cooperate, the value added will be allocated equally over the population and everybody receives Y . When only one group decides to fight, this group becomes dominant⁴ and divides the value added among its members, leaving nothing for the other group. To

²As Robinson [2001, p. 86] puts it, "in reality individuals act not purely in isolation, but also as part of larger social groupings and networks." In order to focus on the problem of group interaction, we assume that the social control within each group is sufficiently effective to overcome the free-riding problem. The high level of social control within ethnic groups is often the reason why the fight for resources occurs along 'ethnic' lines (Gates [2002]).

³For a dynamic analysis of conflicting activities, see Maxwell and Reuveny [2005].

⁴Dominance reflects the situation in which one group manages to seize political and economic power. In the present context this means that the *dominant* group is in control and appropriates the value added.

resolve the conflict when both choose strategy F , we include an exogenous variable ρ (resp. $[1 - \rho]$) that reflects the probability that the members of group K (resp. L) will manage to ‘capture’ the value added. ρ can be interpreted as a measure of relative power of group K , and allows for different interpretations (Neary [1997, p. 483]). It “might be a negotiated division of the stock that takes into account the relative arms levels or it might be the outcome of a winner-take-all contest, where $[\rho]$ is player K ’s probability of winning.”

As a result of the choices made by the groups, there are four potential outcomes of the game: (C, C) , the fully integrated society, when both choose to cooperate; (F, C) , a stratified society where K dominates, when K fights while L cooperates; (C, F) when the reverse holds and (F, F) , a conflictual society, when both choose not to cooperate. Note that, in contrast to all of the literature, we have asymmetric equilibria (stratified societies) which reveal important dilemmas for the UN.

There are two types of cost that are associated with fighting and conflict. First, there is a private cost of choosing the fighting strategy. To implement preferential treatment in the second stage, a group needs to be able to enforce it. This can be done by purchasing arms, which entails a private cost for each member of the group equal to $c > 0$. In the economic literature on conflict (e.g., Hirshleifer [1991, 1995], Skaperdas [1992] and Neary [1997]) it is usually assumed that a group’s probability of winning the conflict depends on the arms expenditures of the groups. In our model a comparable mechanism could be introduced by, for example, relating ρ to the size of the group, α . However, we choose to keep ρ exogenous, for ρ is an obvious channel through which power politics can alter the outcome of the game. UN intervention can change relative power, which influences the strategies chosen by the groups and thereby the nature of the resulting society. In Figure 3.2 we depict the case where $\rho = \alpha$, which is the case where a group’s power is proportional to its size and total arms expenditure by the group members.

Second, there are societal costs associated with a stratified or conflict society. In a stratified society, the per capita value created by the productive sector (and thus national income) is reduced to $\delta_1 Y$, with $0 \leq \delta_1 \leq 1$. The robustness coefficient δ_1 is inversely related to several types of costs, such as costs due to the misallocation of resources (less trade, misallocation of talent), the negative incentive effects of nepotism and discrimination, the impact of antagonism between groups on the over-exploitation of common resources and a diminished social capital stock.⁵ In a conflict society, costs will be even higher since this situation leads to a disruption of all economic activity and a destruction of infrastructure.⁶ These additional costs lower per capita national income to $\delta_1 \delta_2 Y$ with $0 \leq \delta_2 \leq 1$. The magnitude of societal costs of stratification and conflict crucially depends on the kind of economic activity that generates high value added. Activities directed at the exploitation of geographically concentrated primary resources such as mining, or economies heavily dependent on lootable resources, are not much affected. Only a limited number of transport links are needed to operate them. Service industries and trade are much more vulnerable to stratification and war.⁷ We model the boycotts as

⁵The idea is similar to the argument made by Leeson [2005, p. 76]: “Non-fractionalized agents are able to reap the benefits from trade despite being socially distant. Fractionalized agents, in contrast, are unable to do so and instead interact predominantly with those they are very close to and thus know very well.”

⁶Hirshleifer [1988, p. 205] calls it battle damage.

⁷See Schollaert and Van de gaer [2008] for a detailed discussion on how the structure of the economy

exogenous decreases in the robustness coefficients. Hence, the boycott-free values of δ_1 and δ_2 are determined by the structure of a country's economic activity; a strong boycott decreases δ_1 and a weak boycott decreases δ_2 below its boycott-free level.

Straightforward calculation shows that individual payoffs are:⁸

		(L)	
		C	F
K	C	Y (Y)	0 $\left(\frac{1}{(1-\alpha)}\delta_1 Y - c \right)$
	F	$\frac{1}{\alpha}\delta_1 Y - c$ (0)	$\frac{\rho}{\alpha}\delta_1\delta_2 Y - c$ $\left(\frac{(1-\rho)}{(1-\alpha)}\delta_1\delta_2 Y - c \right)$

To solve our game with imperfect information, we compute the BN equilibria of the game. A BN equilibrium consists of probability beliefs $(\pi_{c|o}^L, \pi_{c|o}^K)$ over strategy C and probabilities $(p_{c|o}^L, p_{c|o}^K)$ of choosing strategy C so that (i) given his beliefs, player L (K) chooses $p_{c|o}^L$ ($p_{c|o}^K$) so that his expected utility is maximised and (ii) the beliefs are correct: $p_{c|o}^L = \pi_{c|o}^L$ and $p_{c|o}^K = \pi_{c|o}^K$. Next, we characterise the BN equilibria.

3.3 Bayesian Nash Equilibria

We analyse the effects of boycotts, beliefs and changes in relative power by partitioning the $\delta_1 \times \delta_2$ -space (with $\delta_1 \times \delta_2 \subseteq [0, 1]^2$) in different sections that correspond to different types of societies. This immediately shows the effects of a boycott. Given the structure of its economy, a country has a particular value of δ_1 and δ_2 . Strong and weak boycotts respectively decrease δ_1 and δ_2 below this value. In Definition 1 we define critical value functions that partition the $\delta_1 \times \delta_2$ -space and determine the BN equilibria of the game as shown in Theorem 1.⁹ We delete the arguments of the functions in most of the discussion to simplify the notation.

Definition 1. *Critical value functions:*

$$\delta_{1,K}(\alpha, \frac{c}{Y}) \equiv \alpha \left(1 + \frac{c}{Y} \right).$$

$$\delta_{1,L}(\alpha, \frac{c}{Y}) \equiv (1 - \alpha) \left(1 + \frac{c}{Y} \right).$$

$$\delta_{2,K}(\delta_1, \alpha, \rho, \frac{c}{Y}, \pi_g^L) \equiv -\frac{\pi_g^L}{(1-\pi_g^L)\rho} + \frac{\alpha}{(1-\pi_g^L)\rho\delta_1} \left[\pi_g^L + \frac{c}{Y} \right].$$

$$\delta_{2,L}(\delta_1, \alpha, \rho, \frac{c}{Y}, \pi_g^K) \equiv -\frac{\pi_g^K}{(1-\pi_g^K)(1-\rho)} + \frac{(1-\alpha)}{(1-\pi_g^K)(1-\rho)\delta_1} \left[\pi_g^K + \frac{c}{Y} \right].$$

Figure 3.1 describes a general parameter configuration and depicts the critical value functions.¹⁰ The $\delta_{1,K}$ - and $\delta_{1,L}$ -curves are vertical in the $\delta_1 \times \delta_2$ -space. The $\delta_{2,K}$ - and $\delta_{2,L}$ -curves are decreasing and convex with respect to δ_1 . As stated in Section 3.2, without loss

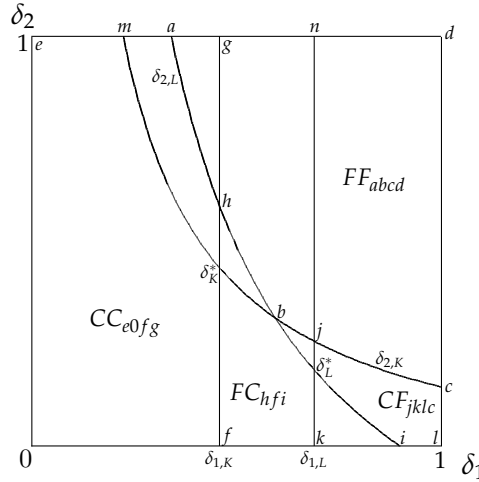
relates to the societal costs of conflict.

⁸By assuming that individuals' utility functions are linear in income, we assume that they are risk neutral.

⁹The critical value functions in Definition 1 are derived in the Proof of Theorem 1.

¹⁰We call Figure 3.1 a 'generic case' because it demonstrates all the riches of the model: it contains all the different kinds of equilibrium areas that might occur for the range of parameter values.

Figure 3.1: Generic case



of generality, we focus on the case where $\alpha \leq 1/2$ such that $\delta_{1,K} \leq \delta_{1,L}$. Both the $\delta_{1,K}$ - and $\delta_{2,K}$ -curves and the $\delta_{1,L}$ - and $\delta_{2,L}$ -curves cross each other in the positive orthant, respectively in $\delta_K^* = (\alpha[1 + \frac{c}{Y}], \frac{1}{\rho} \frac{c}{c+Y})$ and $\delta_L^* = ((1-\alpha)[1 + \frac{c}{Y}], \frac{1}{1-\rho} \frac{c}{c+Y})$. Finally, note that the $\delta_{2,K}$ - and $\delta_{2,L}$ -curve cross at most once.

We next characterise the BN equilibria of the game with two opportunistic players.

Theorem 1. *BN equilibria :*

(a) *The BN equilibria in pure strategies result in the following kinds of societies:*

$$\begin{aligned} (C, C) &\Leftrightarrow \delta_1 \leq \delta_{1,K} \text{ and } \delta_1 \leq \delta_{1,L}, & (C, F) &\Leftrightarrow \delta_2 \leq \delta_{2,K} \text{ and } \delta_1 > \delta_{1,L}, \\ (F, C) &\Leftrightarrow \delta_1 > \delta_{1,K} \text{ and } \delta_2 \leq \delta_{2,L}, & (F, F) &\Leftrightarrow \delta_2 > \delta_{2,K} \text{ and } \delta_2 > \delta_{2,L}. \end{aligned}$$

(b) *BN equilibria in mixed strategies occur when the following conditions hold simultaneously:*

1. *For player K: either*

- (i) $\delta_1 > \delta_{1,K}$ AND $\delta_2 < \delta_{2,K}$; or
- (ii) $\delta_1 < \delta_{1,K}$ AND $\delta_2 > \delta_{2,K}$.

2. *For player L: either*

- (i) $\delta_1 > \delta_{1,L}$ AND $\delta_2 < \delta_{2,L}$; or
- (ii) $\delta_1 < \delta_{1,L}$ AND $\delta_2 > \delta_{2,L}$.

The equilibrium probabilities are then given by:

$$p_{c|o}^L = \frac{1}{(1 - \pi_g^L)} \left[\frac{\rho \delta_1 \delta_2 - \alpha \frac{c}{Y}}{\alpha - \delta_1 + \rho \delta_1 \delta_2} - \pi_g^L \right];$$

and

$$p_{c|o}^K = \frac{1}{(1 - \pi_g^K)} \left[\frac{(1 - \rho) \delta_1 \delta_2 - (1 - \alpha) \frac{c}{Y}}{(1 - \alpha) - \delta_1 + (1 - \rho) \delta_1 \delta_2} - \pi_g^K \right].$$

Intuition for the conditions of the pure strategy equilibria. For values of $\delta_1 \leq \delta_{1,K}$, given that L cooperates, cooperating is player K 's best response. Similarly, the inequality $\delta_1 \leq \delta_{1,L}$ determines the values of δ_1 for which the expected utility of cooperating for player L is larger than the expected utility of fighting, given that K cooperates. The (C, C) equilibrium arises when both players cooperate given that the other player cooperates (compatibility of their optimising decisions) and thus when $\delta_1 \leq \delta_{1,K}$ and $\delta_1 \leq \delta_{1,L}$. In Figure 3.1 this occurs in the area $e0fg$. Similarly, for values of $\delta_2 \leq \delta_{2,L}$ the expected utility of cooperating for player L is larger than of fighting, given that K fights. The (F, C) equilibrium then occurs when player K fights given that L cooperates and L cooperates given that K fights. From the above, this occurs when $\delta_1 > \delta_{1,K}$ and $\delta_2 \leq \delta_{2,L}$, area hfi . The intuition for the other pure strategy equilibria can be derived analogously: (F, F) occurs in area $abcd$, (C, F) in $jklc$.

Intuition for the equilibrium probabilities of the mixed strategy equilibria. In a mixed strategy equilibrium the equilibrium probabilities equate the expected utility of cooperation to the expected utility of fighting. Since $(1 - \pi_g^L)(1 - p_{c|o}^L)$ is the probability that L fights and $[\rho\delta_1\delta_2 - \alpha\frac{c}{Y}]$ is the utility advantage for player K of fighting over cooperating if L fights, and $[\pi_g^L + (1 - \pi_g^L)p_{c|o}^L]$ is the probability that L cooperates and $[\alpha - \delta_1 + \alpha\frac{c}{Y}]$ is the utility advantage for player K of fighting over cooperating if L cooperates, we get:

$$\left[\rho\delta_1\delta_2 - \alpha\frac{c}{Y}\right] (1 - \pi_g^L)(1 - p_{c|o}^L) - \left[\alpha - \delta_1 + \alpha\frac{c}{Y}\right] \left[\pi_g^L + (1 - \pi_g^L)p_{c|o}^L\right] = 0. \quad (3.1)$$

Solving this expression for $p_{c|o}^L$ results in the expression given in Theorem 1, part (b). $p_{c|o}^K$ can be derived from equating the expected utility of cooperating to the expected utility of fighting for player L .

Corollary 5 shows that there are three types of areas with BN equilibria in mixed strategies.

Corollary 5. *Types of areas with mixed strategy equilibria :*

- (a) *Area with mixed strategy equilibria and pure strategy equilibria of type (C, C) and (F, F) .*
- (b) *Area with mixed strategy equilibria and pure strategy equilibria of type (F, C) and (C, F) .*
- (c) *Areas in which the mixed strategy equilibrium is the only equilibrium. This occurs when conditions 1 (i) and 2 (ii) of part (b) of Theorem 1 hold true.*

It is straightforward to find the types of mixed strategy equilibria in Figure 3.1. (a) coincides with area ahg , (b) with area δ_L^*ki and (c) with area $b\delta_L^*j$.

In the cases where the BN equilibrium is of type (a) or (b), there are three different BN equilibria: one in mixed strategies and two in pure strategies. For some parameter configurations no equilibria in pure strategies exist. All finite games, however, have a Nash equilibrium: when no pure strategy equilibria exist, the Nash equilibrium will be of type (c).

Obviously, not all the areas in Figure 3.1 occur for all possible parameter configurations. Which areas occur, depends on the position of the δ_H^* 's and on whether their

coordinates are between 0 and 1. This, in turn, crucially depends on the value of c/Y . As c/Y increases, the $\delta_{1,K}$ - and $\delta_{1,L}$ -curves shift to the right and the $\delta_{2,K}$ - and $\delta_{2,L}$ -curves shift up, thus potentially excluding some equilibrium areas.¹¹

3.4 UN intervention

We now turn to the analysis of the impact of policy intervention. The three policy tools affect the game in distinct ways. We first study their effects on the equilibrium probabilities in mixed strategy equilibria and then their effect on the pure strategy equilibria.

Effect on the equilibrium probabilities in mixed strategy equilibria

In the mixed BN equilibrium areas, UN intervention has an impact on the players' probability of cooperating. Due to the closed form expressions we derived in Theorem 1, the comparative static analysis of this impact is relatively straightforward. Corollary 6 summarises the results. Entry ' $-(x)$ ' in the table of Corollary 6(a) means that the corresponding probability decreases if the mixed strategy equilibrium area is of type (x) , with $x = a, b$ or c , as defined in Corollary 5. An entry ' $+(x)$ ' means that the probability increases.

Corollary 6. *Mixed strategy equilibria and UN intervention:*

- (a) *The effect of boycotts and power politics on the probability that players cooperate depends on the type of mixed strategy equilibrium area. In particular:*

	$p_{c o}^L$		$p_{c o}^K$	
<i>strong boycott</i>	$-(a)$	$+(b) \text{ and } (c)$	$-(a) \text{ and } (c)$	$+(b)$
<i>weak boycott</i>	$-(a)$	$+(b) \text{ and } (c)$	$-(a) \text{ and } (c)$	$+(b)$
<i>increase in ρ</i>	$+(a)$	$-(b) \text{ and } (c)$	$-(a) \text{ and } (c)$	$+(b)$

- (b) *An increased belief that the other player is of the good type decreases the probability that a player will cooperate.*

Part (a) of Corollary 6 shows that boycotts enhance cooperation only in mixed strategy equilibria of type (b). When the mixed strategy equilibrium is of type (a), they make cooperation less likely. Hence, to predict the effects of boycotts in mixed strategy equilibria, the type of mixed strategy equilibrium matters. Power politics only enhance cooperation unambiguously if the economy is in a mixed strategy equilibrium of type (c). In that case, decreasing the power of the smallest group increases the probability that both groups cooperate. In other types of mixed strategy equilibria, power politics increases the probability that one group cooperates, but decreases the probability that the other group cooperates. Consequently, since the parameter values of the economy

¹¹Note that increasing c/Y (e.g. by increasing the costs of armament) would be an effective policy tool. We don't consider it here, however, because within our model it generates trivial conclusions. Moreover, when small farming tools can serve as weapons, the feasibility of manipulating the costs of armament becomes highly questionable.

determine the type of mixed strategy equilibrium that might occur, to predict the effects of boycotts and power politics, we need to know these values. We say that their effects are context-specific.

Part (b) shows that an increased belief that the other player is of the good type decreases the probability that a player cooperates. The reason is that, if the other player cooperates, it is possible to gain by fighting. If a player's belief that the other one is of the good type increases, the expected gains from fighting increase, inducing him to decrease the probability of cooperation. Put differently: it pays to take advantage of the believed trustworthiness of the other player. This is an important conclusion: in areas where mixed strategy equilibria occur, trust building decreases the probability that players opt for a cooperative strategy.

Policy Implication 1. *(Mixed strategy equilibria) The effect of boycotts and power politics on mixed strategy equilibria is context-specific. Trust building decreases the probability that players choose a cooperative strategy.*

Effect on the pure strategy equilibria

Since the effect of boycotts are readily seen from Figure 3.1, while the effects of power politics and trust building require further analysis, we deal with these instruments in separate sections.

Boycotts

The partitioning of the $\delta_1 \times \delta_2$ -space allows for a straightforward analysis of the effects of boycotts on the BN equilibria in pure strategies. Boycotts sanctioning any deviation from cooperation (strong boycotts) lower δ_1 , boycotts sanctioning only when both players fight (weak boycotts) lower δ_2 . Since $\delta_{1,L} > \delta_{1,K} > 0$, strong boycotts can always induce a (C,C) equilibrium by decreasing δ_1 . Moreover, since $\delta_{2,K}$ and $\delta_{2,L}$ are strictly positive for all $\delta_1 > 0$, if strong enough, strong boycotts can guarantee that the (C,C) equilibrium in pure strategies is the unique equilibrium. Due to the vertical orientation of $\delta_{1,K}$, weak boycotts are only effective in turning a mixed strategy equilibrium of type (a) into a (C,C) equilibrium; i.e. when, left of $\delta_{1,K}$, we force the economy below $\delta_{2,L}$, we make cooperating the dominant strategy for player L and, therefore (again: left of $\delta_{1,K}$) also for player K.

Policy Implication 2. *While strong boycotts can always induce that a cooperative equilibrium is the only equilibrium, weak boycotts can only do so if the economy was originally in a mixed strategy equilibrium of type (a).*

Power politics and trust building

The position of the $\delta_{1,K}$ -curve is independent of relative power (ρ) and respective levels of trust (π_g^L and π_g^K). Therefore, these policies can never expand the CC-area in Figure 3.1. Yet, ρ and π_g^L and π_g^K determine the size of the other equilibrium areas by shaping the course of the $\delta_{2,H}$ -curves. Lemma 1 lists how $\delta_{2,K}$ and $\delta_{2,L}$ are affected by changes in power and trust.

Lemma 1. *Comparative static properties of $\delta_{2,H}$. An increase in:*

- π_g^L rotates the $\delta_{2,K}$ -curve clockwise through the point δ_K^* ;
- π_g^K rotates the $\delta_{2,L}$ -curve clockwise through the point δ_L^* ;
- ρ rotates the $\delta_{2,K}$ -curve counter-clockwise through the point $\left(\alpha \left[1 + \frac{1}{\pi_g^L} \frac{c}{Y}\right], 0\right)$;¹²
- ρ rotates the $\delta_{2,L}$ -curve clockwise through the point $\left((1 - \alpha) \left[1 + \frac{1}{\pi_g^K} \frac{c}{Y}\right], 0\right)$;¹²
- ρ shifts δ_K^* vertically down;
- ρ shifts δ_L^* vertically up.

For economies in a type (a) area with three equilibria (Corollary 5) power politics and trust manipulation can, by affecting the position of the $\delta_{2,H}$ -curves, change the equilibrium of the game in such a way that the only remaining BN equilibrium is the cooperative equilibrium. In the generic case of Figure 3.1, this can be achieved by increasing ρ or π_g^K , or by increasing π_g^L substantially, i.e. such that the $\delta_{2,K}$ -curve lies above the $\delta_{2,L}$ -curve. However, for economies in other areas these policy measures can have undesirable effects. Consider for instance economies in the area $j\delta_L^*ilc$ of the generic case in Figure 3.1. Increasing π_g^L , by rotating the $\delta_{2,K}$ -curve clockwise through the point δ_K^* has the perverse effect of turning some of the (C, F) equilibria into an (F, F) equilibrium. An increase in ρ , by rotating the $\delta_{2,K}$ -curve counter-clockwise through the point $(\alpha[1 + c/(\pi_g^L Y)], 0)$ will have the same consequences. In Figure 3.1, only π_g^K has no perverse effects on the pure strategy equilibrium areas. However, the positions of the $\delta_{2,K}$ -curve and $\delta_{2,L}$ -curve within the generic case described in Figure 3.1, are a particular case. It is, for instance, possible that $\delta_{2,L}$ lies entirely above the $\delta_{2,K}$ (cf. Figure 3.2, proportional power). Here,

Figure 3.2: Proportional power

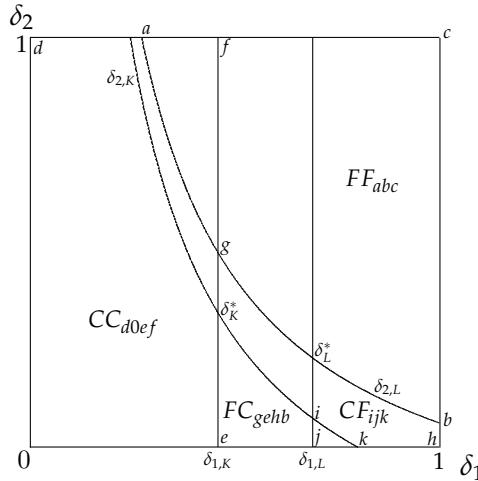
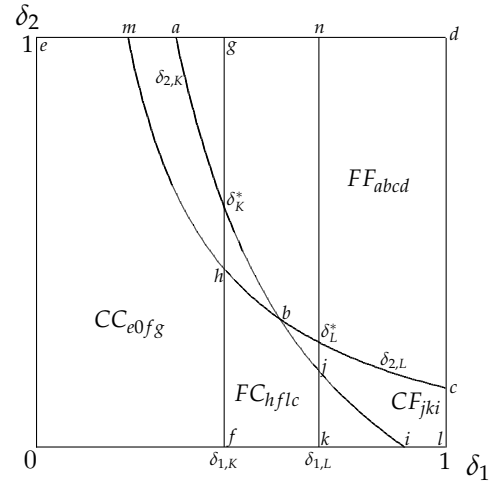


Figure 3.3: Special case



¹²Note that this is a point on the horizontal axis that may lie outside of the $\delta_1 \times \delta_2$ -space.

an increase in π_g^K rotates the $\delta_{2,L}$ -curve clockwise through the point δ_L^* and turns some (C, F) equilibria in an (F, F) equilibrium.

Alternatively, for example, the $\delta_{2,K}$ -curve could be steeper than the $\delta_{2,L}$ -curve, as shown in Figure 3.3. Here, contrary to the generic case in Figure 3.1, to reduce the three BN equilibria to a unique cooperating equilibrium, ρ has to be decreased. These two ‘special cases’ (figures 3.2 and 3.3) show that the effects of power politics and trust manipulation on the pure strategy equilibria are context-specific.

Policy Implication 3. *Power politics and trust manipulation can only ensure that the cooperative equilibrium is unique for economies located in the area of type (a), described in Corollary 5. By doing so, however, power politics and trust manipulation have the perverse effect of turning some stratified equilibria into a fighting equilibrium. Moreover, the effectiveness of both policy tools is context-specific.*

3.5 Ranking policies

Section 3.4 provided some insights on how the equilibrium outcomes are affected by UN intervention. Here, we have a closer look at the relative effectiveness and straightforwardness of the intervention tools under consideration in the general case.

Potential to induce the cooperative equilibrium

We now discuss whether UN action, with strictly positive private costs of conflict ($c/Y \geq 0$), but irrespective of other parameter values, can guarantee existence of a (C, C) equilibrium. To allow for a (C, C) equilibrium, we need that $\delta_1 \leq \delta_{1,K}$. Since we focus on the case where $\alpha \leq \frac{1}{2}$, this condition is necessary and sufficient. Explicitly, we get the following condition to establish a cooperative equilibrium:

$$\delta_1 \leq \alpha \left[1 + \frac{c}{Y} \right].$$

Clearly, since only δ_1 enters this inequality, only manipulation of δ_1 can (always) guarantee that it holds true. Furthermore, the right-hand side of the inequality is strictly positive; a severe strong boycott can, therefore, always ensure that the inequality holds true. This result can easily be inferred from the pay-off matrix in Section 3.2. For δ_1 going to zero, the (C, C) equilibrium becomes a dominant strategy equilibrium. Uniqueness follows from the fact that with δ_1 becoming very small, δ_{2K} and δ_{2L} become larger than 1, such that $\delta_2 \leq \delta_{2K}$ and $\delta_2 \leq \delta_{2L}$.

Policy Implication 4. *Potential to enforce mutual cooperation when both players are opportunistic:*

- (a) *The strong boycott can always guarantee that the cooperative equilibrium is the unique equilibrium of the game.*
- (b) *Neither a weak boycott, power politics nor trust building have the potential to guarantee that the cooperative equilibrium is always an equilibrium of the game.*

Potential to preclude the fighting equilibrium

From an international policy point of view, it is not only interesting to know when a particular policy tool will manage to make cooperation an equilibrium strategy, it is also important to know whether this tool will manage to exclude the conflict equilibrium. Corollary 7 states conditions on the parameter values for which each policy tool, pushed to (one of its) extremes, can preclude the fighting equilibrium.

Corollary 7. *Potential to preclude the fighting equilibrium when both players are opportunistic:*

- (a) *A strong boycott can always preclude the fighting equilibrium.*
- (b) *A weak boycott and power politics can preclude the fighting equilibrium if and only if:*

$$\frac{c}{Y} \geq \min \left\{ \frac{\delta_1 - \alpha}{\alpha} \pi_g^L, \frac{\delta_1 - (1 - \alpha)}{1 - \alpha} \pi_g^K \right\}.$$

- (c) *Manipulation of trust can preclude the fighting equilibrium if and only if:*

$$\frac{c}{Y} \geq \min \left\{ \frac{\delta_1 - \alpha}{\alpha}, \frac{\rho \delta_1 \delta_1}{\alpha}, \frac{\delta_1 - (1 - \alpha)}{1 - \alpha}, \frac{(1 - \rho) \delta_1 \delta_1}{1 - \alpha} \right\}.$$

From Corollary 7 it is clear that strong a boycott is the only instrument that, for all parameter configurations, can preclude the fighting equilibrium. Weak boycotts and power politics face the same restricting condition on the private cost of fighting. Yet, there is an important difference in how they ought to be implemented. Weak boycotts have to be strong enough: δ_2 must be small enough. Power politics must either make ρ small enough, or high enough:

- if $\frac{\delta - (1 - \alpha)}{1 - \alpha} \pi_g^K > \frac{c}{Y} > \frac{\delta - \alpha}{\alpha} \pi_g^L$, ρ must be close enough to 0, while
- if $\frac{\delta - \alpha}{1 - \alpha} \pi_g^L > \frac{c}{Y} > \frac{\delta - (1 - \alpha)}{1 - \alpha} \pi_g^K$, ρ must be close enough to 1.

Moreover, if c/Y is larger than both elements of the set behind the min operator, both a value of ρ close to 0 and close to 1 will eliminate the fighting equilibrium. In such a case, the UN, when using power politics to eliminate a fighting equilibrium, has to decide which group to grant, and which group to deprive of, power.

A similar issue occurs for the conditions under which trust manipulating can preclude the fighting equilibrium. Depending on the value of c/Y , this can occur through making π_g^L low or high enough or through making π_g^K low or high enough. If c/Y is larger than all four conditions, each of these possible policies of trust manipulation can preclude the fighting equilibrium. Again, it is not clear on which grounds such a decision can be made.

The conditions in Corollary 7 for the UN to be able to preclude the fighting equilibrium depend on parameter values of the economy which might be difficult to observe. Corollary 8 reformulates these conditions, assuming that the UN are unable to observe $\delta_1, \delta_2, \rho, \pi_g^L$ and π_g^K . Only α and c/Y can be observed.

Corollary 8. *Potential to preclude the fighting equilibrium for an uninformed UN when both players are opportunistic:*

- (a) *A strong boycott can always preclude the fighting equilibrium.*
- (b) *A weak boycott, power politics and trust manipulation can preclude the fighting equilibrium if and only if:*

$$\frac{c}{Y} \geq \min \left\{ \frac{1-\alpha}{\alpha}, \frac{\alpha}{1-\alpha} \right\}.$$

For an uninformed UN the condition on the private costs of fighting for trust manipulation has become the same as for weak boycotts and power politics. With $\alpha \leq 1/2$, the condition reduces to $\frac{c}{Y} \geq \frac{\alpha}{1-\alpha}$. If this condition holds, a severe enough weak boycott, bringing ρ close enough to 1 and making π_g^K close enough to 1, eliminates the fighting equilibrium. However, bringing ρ close enough to 0 and π_g^L close enough to 1 also eliminates the fighting equilibrium. It is unclear how the UN could choose either policy over the other. A final policy implication summarises the preceding discussion.

Policy Implication 5. *Potential to preclude the fighting equilibrium when both players are opportunistic.*

- (a) *A severe enough strong boycott can always preclude the fighting equilibrium.*
- (b) *A severe enough weak boycott and power politics can preclude the fighting equilibrium if the private costs of conflict are above some threshold. This threshold can be lower or higher than the threshold above which trust manipulation becomes effective. If the UN are uninformed, these thresholds are the same for the three policy tools.*
- (c) *To preclude the fighting equilibrium through power politics and trust manipulation, the UN might face a delicate choice of which group to favour at the expense of the other group.*

Policy recommendation

Policy Implications 2, 4 and 5 confirm the unconditional effectiveness of the strong boycott: it can make mutual cooperation the unique equilibrium and, therefore, prevent the conflictual society to be one, irrespective of the private costs of fighting. In contrast, neither of the other intervention tools can make the cooperative equilibrium a possible equilibrium when it wouldn't be one without intervention. For some economies, however, weak boycotts, power politics and trust manipulation can reduce the number of BN equilibria such that only the cooperative equilibrium remains. Finally, provided that the cost of fighting exceeds a certain threshold, the latter three policy tools can allow an uninformed UN to exclude the fighting equilibrium. An informed UN can achieve this for a lower threshold.

Note, furthermore, from Policy Implication 3, that except for boycotts, the direction of the necessary intervention is highly context-specific: it depends on the precise values of the parameters of the economy. Trust manipulation is very delicate: while it is commonplace to assume that positive beliefs foster cooperation and negative beliefs may lead to conflict, we find that the support for this statement is limited in our model. First,

increasing trust has no effect on the size of the (C, C) -equilibrium: there is no impact of beliefs on the occurrence of a fully integrated society. Second, the impact of beliefs on the other equilibrium areas is tricky to predict: small differences in parameter values in the neighbourhood of δ_H^* can completely alter the consequences of trust building in an economy. Finally, we know from Policy Implication 1 that, in mixed strategy equilibria, increased trust always decreases the probability that a player chooses to cooperate. These results, we believe, cast serious doubts on the attractiveness of trust manipulation as an intervention tool for the UN in conflict prevention.

In sum, policy implications 1–5 allow us to postulate an effectiveness-ranking in the four intervention types we have considered.

Corollary 9. *Ranking of the intervention tools.*

The strong boycott – which punishes all non-cooperative behaviour – constitutes an effective and easy intervention tool, no matter what the costs of fighting are. The weak boycott and the manipulation of relative power are effective under the same restriction on the private costs of fighting. The weak boycott is far more straightforward than power politics. The manipulation of trust, finally, is less effective than the strong boycott. Moreover, power politics and trust manipulation require very specific knowledge of the values of the parameters of the economy in order to be used successfully.

3.6 Conclusion

In this paper we use a simple game theoretic model to analyse what outside parties such as the United Nations can do to prevent a civil conflict within a country. We focused on the effects of boycotts, power politics and trust building and ignored problems of implementation of these interventions. Admittedly, implementation problems can be huge, but we argue that if in the absence of such problems an intervention lacks potential, we probably should not even consider its implementation anyway.

Boycotts can be of two types: strong boycotts sanction any non-cooperative behaviour while weak boycotts only sanction joint non-cooperative behaviour. Only the former type of boycott can, irrespective of the private costs of conflict, always ensure that cooperation is an equilibrium strategy for both parties. The reason is obvious: with societal costs of non-cooperation rising above a certain level, mutual cooperation is always an equilibrium strategy. By contrast, our model shows that neither weak boycotts nor power politics and trust building have the potential to ensure that both players cooperate.

All four policy measures do, however, have the potential to prevent the society from becoming conflictual. Again, the strong boycott has that potential irrespective of the level of the private costs of conflict. For the weak boycott, power politics, and trust manipulation to have that potential, private costs of conflict need to be above a certain threshold. For an uninformed UN the threshold is the same for these three instruments. If the UN is informed about the relevant parameter values, the threshold level is lower than if it were uninformed, and the same for a weak boycott and power politics. The threshold for trust manipulation can be lower or higher than for the latter two policy tools.

Maybe even more importantly, we show that successfully using power politics and trust manipulation requires much more information on the economic parameters than

using boycotts: small mistakes in assessing the economic context can induce good policy intentions to generate horrific outcomes. Increasing one group's relative power may have desirable results in a certain context, but highly undesirable ones in another. Similarly, the effects of a particular change in trust are very context-specific and sometimes counterintuitive. We show, for example, that in order to prevent groups from fighting, sometimes a decrease in trust is required: if a group believes that it is very likely that the other group will cooperate, then that group can be induced to fight to reap the rewards of becoming the dominant group in society. Under such circumstances, a decreased trust in the cooperative nature of the other group can establish cooperative behaviour. Finally, by hitting groups asymmetrically, power politics and, to a certain extent, trust manipulation may well raise moral issues. Why should the UN favour one group over another?

Based on these results, a clear hierarchy of the intervention measures appears: strong boycotts first, then weak boycotts, power politics, and, finally, trust building. Strangely enough, though, in contemporary international politics, boycotts seem to be the least popular intervention tools. This might, of course, have something to do with the difficulty of enforcing a boycott by all trading partners, due to the individual gains each partner can obtain by shirking. The other intervention policies are clearly less prone to this type of free-riding behaviour. However, by showing that (especially) a strong boycott is the most predictable and most effective policy measure to prevent conflict and non-cooperative behaviour of opposing groups, this paper clearly pleads for a reappraisal of boycotts in conflict prevention and urges both researchers and the UN to develop mechanisms to overcome free-riding problems associated with boycotts.

With Thomas Demuyneck

4.1 Introduction

The resurgence of civil conflicts after the Cold War has spurred a plethora of scientific and policy inspired literature (Collier et al. [2003]). In an attempt to organise and guide the vast literature, Sambanis [2002] provides a fundamental and exhaustive review of the major theoretical and empirical contributions in the field so far. If one thing, his review article clearly shows that more research on the causes of civil war is absolutely necessary.

Among the many and diverse analyses of the potential risk factors for civil war outbreak, there appears to be some (theoretical) agreement on the importance of economic development and state strength (Sambanis [2002]; Lacina [2004]). One of the often cited factors that relates to both underdevelopment and weak states is the dependence on (certain) natural resources. It is, indeed, hard to disregard that a considerable share of today's conflicts occurs in areas where highly valuable and easily appropriable natural resources account for a considerable share of generated income.

The two predominant academic views that link natural resources to civil war tend to disagree on the linking mechanism. Among others, Fearon [2005] stresses the role of grievances: ethnic, religious or political groups rebel against, for example, oppression or inequality and find in natural resources the means to finance rebellion. Collier and Hoeffler [2004] and the likes, on the other hand, attribute a greater role to greed, the struggle for scarce resources. However relevant the true nature of the linking mechanism may be, the fact remains that rebel groups need resources to be viable: waging war requires armed forces and weaponry. Moreover, since warfare in itself does not create economic surplus (at best, whatever one group gains, the other loses) it must extract resources from other sectors in the economy. Obviously, sectors with excess profits, such as non-contestable markets (e.g. oil or kimberlite diamond-mining), especially where property rights are ill-defined, or illegal markets (e.g. drugs production or looting), are natural candidates for such extraction.

Mineral resources, however, have played a very different role in different areas of the world (Mehlum et al. [2006]): the discovery of valuable resources in the north-eastern provinces of the DR Congo had a dramatically different effect on the country's development than a similar discovery had in Australia or Canada. They can, therefore, not account for the full story. Another feature that many contemporaneous conflicts share, is that they are predominantly fought in sub-Saharan Africa (SIPRI [1998, 1999]), and more specifically in underdeveloped rural areas with very few economic alternatives to cultivating so-called 'tropical agricultural commodities': internationally traded (and consumed) agricultural commodities (e.g. coffee or cocoa) which are predominantly produced by a large number of small farmers in rural areas, almost exclusively in developing countries.

This unenviable, but distinct, position of sub-Saharan Africa surely justifies a context

specific theoretical analysis. Therefore, like e.g. Azam [2002] and Miguel et al. [2004], we present a local analysis and focus on those parameters that in our opinion characterise a considerable share of today's war-torn sub-Saharan African areas. On the one hand, the model incorporates coercive oligopolies, a mining sector with imperfectly defined property rights. We develop a general equilibrium model where – as in Collier [2000] – we model rebel-groups as enterprises that compete for the mineral resource abundant areas. The profits that accrue to those who control the resource abundant territories allure other potential 'firms.' This entrance will last as long as the profits from operating the mines in the conquered areas exceed the costs of running a rebel organisation. In this sense, we endogenise the number of warring groups: the viable number of rebel groups follows from the equilibrium zero profit condition. Moreover, competition between the competing firms is not settled by the market (prices) for mineral rich areas but by the relative investments in arms and armed forces.

Like in the seminal paper by Grossman [1991], we stress the arbitrage between the returns from fighting and the returns from conventional economic activity: besides the mineral sector we incorporate an agrarian sector that produces tropical agricultural commodities. The context we consider, therefore, is very specific: a poorly diversified economy where mining is the only conventional employment alternative to producing a tropical agricultural commodity,¹ and where besides mining or farming, labourers can choose to join a rebel group. The relative attractiveness of one sector to another then depends on the world market prices: be it in New York or in London,² the price setting is exogenous to the local market but determines the profits and, hence, the attractiveness of the different sectors. We study how changes in the world market prices of mineral resources and tropical agricultural commodities have an impact on the investment in armed forces and weapons and on the viable number of rebel groups in a certain area. Thus, by exploring the causal link between adverse external price shocks and civil war, we attempt to fill one of the gaps in the current literature (Sambanis [2002, p. 230]).

Before discussing our main findings, it is worthwhile to briefly elaborate on a paper by Azam [2002] that is closely related to ours in spirit. Although the paper has a different focus than ours – it looks at the determinants of the levels of fighting and looting – Azam too starts from a sub-Saharan African context. He considers two ethnoregional groups that optimise their respective allocation of labour over production (farming), fighting and looting and each warlord or group's leader optimises his own group's utility. The three major aspects in which our analysis differs from his allow us to pinpoint the core specifications of our model. First, in order to allow for mineral resources to play a role, we add a productive (mining) rather than a predatory (looting) sector to the economy. Second, contrary to Azam (and the majority of contributions to this literature), we endogenise the potential number of warring groups. In our model, conflict between two

¹Our focus on such a 'restricted' labour market is inspired by the fact that many of the least developed countries (most often war-torn too) rely heavily, that is for more than half their total export earnings, on three or fewer (in most cases just one) of such (a) tropical agricultural commodities (FAO [2004]). Our analyses is, therefore, complementary to Addison [2005], who looks at the importance of agriculture for development in more general terms, i.e., he also takes those agricultural commodities for which developing countries have to compete with developed countries (like cotton, sugar, corn, etc.) into account.

²The New York Board of Trade provides the most important futures and options markets for several internationally traded agricultural commodities: cocoa, coffee, cotton, orange juice and sugar. The London Metal Exchange is the most important non-ferrous metals futures and options market.

groups is not predetermined by the core assumptions: whether conflict erupts and how many groups participate in it depends on the equilibrium conditions of the model. Finally, by incorporating their entire ethnoregional group's utility, in Azam [2002] warlords are viewed as agents that advance an entire ethnoregional group's interests, by which his model inherently carries the 'grievance factor' within it. In contrast, we allow for a 'greedy' rebel leader: although rebel groups may (or may not) evolve around ethnic lines, the rebel leader only optimises (and possibly appropriates) the rebel group's profit.

The paper has two major contributions, from which several policy recommendations derive. First, we show that international commodity prices matter for Third World civil conflict. On the one hand, the accelerated world economic development, which mainly occurred in the western world, intensified the search for natural resources. The fact that those resources happen to be abundant especially in certain underdeveloped areas in Africa implies that the costs and benefits from this modernisation³ process accrue to different parts of the world: while the western world enjoys (strong) economic development, southern countries bear the costs of the struggle for the required mineral resources. We show that the sustained economic development in First World countries may well have increased political tension in underdeveloped and mineral-rich Third World countries: the increasing demand for primary commodities makes resource-rich but poor countries very vulnerable to the struggle for those resources. In other words, sub-Saharan Africa may suffer (part of) the cost of the sustained economic advancement of the high income countries. On the other hand, we show that tropical agricultural commodity prices matter just as much: a drop in those prices increases the attractiveness of other economic assets such as minerals. High relative prices of coffee, cocoa or palm oil would, therefore, offer sub-Saharan African labourers a valuable alternative to mining and, more importantly, to the struggle for its spoils. We thus provide a theoretical mechanism through which exogenous variables such as weather shocks and climatic hazards, but also international price shocks,⁴ can have an impact on civil conflict. We show that both rising mineral prices and falling tropical agricultural commodity prices may be important determinants of rebellion and that, essentially, it is their relation that matters.

Second, we show that the *occurrence* of civil war may carry within itself a non-reversible component. If an increase of mineral prices or a decrease of tropical agricultural commodity prices (or a combination of the two) triggers civil conflict, a mere return of the prices to their pre-conflict level may not be sufficient to end the conflict. The mechanism behind this result is that a civil conflict, due to its destructive nature, lowers agricultural productivity and reduces wages in agriculture. The resulting lower equilibrium market wage increases the mining profits and, thus, lowers the threshold

³By looking at the effect of external price shocks on the sub-Saharan labour market, our model contains an element of modernisation theory (Newman [1991]).

⁴By using variation in rainfall as an instrumental variable for income growth, Miguel et al. [2004, p. 727] find that "GDP growth is significantly negatively related to the incidence of civil conflict in sub-Saharan Africa" and that this relationship is "very strong." In an extensive empirical study of politically-motivated violence in Colombia between 1988 and 2004, Dube and Vargas [2007, p. 31] show that a "higher value of [coffee] in international markets eases social unrest, while a lower value exacerbates politically-motivated violence." Furthermore, it is probably not a mere coincidence that the civil war in Côte d'Ivoire (Woods [2003]) and the genocide in Rwanda (Kamola [2007]) erupted shortly after a sharp decline in the world prices of, respectively, cocoa and coffee.

mineral price below which, or increases the tropical agricultural commodity price above which, only a single rebel group is viable.

The following policy recommendations derive from these results. First, since relative international commodity prices matter for conflict, taxing mineral resources and supporting the prices of tropical agricultural commodities may be effective instruments to end or prevent civil conflict. Moreover, our results may explain the failure of certain peace agreements (Regan [2002]; Fearon [2004]): irrespective of what policy makers or warlords agree, as long as the economic trade-off for labourers is in favour of mining or joining rebel organisations, there will always be an incentive for some new warlord or shrewd rebel commander to exploit this labour supply. Therefore, it may not always be sensible to broker a peace agreement. Furthermore, it is shown that weapon embargoes may backfire: although they can reduce the duration of an ongoing war, pre-emptive weapon embargoes may actually trigger civil conflict. Finally, and maybe most importantly, by sustaining economic diversification, local authorities and the international community can reduce Third World countries' vulnerability to fluctuating world market prices for tropical agricultural commodities and, thus, their proneness to civil conflict.

The paper is organised as follows: Section 4.2 presents the assumptions and develops the model. Sections 4.3 and 4.4 elaborate on the impact of the international prices of mineral resources and tropical agricultural commodities on, respectively, the onset and the persistence of civil conflicts. Section 4.5 analyses the effectiveness of weapon embargoes to prevent or end civil conflict, Section 4.6 extends the model to include other sectors and Section 4.7 concludes.

4.2 A benchmark model

We consider a predominantly rural area with a lack of, or ill-defined, political and property rights. We analyse the specific context where economic activity and the corresponding value added are concentrated in two sectors: small scale agriculture of an internationally traded commodity (e.g. coffee or cocoa) and artisanal mining (e.g. alluvial diamonds or coltan).

We consider an economy with N agents, where each agent supplies one unit of labour inelastically and extracts utility from his wage, w . In order to preclude corner solutions, we assume that labour supply is large enough to secure production in both the mining sector and the agricultural sector.

The agricultural sector

We assume an agricultural sector with M_a units of agricultural land. Each agricultural firm has a constant returns to scale production function $f_a(l_a, L_a) = l_a^\alpha L_a^{1-\alpha}$ with $\alpha \in]0, 1[$, where l_a is the amount of labour input and L_a the amount of agricultural land a firm uses. The price for agricultural output, p_a , is exogenously determined on international markets. If w is the wage per unit of labour and s_a the price per unit of agricultural land, then we can write the profit for an agricultural firm as:

$$\begin{aligned}\pi_a &= p_a f(l_a, L_a) - w l_a - s_a L_a \\ &= L_a (p_a f(l_a/L_a, 1) - w l_a/L_a - s_a),\end{aligned}\tag{4.1}$$

where equation (4.1) follows from the constant returns to scale production function. Each agricultural firm will optimise its profit per unit of land. The first order condition of equation (4.1) with respect to l_a/L_a determines the optimal amount of labour per unit of land, $(l_a/L_a)^*$ as a function of w and p_a :⁵

$$p_a \frac{\partial f(l_a/L_a)}{\partial (l_a/L_a)} = w \leftrightarrow \left(\frac{l_a}{L_a} \right)^* = \left(\frac{p_m \alpha}{w} \right)^{\frac{1}{1-\alpha}}. \quad (4.2)$$

Define π_a^* as the corresponding optimal profit in the agricultural sector:

$$\pi_a^* = L_a \left[p_a f \left(\left(\frac{l_a}{L_a} \right)^*, 1 \right) - w \left(\frac{l_a}{L_a} \right)^* - s_a \right]. \quad (4.3)$$

Assuming perfect competition in the agricultural sector and, therefore, zero profits in equilibrium, equation (4.3) allows us to derive the optimal price of land, s_a^* , as a function of w and p_a :

$$s_a^* = f \left(\left(\frac{l_a}{L_a} \right)^*, 1 \right) - w \left(\frac{l_a}{L_a} \right)^*. \quad (4.4)$$

With a fixed endowment of agricultural land, M_a , the total amount of labour employed in the agricultural sector will be equal to $M_a(l_a/L_a)^*$.

The mining and rebel sector

We focus on geographically concentrated mineral resources and we assume that there are M_m units of mineral abundant land to extract, say, M_m is the amount of mining sites. Mining firms are assumed to be controlled by rebel organisations who skim off the excess profits in this sector. Somewhat jumping ahead, we assume that each mining firm is owned by a single rebel group and we model the ‘contest’ for the exploitation rights of a mine as ‘civil war’ between n rebel groups (n is endogenously determined and will be modelled in Section 4.2). It is helpful to think of this competition as an alternative economic activity besides mining and farming: the rebel sector.

Output of a mining firm, i , is given by the constant returns to scale production function $f_m(l_i, t_i) = l_i^\beta (M_i t_i)^{1-\beta}$ with $\beta \in]0, 1[$, where l_i is the amount of labour and t_i the fraction of the resource abundant land that is owned by rebel group i . The output price of mineral resources, p_m , is determined on the international market and, therefore, exogenous.

Output of the rebel sector is the fraction of mineral resource rich land, t_i , that a rebel group i controls and exploits. Input for the rebellion sector consists of an army, a_i , and weaponry, g_i . We assume that the price of weapons, p_g , is determined on the international market while rebel wages are determined on the labour market. We assume that rebel groups recruit solely on the local labour market.⁶ Thus, individuals can choose

⁵Note that variables with an asterisk represent optimal values.

⁶If a rebel group hires mercenaries, we assume that these soldiers have to be paid in advance and that we can, therefore, incorporate their wages in the costs of weaponry.

between mining, farming or enrolling in a rebel army. Equilibrium on the labour market requires that individuals are indifferent to working in either sector. In equilibrium, therefore, wages are the same across all sectors: w .

A rebel group ‘produces’ war power. Let $h(a_i, g_i) = a_i^\gamma g_i^\delta$ be a rebel group’s production function, where $\gamma, \delta > 0$. The fraction of mining land that is controlled by rebel group i , t_i , is determined by its relative ‘competitiveness,’ its war power relative to the competing rebel groups, which we represent by the following competitiveness function:

$$t_i(\{a_j, g_j\}_{j \leq n}) = \frac{h(a_i, g_i)}{\sum_{j=1}^n h(a_j, g_j)}. \quad (4.5)$$

Equation (4.5) is similar to Hirshleifer’s [1995] Contest Success Function. The parameters γ and δ are the elasticities of the function h with respect to a_i and g_i . The sum of γ and δ represents what Hirshleifer [1995] calls the ‘decisiveness parameter’: the degree to which increased investments in soldiers and weapons are translated in a higher victory probability. In Section 4.2, we will further elaborate on the meaning and impact of these elasticities.

Then, assuming that there is a fixed cost F of operating and controlling a mine (shovels, sieves, small pumps, etc. on the one hand, and, for instance, recruitment costs on the other), the profits for rebel group i are given by:

$$\pi_i = p_m f_m(l_i, M_m t_i) - w l_i - w a_i - p_g g_i - F.$$

To maximise their profits, rebel groups take potential other groups’ actions as given, which generates the following first order conditions with respect to l_i , a_i and g_i :

$$w = p_m \frac{\partial f_m(l_i, M_m t_i)}{\partial l_i}, \quad (4.6)$$

$$w = p_m \frac{\partial f_m(l_i, M_m t_i)}{\partial t_i} \frac{\partial t_i}{\partial a_i}, \quad (4.7)$$

$$p_g = p_m \frac{\partial f_m(l_i, M_m t_i)}{\partial t_i} \frac{\partial t_i}{\partial g_i}. \quad (4.8)$$

Equations (4.6), (4.7) and (4.8) allow us to derive the three (implicit) equations which determine the optimal quantities: l_i^* , a_i^* and g_i^* (and t_i^*) as functions of the endogenous variables w , l_j , a_j , g_j for $j \neq i$ and the exogenous variables M_m , p_m and p_g :⁷

$$l_i^* = \left[\frac{p_m \beta}{w} \right]^{\frac{1}{1-\beta}} M_m t_i^*, \quad (4.9)$$

$$a_i^* = \frac{p_m}{w} (1 - \beta) f_m(l_i^*, M_m t_i^*) (1 - t_i^*) \gamma, \quad (4.10)$$

$$g_i^* = \frac{p_m}{p_g} (1 - \beta) f_m(l_i^*, M_m t_i^*) (1 - t_i^*) \delta. \quad (4.11)$$

We consider the symmetric case where each rebel group has the same objective function and the same optimal values of l_i^* , a_i^* and g_i^* . In that case, $t_i^* = \frac{1}{n}$, and for each rebel

⁷It can be shown that the second order conditions for a maximum are also satisfied.

group i and j , it holds that $l_j^* = l_i^*$, $a_j^* = a_i^*$ and $g_j^* = g_i^*$. The equilibrium profit for a rebel group – given the total number of competing rebel groups – can then be written as:

$$\pi_i^* = p_m f_m \left(l_i^*, M_m \frac{1}{n} \right) - w l_i^* - w a_i^* - p_g g_i^*. \quad (4.12)$$

By substituting conditions (4.9), (4.10) and (4.11) into equation (4.12), this yields:

$$\pi_i^* = M_m \frac{1}{n} p_m^{\frac{1}{1-\beta}} \left[\frac{\beta}{w} \right]^{\frac{\beta}{1-\beta}} (1-\beta) \left[1 - (\gamma + \delta) \left(1 - \frac{1}{n} \right) \right] - F. \quad (4.13)$$

Note that π_i^* depends on w , n , p_m and M_m , but not directly on p_g .

Clearing the labour market

To pinpoint the equilibrium values of l_a^* , l_i^* , a_i^* and g_i^* , we still need to determine the equilibrium wage w^* . Equilibrium on the labour market imposes the following condition:

$$N = M_a \left(\frac{l_a}{L_a} \right)^* + n (a_i^* + l_i^*). \quad (4.14)$$

The value of w for which equation (4.14) holds, determines the equilibrium wage w^* as a function of n and the exogenous variables p_a , p_m , M_a , M_m , N and p_g . If we substitute equation (4.2), (4.9) and (4.10) in condition (4.14), we obtain:

$$N = M_a \left[\frac{p_a \alpha}{w^*} \right]^{\frac{1}{1-\alpha}} + M_m \left[\frac{p_m \beta}{w^*} \right]^{\frac{1}{1-\beta}} \left[1 + \frac{1-\beta}{\beta} \gamma \left(1 - \frac{1}{n} \right) \right]. \quad (4.15)$$

First, note that equation (4.15) does not depend directly on p_g . Furthermore, it is readily seen that in order to preserve the equilibrium on the labour market, an increase in M_a , p_a , M_m or p_m will require an increase in w^* . An increase in N , on the other hand, will require a decrease of the equilibrium wage, w^* . Finally, and maybe most importantly in the context of this paper, note that if the amount of mineral resource rich land (M_m) is very small compared to the amount of agricultural land (M_a), the equilibrium market wage is mainly determined by p_a . Hence, while a change in p_a will require a large adjustment of the equilibrium wage, a change in p_m , M_a or M_m will only require minor adjustments in order to preserve the equilibrium on the labour market.

Equilibrium number of rebel groups

Substituting the equilibrium wage into equation (4.13), we can derive a rebel group's equilibrium profit as a function of n , and the exogenous variables p_m , M_m , p_a , M_a and N :

$$\pi_i^* = M_m \frac{1}{n} p_m^{\frac{1}{1-\beta}} \left[\frac{\beta}{w^*} \right]^{\frac{\beta}{1-\beta}} (1-\beta) \left[1 - (\gamma + \delta) \left(1 - \frac{1}{n} \right) \right] - F. \quad (4.16)$$

Equation (4.16) is strictly decreasing in n (see also Appendix B.1) for $n \in [1, \infty]$. Then, if we assume that positive profits for rebel organisations will attract other potential rebel groups, i.e. that n will increase as long as:

$$\pi_i^*(n) \geq 0, \quad (4.17)$$

it follows that the equilibrium/viable number of rebel groups, n^* , can be determined as the greatest integer n that still satisfies equation (4.17), and that this value is unique.⁸

Note that the equilibrium number of rebel groups, n^* , is an integer. It is, therefore, likely that rebel organisations make strictly positive profits. We assume that these excess profits accrue to the rebel leader, who is taken to be a member of the rebel army: the rebel leader receives a wage w , increased with these excess profits. Since consumption prices are exogenously determined in our model, the (potentially) resulting excess consumption of this rebel leader will not have equilibrium consequences.

The outbreak of civil war

Straightforward comparative static analysis can now reveal the potential impact of price fluctuations on the respective international markets within poor but resource-rich rural sub-Saharan African areas.

Formally, civil war requires that condition (4.17) is satisfied for some $n \geq 2$. Since, as shown in Section 4.2, profits π_i^* are decreasing in n , there will be civil war if and only if $\pi_i^* \geq 0$ for $n = 2$. Civil war, therefore, requires that:

$$\pi_i^*(2) = \underbrace{\frac{M_m}{2} \left[\frac{p_m \beta^\beta}{(w^*)^\beta} \right]^{\frac{1}{1-\beta}} (1-\beta) - F}_I - \underbrace{\frac{M_m}{2} \left[\frac{p_m \beta^\beta}{(w^*)^\beta} \right]^{\frac{1}{1-\beta}} \frac{(1-\beta)(\gamma+\delta)}{2}}_{II} \geq 0, \quad (4.18)$$

where w^* is determined by:

$$N = M_a \left[\frac{p_a \alpha}{w^*} \right]^{\frac{1}{1-\alpha}} + M_m \left[\frac{p_m \beta}{w^*} \right]^{\frac{1}{1-\beta}} \left[1 + \frac{1-\beta}{\beta} \gamma \frac{1}{2} \right]. \quad (4.19)$$

We split equation (4.18), and call Part I a rebel group's (*hypothetical*) *operational revenue*, i.e. profits a rebel group obtains without incorporating the costs of fighting:

$$\frac{M_m}{2} \left[\frac{p_m \beta^\beta}{(w^*)^\beta} \right]^{\frac{1}{1-\beta}} (1-\beta) - F = M_m p_m f_m(l_i^*, 1/2) - w^* l_i^* - F, \quad (4.20)$$

and Part II its (*hypothetical*) *operational cost*:

$$\frac{M_m}{2} \left[\frac{p_m \beta^\beta}{(w^*)^\beta} \right]^{\frac{1}{1-\beta}} \frac{(1-\beta)(\gamma+\delta)}{2} = w^* a_i^* + p_g g_i^*. \quad (4.21)$$

Observe that when $\gamma + \delta \geq 2$, $\pi_i^*(2)$ is always negative and the equilibrium number of rebel organisations will always be less than 2. Therefore, we will focus on the more interesting case where $\gamma + \delta < 2$, where conflict is not excluded by technological constraints.

Assumption 1. *Conflict is not excluded by war power-producing technologies: $\gamma + \delta < 2$.*

The subsequent sections elaborate on how some pertinent exogenous variables may influence condition (4.18) and, therefore, the potential onset/offset of civil conflict.

⁸We assume that if $\pi_i^*(1) < 0$, then $n^* = 0$.

4.3 International commodity prices

We first analyse the potential impact of fluctuations in the international prices of mineral resources and tropical agricultural commodities on civil conflict.

Mineral resources

An increase in the international prices of mineral resources (p_m) will increase $\pi_i^*(2)$ (cf. Appendix B.2) and may, therefore, trigger a civil war.

The intuition behind this result is straightforward. An increase in p_m increases both the operational costs of running a rebel organisation (equation (4.21)) and – by directly increasing the operational revenue of mining – a rebel organisation's potential income (equation (4.20)). However, by Assumption 1, we know that the first effect is smaller than the second.

Policy Implication 6. *Taxing mineral resources may be an effective tool to prevent or end civil conflict in poor but resource-rich countries.*

Low mineral resource prices reduce the risk of a civil war in rural areas with few economic alternatives. Since prices are set on international markets, the international community may agree to impose a tax on the sales of mineral resources from that country to reduce the relative attractiveness of its mining industry. It should, however, be acknowledged that, especially with easily accessible and lootable resources, tax evasion is undoubtedly a legitimate concern.

Tropical agricultural commodities

From equation (4.15) we know that a decrease in the tropical agricultural commodity prices p_a decreases the equilibrium wage w^* which, in turn, increases the potential profits for the rebel organisation, $\pi_i^*(2)$ (cf. Appendix B.3). A decrease in p_a increases the operational revenue of mining and the operational cost of a rebel organisation. However, due to Assumption 1 we know that the total increase in potential income is higher than the total increase in potential costs.

Policy Implication 7. *High(er) prices for tropical agricultural commodities can be an effective tool to prevent or end conflict in poor but resource-rich countries.*

In order to reduce its proneness to conflict, a country would favour low profits in the mining sector. It should be of interest for international policy makers that, as the current model shows, the prices for tropical agricultural commodities can serve the same goal. If, for example, the prices of mineral resources increase due to the increased demand, the price of tropical agricultural commodities remains a valuable tool to prevent the outbreak of civil conflicts. Which tool serves best will depend on the various production technologies in the economy and, probably even more so, on the implementing institution. In any case, we hope to show that, as an instrument to reduce a rural area's proneness to conflict, measures to support international prices for tropical agricultural commodities provide an alternative to taxing mineral resources.

Policy Implication 8. *Favourable international commodity prices are conducive to peace.*

4.4 The persistence of civil war

So far, the analysis was static. A civil war, however, has a devastating impact on the stocks of physical and human capital in the economy. Capital flight, the destruction of infrastructure and casualties of war, especially in the economically productive age range, reduce the economic potential of war-torn areas dramatically (Imai and Weinstein [2000]).

In order to incorporate this negative impact of civil war into our model, we allow for shifting productivity in the agricultural sector⁹ (Fulginiti et al. [2004]). During civil war we assume less capital intensive agricultural commodity production in less accessible areas (because of, e.g., hazardous transportation) with less productive labourers (children, elderly).

Assume that at time instance $v \in [0, \infty[$, civil war destroys a fraction $1 - \sigma(v)$ of the agricultural production, with $\sigma(\cdot) : [0, \infty[\rightarrow [0, 1]$. The function $\sigma(\cdot)$ represents the fraction of an economy's potential agricultural production that is actually produced. A rise in σ has similar implications as an increase of the agricultural price p_a . Therefore, by equation (4.15), an increase in σ induces an increase in the equilibrium wage w^* . Let $\dot{\sigma}(v) = \lim_{h \rightarrow 0} \frac{\sigma(v+h) - \sigma(v)}{h}$ and assume that there exists a 'lower bound' $\sigma_l \in]0, 1[$ such that:

$$\begin{cases} \dot{\sigma}(v) > 0 & \text{if and only if } n^* \leq 1 \text{ and } \sigma(v) < 1, \\ \dot{\sigma}(v) < 0 & \text{if and only if } n^* > 1 \text{ and } \sigma(v) > \sigma_l, \\ \dot{\sigma}(v) = 0 & \text{if and only if } n^* \leq 1 \text{ and } \sigma(v) = 1 \text{ or } n^* > 1 \text{ and } \sigma(v) = \sigma_l. \end{cases} \quad (4.22)$$

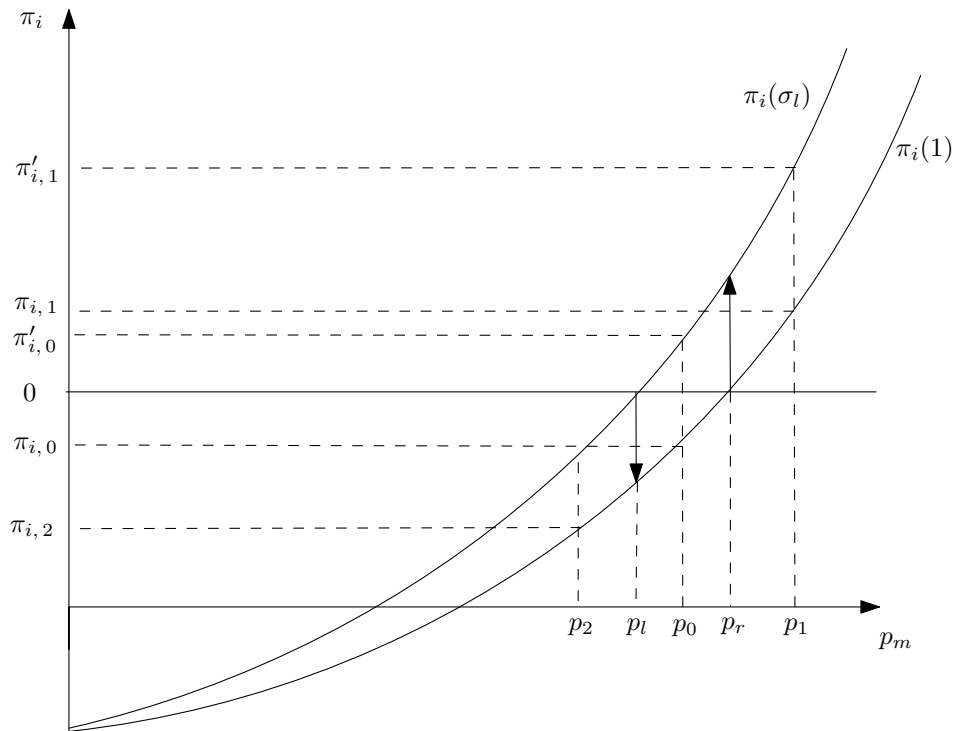
This means that $\sigma(v)$ decreases over time as long as there is a civil war (until the lower bound is reached) and increases during periods of peace. Therefore, the longer the civil war lasts, the smaller the fraction of potential output that is actually realised becomes.

The dynamics of these productivity shifts are illustrated in Figure 4.1, which displays the hypothetical profits of a rebel group when the number of rebel groups is equal to 2, i.e. equation (4.18), as a function of the price of mineral resources (p_m). $\pi_i(\sigma_l)$ and $\pi_i(1)$ show the profits of mining for the border-levels of agricultural productivity, during war and peace respectively.

Assume an increase in the price of mineral resources on the international market from p_0 to p_1 , a price which is higher than the threshold-price p_r at which rebellion shifts to be viable for more than one group. Assume, therefore, a peaceful economy where mining generates insufficient added value to support two or more rebel groups ($\pi_{i,0} < 0$) that, by the (mis?) fortunes of a price increase for mineral resources on the international market, turns into a conflict economy where two or more groups would find an interest in exploiting the mine ($\pi_{i,1} \geq 0$). The higher mineral prices increase the mining profits from $\pi_{i,0}$ to $\pi_{i,1}$ and lead to the entrance of a second rebel group. The emerging conflict causes destruction of agricultural output: the profit function gradually moves from $\pi_i(1)$ to $\pi_i(\sigma_l)$. The resulting lower mining wages then increase the profits of mining from $\pi_{i,1}$ to $\pi'_{i,1}$.

⁹Since we consider small scale/artisanal mining (cf. Section 4.2), productivity in the mining sector is assumed not to suffer from civil war.

Figure 4.1: The persistence of civil war



It is readily seen from Figure 4.1 that reversing the process will require a much greater decrease in mineral prices than a mere return to the pre-war level: a decrease in mineral prices from p_1 to p_0 keeps the mining profits above the threshold ($\pi'_{i,0} \geq 0$) and therefore does not initiate a return to the pre-war level of agricultural productivity. For peace to return, prices of minerals would have to drop below p_l , the price level at which mining does not generate enough value added to entice more than one rebel group to exploit it.

These simple dynamics demonstrate how the outbreak of civil war may be subject to 'stickiness': a price increase that leads to an outbreak of civil war will not be recovered by a mere reversing of the price increase. Moreover, the longer the war wages, the larger the decrease in mineral prices or the increase in tropical agricultural commodity prices will have to be in order to end the war.

Policy Implication 9. *The longer a war wages, the less effective international commodity prices become as an instrument to foster conditions favourable to peace.*

4.5 A weapon embargo

A weapon embargo restricts the accessibility of weapons and is likely to alter the technology of conflict. It is, therefore, an obvious and popular (DellaVigna and La Ferrara [2008]) policy instrument to deter conflict. We distinguish between an embargo's direct effect – on the rebel group's investment decision – and its indirect effect – on the level and size of destruction a war entails.

A rebel group's investment decision

Restricted access to weapons

In a strict sense, a watertight weapon embargo implies that rebel groups can not purchase weapons anymore: each rebel group therefore takes the amount $g_i = \bar{g} \leq g_i^*$ as given and optimises its expected profit with respect to l_i and a_i . Condition (4.18) then changes to:

$$\pi_i^*(2) = p_a f_m(l_i^*, 1/2)(1 - \beta - 1/2(1 - \beta)\gamma) - p_g \bar{g} - F. \quad (4.23)$$

Equation (4.23) will be larger than equation (4.18) if and only if $p_g g_i^* \geq p_g \bar{g}$, which we assume. Hence, maybe rather surprisingly, with constant scale-elasticity, instead of preventing it, a watertight weapon embargo may well lead to civil conflict: by lowering the operational costs without affecting the operational revenue, an effective embargo increases the expected profits of rebellion. Without constant scale-elasticity, the effect is undetermined.

Considering the history of weapon embargoes, however, watertightness may not be the most realistic assumption (Tierney [2005]; DellaVigna and La Ferrara [2008]). Especially in poor third world countries, where wars are primarily fought with small arms, the legal prohibition of the arms-trade is more likely to merely restrain the access to weapons and, thereby, to increase their price p_g . Surprisingly again, with constant scale-elasticity, the price of weapons has no influence on the constraint that determines the outbreak of civil war (see equation (4.18)).

Policy Implication 10. *Restricting the access to weapons is ineffective to deter civil conflict.*

Restricted war technology

A weapon embargo presumably also affects the technology of war and conflict ($\gamma + \delta$): by restricting the access to certain types of weapons, an embargo may constrain rebel groups to resort to different fighting technologies.

To see how changing war technologies may affect civil war, it is important to understand the distinction between what Hirshleifer [1995] calls defensive and offensive technologies. With offensive technologies, $\gamma + \delta$ is large, marginally more arms investments are converted in considerable war power differences and, therefore, in a considerably larger share of the mining sector. In contrast, with defensive technologies, $\gamma + \delta$ is small, differences in arms investments have a limited effect on relative war power. With the latter, therefore, rebel groups have no incentive to be large and hypothetical operational costs ($w^* a_i^* + p_g g_i^*$) will be low. This, in turn, increases the viable number of rebel groups: with defensive technologies even low hypothetical operational profits can be sufficient to trigger civil conflict. Therefore, since it is likely to impose lower – more defensive – war technologies, a weapon embargo can be expected to trigger, rather than prevent, civil conflict.

Policy Implication 11. *A weapon embargo that leads to a more defensive war technology may induce civil conflict.*

The level and size of destruction

It is highly probable that the level of σ and the size of $\dot{\sigma}$ depend on the size of a_i^*, g_i^* and on the fighting technology $\gamma + \delta$: when armies and weapon arsenals are large, and if the technology is offensive ($\gamma + \delta$ is large), we may expect a more destructive and devastating conflict and, thus, larger persistence effects of civil war.

Therefore, to the extent that a weapon embargo reduces the quantity of weapons and lowers the war technology that is available to the warring groups, it may limit the persistence of civil conflict.

Policy Implication 12. *A weapon embargo that leads to a more defensive war technology may mitigate the persistence of civil conflict.*

The impact of a weapon embargo, therefore, crucially depends on its timing: a pre-emptive embargo, by lowering the operational costs of rebellion, may actually trigger a conflict, while a reactive embargo, by limiting the destruction caused by a conflict, is likely to reduce its duration.¹⁰

4.6 Economic diversification

So far, we have considered two (productive) sectors, agriculture and mining, and have shown that the equilibrium wage w^* largely depends on the international price of the agriculture commodity, p_a . Here, we show how the model can easily be extended to incorporate multiple sectors.

Consider a sector k , which we call the manufacturing sector. A manufacturing firm uses an amount of labour, l_k , and an amount of 'manufacturing capital'¹¹ equal to c_k . We assume that the total amount of manufacturing capital available in the economy, M_k , is fixed, and that its price, s_k , is determined endogenously. Manufacturing production is determined by a constant returns to scale production function:

$$f_k(l_k, c_k) = l_k^\eta c_k^{1-\eta}.$$

We assume that the price of a manufacturing good, p_k , is determined on international markets. Therefore, profits per firm are given by:

$$\pi_k = p_k f_k(l_k, c_k) - w l_k - s_k c_k = c_k \left[f_k\left(\frac{l_k}{c_k}, 1\right) - w \frac{l_k}{c_k} - s_k \right].$$

The first-order condition with respect to l_k/c_k determines the optimal amount of labour per unit of manufacturing capital $(l_k/c_k)^*$ as a function of w and p_k :

$$\left(\frac{l_k}{c_k}\right)^* = \left(\frac{p_k \eta}{w}\right)^{\frac{1}{1-\eta}}.$$

¹⁰The net effect will be determined by a trade-off between the increase in σ due to the embargo and the upward shift in $\pi_i^*(2)$ due to a more defensive technology.

¹¹Think of manufacturing capital as the essential infrastructure, e.g. factory buildings, machinery etc., that is fixed in the short term.

The zero profit condition determines the equilibrium price of capital s_c^* . Total labour demand by the manufacturing sector is $M_k(l_k/c_k)^*$ and the equilibrium wage, w^* , is determined by the equilibrium condition on the labour market:

$$N = M_a(l_a/L_a)^* + M_k(l_k/c_k)^* + n^*(a_i^* + l_i^*). \quad (4.24)$$

It is easy to see that when p_a decreases, the resulting decrease in w^* – necessary to make the equilibrium condition binding – will be less than in our basic model. Therefore, introducing an extra sector lowers the equilibrium wage's sensitivity to a change in agricultural prices. Generalising equation (4.24), by including multiple sectors $j = 1, \dots, m$:

$$N = \sum_{j=1}^m M_j(l_j/z_j)^* + n^*(a_i^* + l_i^*),$$

where z_j is an industry-specific production factor. We demonstrate that – in this specific setting – more economic diversity lowers the equilibrium wage's sensitivity to fluctuations of a single price, p_j .

Considering the high volatility of – especially tropical – agricultural commodity prices and the much more stable prices for manufacturing goods, diversifying away from tropical agricultural commodity prices and further industrialisation are likely to reduce the conflict proneness of many, especially sub-Saharan African, rural areas.

4.7 Conclusion

We have used conventional economic analysis, a simple general equilibrium model, to analyse the potential influence of the world market prices for mineral resources and tropical agricultural commodities on civil conflict in poor sub-Saharan African countries. This analysis allows us to draw some remarkable conclusions and formulate policy recommendations.

First, the well-documented link between mineral resources and civil conflict is corroborated by our model: international market prices for mineral resources affect the opportunity costs of joining a rebel movement and, therefore, the labour market choice in many rural areas with limited alternatives on the labour market. Therefore, an increase in the prices of mineral resources can trigger civil conflict. Moreover, we show that the tropical agricultural commodity prices have an inverse, but analogous, impact on civil conflict. High or increasing tropical agricultural commodity prices reduce the attractiveness of economic activities such as, for instance, mining or rebellion: they turn farming into a valuable labour alternative for rural labourers and, thus, reduce a country's proneness to conflict. International commodity prices may, in other words, provide the international community with an instrument to foster peace in the Third World.

Consequently, our model provides an explanation for the failure of peace agreements. Unfavourable international commodity prices may make peace agreements unsustainable when the labour market alternatives are limited: when the prices of mineral resources are relatively too high to make farming a valuable alternative to predation on the mining sector, the labour market will provide new potential rebel leaders an incentive to step in, or the old rebel leaders an incentive to breach the peace agreement they

signed. Hence, for peace agreement negotiations to be worthwhile, the labour market should provide potential rebels and looters with alternative economic activities.

Furthermore, we show that, through its destructive impact on agricultural productivity, civil war perpetuates itself. For instance, a decrease in the prices of tropical agricultural commodities that triggers civil war, decreases agricultural productivity and, therefore, equilibrium market wages. These lower wages increase the profits of mining even more and increase the attractiveness of contesting the right to exploit the mine. Therefore, the necessary increase in tropical agricultural commodity prices will be larger than the initial decrease in those prices that triggered the conflict.

Maybe rather surprisingly, then, it is shown that a pre-emptive weapon embargo may actually trigger a conflict: by lowering the operational costs of rebellion, it increases its potential profits. Since, on the other hand, a weapon embargo may also reduce the duration of an ongoing conflict, the timing of its implementation is likely to affect the effectiveness of a weapon embargo.

Finally, the model establishes diversification of the economic activity as a critical instrument for deterring conflict: by reducing its dependence on (fluctuations of) the international market, and by providing its labourers with productive economic alternatives when small scale farming turns unprofitable, it reduces an area's conflict proneness. It should be clear, however, that the consequent recommendation carries beyond vulnerable countries alone: the international community, too, can contribute to such diversification. First, and probably most easily, international donor countries and agencies (the aid side) can bolster production – both agricultural and industrial – for the local market and should be wary of exacerbating Third World countries' dependence on tropical agricultural commodities. More fundamentally, however, First World agricultural policy (the trade side) could be altered in favour of a less distorted world market. It is widely acknowledged that First World export subsidies for non-tropical agricultural commodities distort agriculture in tropical areas in favour of a limited number of tropical commodities, and that so-called 'tariff escalation' (higher import duties for processed products than for raw commodities) inhibits the development of a processing sector. Therefore, by potentially nurturing civil conflict, First World agricultural policy may well impose a highly underestimated cost on resource-rich but tropical agricultural commodity dependent countries.

BIBLIOGRAPHY

Chapter 0

- Bhavnani, Ravi. "Ethnic norms and interethnic violence: accounting for the mass participation in the Rwandan genocide." *Journal of Peace Research* 43: (2006) 651–669.
- Collier, Paul. *The Bottom Billion: Why the Poorest Countries Are Failing and What Can Be Done About It*. Oxford University Press, 2007.
- Collier, Paul, and Anke Hoeffler. "Greed and grievance in civil war." *Oxford Economic Papers* 56, 4: (2004) 563–595.
- Gates, Scott. "Recruitment and Allegiance: The Microfoundations of Rebellion." *Journal of Conflict Resolution* 46, 1: (2002) 111–130.
- Gurr, Ted Robert. "Peoples Against States: Ethnopolitical Conflict and the Changing World System: 1994 Presidential Address." *International Studies Quarterly* 38, 3: (1994) 347–377.
- Robinson, James A. "Social Identity, Inequality and Conflict." *Economics of Governance* 2, 1: (2001) 85–99.
- Roemer, John E. "Rationalizing Revolutionary Ideology." *Econometrica* 53, 1: (1985) 85–108.

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- Alesina, Alberto, Reza Baqir, and William Easterly. "Public Goods and Ethnic Divisions." *Quarterly Journal of Economics* CXIV, 4: (1999) 1243–1284.
- Alesina, Alberto, and Eliana La Ferrara. "Ethnic Diversity and Economic Performance." *Journal of Economic Literature* 43, 3: (2005) 762–800.
- Banton, Michael. "Ethnic Conflict." *Sociology* 34, 3: (2000) 481–498.
- Bates, Robert H. *State versus Ethnic Claims: African Policy Dilemmas*, Boulder: Westview Press, 1983, chapter Modernization, Ethnic Competition, and the Rationality of Politics in Africa, 152–171.
- Brass, Paul R. *Theft of an Idol: Text and Context in the Representation of Collective Violence*. Princeton University Press, NJ, 1997.
- Carter, Sean. "Mobilising generosity, framing geopolitics: Narrating crisis in the homeland through diasporic media." *Geoforum* 38: (2007) 1102–1112.
- Chandra, Kanchan. "What is ethnic identity and does it matter?" *Annual Review of Political Science* 9, 1: (2006) 397–424.

- Chrétien, Jean-Pierre. "There is no ethnic war in Rwanda, the truth behind the Hutu and Tutsi distinction." *Histoire* 180: (1994) 70–73.
- Collier, Paul. "Ethnicity, Politics and Economic Performance." *Economics and Politics* 12, 3: (2000) 225–245.
- . *The Bottom Billion: Why the Poorest Countries Are Failing and What Can Be Done About It*. Oxford University Press, 2007.
- Collier, Paul, and Jan Willem Gunning. "Explaining African Economic Performance." *Journal of Economic Literature* 37, 1: (1999) 64–111.
- Collier, Paul, and Anke Hoeffler. "On economic causes of civil war." *Oxford Economic Papers* 50, 4: (1998) 563–573.
- . "Greed and grievance in civil war." *Oxford Economic Papers* 56, 4: (2004) 563–595.
- Connor, Walker. "Politics of Ethnonationalism." *Journal of International Affairs* 27: (1973) 1–21.
- Crawford, Beverly, and Ronnie D. Lipschutz. *The Myth of "Ethnic Conflict": Politics, Economics, and Cultural Violence*. University of California, International and Area Studies, 1999.
- de Figueiredo Jr., Rui J.P., and Barry R. Weingast. *Civil Wars, Insecurity and Intervention*, Columbia University Press New York, 1999, chapter The Rationality of Fear: Political Opportunism and Ethnic conflict, 261–302.
- Des Forges, Alison. *Leave None to Tell the Story: Genocide in Rwanda*. London, New York: Human Rights Watch, 1999.
- Easterly, William, and Ross Levine. "Africa's Growth Tragedy: Policies and Ethnic Divisions." *Quarterly Journal of Economics* CXII, 4: (1997) 1203–1250.
- Elster, Jon. "Rationality and the Emotions." *The Economic Journal* 106, 438: (1996) 1386–1397.
- Eriksson, John. *The International Response to Conflict and Genocide: Lessons from the Rwanda Experience*. Steering Committee of the Joint Evaluation of Emergency Assistance to Rwanda, 1996.
- Fearon, James D. "What is identity (as we now use the word)?", 1999. Unpublished manuscript, Stanford University, Calif.
- Fearon, James D., and David D. Laitin. "Ordinary Language and External Validity: Specifying Concepts in the Study of Ethnicity." Presented at the Annual Meetings of the American Political Science Association, Washington, D.C., 2000a.
- . "Violence and the Social Construction of Ethnic Identity: Review Essay." *International Organization* 54, 4: (2000b) 845–877.

- . "Ethnicity, Insurgency, and Civil War." *The American Political Science Review* 97, 1: (2003) 75–90.
- Gellner, Ernest. *Nations and Nationalism*. NY: Cornell University Press, 1983.
- Gilley, Bruce. "Against the concept of ethnic conflict." *Third World Quarterly* 25: (2004) 1155–1166.
- Griffin, Michèle. "Where Angels Fear to Tread: Trends in International Intervention." *Security Dialogue* 31, 4: (2000) 421–435.
- Hale, Henry E. "Explaining Ethnicity." *Comparative Political Studies* 37, 4: (2004) 458–485.
- Hintjens, Helen M. "When Identity Becomes a Knife: Reflecting on the Genocide in Rwanda." *Ethnicities* 1, 1: (2001) 25–55.
- Horowitz, Donald L. *Ethnic Groups in Conflict*. Berkeley, CA: University of California Press, 1985.
- Jehl, Douglas. "Officials Told to Avoid Calling Rwanda Killings 'Genocide'." *The New York Times* Op-Ed, June 10th.
- Jervis, Robert. "Cooperation Under the Security Dilemma." *World Politics* 30, 2: (1978) 167–214.
- Kamola, Isaac A. "The global coffee economy and the production of genocide in Rwanda." *Third World Quarterly* 28, 3: (2007) 571–592.
- Kapuściński, Ryszard. *The Shadow of the Sun*. Penguin Books, 2001.
- Kaufman, Stuart J. *Modern Hatreds: The Symbolic Politics of Ethnic War*. Cornell University Press, 2001.
- . "Symbolic Politics or Rational Choice? Testing Theories of Extreme Ethnic Violence." *International Security* 30: (2006) 45–86.
- King, Charles, and Neil J. Melvin. "Diaspora Politics - Ethnic Linkages, Foreign Policy, and Security in Eurasia." *International Security* 24: (1999) 108–138.
- Kuran, Timur. *The International Spread of Ethnic Conflict: Fear, Diffusion, and Escalation*, Princeton University Press, 1998, chapter Ethnic dissimilation and its international diffusion, 35–60.
- Lake, David A., and Donald Rothchild. "Containing Fear: The Origins and Management of Ethnic Conflict." *International Security* 21, 2: (1996) 41–75.
- Le Vine, Victor T. "Conceptualizing "Ethnicity" and "ethnic conflict": A controversy revisited." *Studies in Comparative International Development* 32: (1997) 45–75.
- MacGaffey, Wyatt. "African History, Anthropology, and the Rationality of Natives." *History in Africa* 5: (1978) 101–120.

- Maquet, Jacques. *Le système des relations sociales dans le Rwanda ancien*. Tervuren (Belgium): Musée Royal de l'Afrique Centrale, 1954.
- Maren, Michael. "Using Food as a Weapon." *The New York Times* Op-Ed, December 2nd.
- Montalvo, José Garcia, and Marta Reynal-Querol. "Ethnic diversity and economic development." *Journal of Development Economics* 76, 2: (2005a) 293–323.
- . "Ethnic Polarization, Potential Conflict, and Civil Wars." *American Economic Review* 95, 3: (2005b) 796–816.
- Mueller, John. "The Banality of "Ethnic War"." *International Security* 25, 1: (2000) 42–70.
- Newbury, Catharine. "Background to Genocide: Rwanda." *Issue: A Journal of Opinion* 23, 2: (1995) 12–17.
- Newbury, Catharine, and David S. Newbury. "A Catholic Mass in Kigali: Contested Views of the Genocide and Ethnicity in Rwanda." *Canadian Journal of African Studies / Revue Canadienne des Études Africaines* 33, 2/3: (1999) 292–328.
- Newbury, Catherine. *The Cohesion of Oppression: Clientship and Ethnicity in Rwanda, 1860–1960*. University Presses of California, Columbia and Princeton, 1993.
- Newbury, David. "Understanding Genocide." *African Studies Review* 41, 1: (1998) 73–97.
- Newman, Saul. "Does Modernization Breed Ethnic Political Conflict?" *World Politics* 43, 3: (1991) 451–478.
- Ngaruko, Floribert, and Janvier D. Nkurunziza. "An Economic Interpretation of Conflict in Burundi." *Journal of African Economies* 9, 3: (2000) 370–409.
- Platteau, Jean-Philippe. "Institutional Obstacles to African Economic Development: State, Ethnicity, and Custom." Forthcoming in the *Journal of Economic Behavior & Organization*, 2008.
- Posen, Barry R. "The Security Dilemma and Ethnic Conflict." *Survival* 35: (1993) 27–47.
- Prunier, Gérard. *The Rwanda Crisis: History of a Genocide*. New York: Columbia University Press, 1995.
- Rosenthal, Andrew. "Bush Urges U.N. to Back Force to Get Aid to Bosnia." *The New York Times* .
- Sadowski, Yahya. "Ethnic Conflict." *Foreign Policy* Nr. 111, 111: (1998) 12–23.
- Sanders, Edith R. "The Hamitic Hypothesis; Its Origin and Functions in Time Perspective." *The Journal of African History* 10, 4: (1969) 521–532.
- Sears, David O., Carl P. Hensler, and Leslie K. Speer. "Whites' Opposition to "Busing": Self-Interest or Symbolic Politics?" *The American Political Science Review* 73, 2: (1979) 369–384.

- Shils, Edward. "Primordial, Personal, Sacred and Civil Ties: Some Particular Observations on the Relationships of Sociological Research and Theory." *The British Journal of Sociology* 8, 2: (1957) 130–145.
- Snyder, Jack. "Nationalism and the Crisis of the Post-Soviet State." *Survival* 35: (1993) 5–26.
- Taylor, Christopher C. "Dual Systems in Rwanda: Have they ever really existed?" *Anthropological Theory* 4, 3: (2004) 353–371.
- Uvin, Peter. "Ethnicity and Power in Burundi and Rwanda: Different Paths to Mass Violence." *Comparative Politics* 31: (1999) 253–271.
- Van Evera, Stephen. "Primordialism Lives!" *apsa-cp: Newsletter of the Organized Section in Comparative Politics of the American Political Science Association* 12: (2001) 20–22.
- Vansina, Jan. *Antecedents to Modern Rwanda: The Nyiginya Kingdom*. The University of Wisconsin Press, 2005.
- de Waal, Alex. "Group identity, rationality, and the state." *Critical Review* 11, 2: (1997) 279–289.
- Waters, Tony. "Tutsi Social Identity in Contemporary Africa." *The Journal of Modern African Studies* 33, 2: (1995) 343–347.
- Wharton Jr., Clifton R. "The Nightmare in Central Africa." *The New York Times* Op-Ed, April 9th.
- Young, Crawford. "The Temple of Ethnicity." *World Politics* 35, 4: (1983) 652–662.
- Young, Crawford, and Mustafa Kemal Mirzeler. "Rethinking African Politics: An Interview with Crawford Young." *African Studies Review* 45, 1: (2002) 103–114.

Chapter 2

- Addison, Tony, Philippe Le Billon, and Mansoob S. Murshed. "Conflict in Africa: The Cost of Peaceful Behaviour." *Journal of African Economies* 11, 3: (2002) 365–386.
- André, Catherine, and Jean-Philippe Platteau. "Land Relations under Unbearable Stress: Rwanda Caught in the Malthusian Trap." *Journal of Economic Behavior & Organization* 34, 1: (1998) 1–47.
- Auty, Richard M. "The Political Economy of Resource-Driven Growth." *European Economic Review* 45, 4–6: (2001) 839–846.
- Azam, Jean-Paul. "Looting and Conflict between Ethnoregional Groups: Lessons for State Formation in Africa." *Journal of Conflict Resolution* 46, 1: (2002) 131–153.
- Banton, Michael. "Ethnic Conflict." *Sociology* 34, 3: (2000) 481–498.

- Bhavnani, Ravi. "Ethnic norms and interethnic violence: accounting for the mass participation in the Rwandan genocide." *Journal of Peace Research* 43: (2006) 651–669.
- Brakman, Steven, Harry Garretsen, and Marc Schramm. "The strategic bombing of German cities during World War II and its impact on city growth." *Journal of Economic Geography* 4, 2: (2004) 201–218.
- Brogan, Patrick. *World Conflicts: Why and Where They Are Happening (Second Edition)*. Bloomsbury, London, 1989.
- Collier, Paul. "On the Economic Consequences of Civil War." *Oxford Economic Papers* 51, 1: (1999) 168–183.
- Collier, Paul, and Anke Hoeffler. "On economic causes of civil war." *Oxford Economic Papers* 50, 4: (1998) 563–573.
- . "Greed and grievance in civil war." *Oxford Economic Papers* 56, 4: (2004) 563–595.
- . "Resource Rents, Governance, and Conflict." *Journal of Conflict Resolution* 49, 4: (2005) 625–633.
- Collier, Paul, Anke Hoeffler, and Måns Söderbom. "On the Duration of Civil War." *Journal of Peace Research* 41, 3: (2004) 253–273.
- Davis, Donald R., and David E. Weinstein. "Bones, Bombs, and Break Points: The Geography of Economic Activity." *American Economic Review* 92, 5: (2002) 1269–1289.
- Fearon, James D. "Primary Commodity Exports and Civil War." *Journal of Conflict Resolution* 49, 4: (2005) 483–507.
- Fearon, James D., and David D. Laitin. "Ethnicity, Insurgency, and Civil War." *The American Political Science Review* 97, 1: (2003) 75–90.
- Fenton, Steve. "Beyond Ethnicity: The Global Comparative Analysis of Ethnic Conflict." *International Journal of Comparative Sociology* 45, 3-4: (2004) 179–194.
- Goldsmith, Paul, Lydia A. Abura, and Jason Switzer. "Oil and Water in Sudan." In *Scarcity and Surfeit, The Ecology of Africa's Conflicts*, edited by Jeremy Lind, and Kathryn Sturman, Institute for Security Studies, South Africa, 2002, 186 – 241.
- Guidolin, Massimo, and Eliana La Ferrara. "Diamonds Are Forever, Wars Are Not: Is Conflict Bad for Private Firms?" *American Economic Review* 97, 5: (2007) 1978–1993.
- Hirshleifer, Jack. "The Analytics of Continuing Conflict." *Synthese* 76, 2: (1988) 201–233.
- . "Anarchy and Its Breakdown." *Journal of Political Economy* 103, 1: (1995) 26–52.
- Horowitz, Donald L. *Ethnic Groups in Conflict*. Berkeley, CA: University of California Press, 1985.
- Humphreys, Macartan. "Natural Resources, Conflict, and Conflict Resolution: Uncovering the Mechanisms." *Journal of Conflict Resolution* 49, 4: (2005) 508 – 537.

- Le Billon, Philippe. "The political ecology of war: natural resources and armed conflicts." *Political Geography* 20, 5: (2001) 561–584.
- Lujala, Päivi, Nils Petter Gleditsch, and Elisabeth Gilmore. "A Diamond Curse? Civil War and a Lootable Resource." *Journal of Conflict Resolution* 49, 4: (2005) 538–562.
- Malhotra, Deepak K., and Sumanasiri Liyanage. "Long-Term Effects of Peace Workshops in Protracted Conflicts." *Journal of Conflict Resolution* 49, 6: (2005) 908–924.
- Miguel, Edward, and Gérard Roland. "The Long Run Impact of Bombing Vietnam." Mimeo, 2006.
- Miguel, Edward, Shanker Satyanath, and Ernest Sergenti. "Economic Shocks and Civil Conflict: An Instrumental Variables Approach." *Journal of Political Economy* 112, 4: (2004) 725–753.
- Montague, Dena. "Stolen Goods: Coltan and Conflict in the Democratic Republic of Congo." *SAIS Review* XXII, 1: (2002) 103–118.
- Montalvo, José Garcia, and Marta Reynal-Querol. "Ethnic Polarization, Potential Conflict, and Civil Wars." *American Economic Review* 95, 3: (2005) 796–816.
- Moyroud, Celine, and John Katunga. "Coltan Exploration in Eastern Democratic Republic of the Congo." In *Scarcity and Surfeit, The Ecology of Africa's Conflicts*, edited by Jeremy Lind, and Kathryn Sturman, Institute for Security Studies, South Africa, 2002, 157 – 185.
- Mueller, John. "The Banality of "Ethnic War"." *International Security* 25, 1: (2000) 42–70.
- Neary, Hugh M. "Equilibrium Structure in an Economic Model of Conflict." *Economic Inquiry* 35, 3: (1997) 480–494.
- Pryor, Frederic L. "The plantation economy as an economic system." *Journal of Comparative Economics* 6, 3: (1982) 288–317.
- Regan, Patrick M. "Third-Party Interventions and the Duration of Intrastate Conflicts." *Journal of Conflict Resolution* 46, 1: (2002) 55–73.
- Renner, Michael. *The Anatomy of Resource Wars*. Worldwatch Paper # 162, 2002.
- Robinson, James A. "Social Identity, Inequality and Conflict." *Economics of Governance* 2, 1: (2001) 85–99.
- Roemer, John E. "Rationalizing Revolutionary Ideology." *Econometrica* 53, 1: (1985) 85–108.
- Ron, James. "Paradigm in Distress? Primary Commodities and Civil War." *Journal of Conflict Resolution* 49, 4: (2005) 443–450.
- Ross, Michael L. "Oil, Drugs, and Diamonds: How Do Natural Resources Vary in their Impact on Civil War?" In *Beyond Greed and Grievance: The Political Economy of Armed Conflict*, Lynne Rienner Publishers, 2003.

- . “How Do Natural Resources Influence Civil War? Evidence from Thirteen Cases.” *International Organization* 58, 1: (2004) 35–67.
- Rwanda, Media Case. “International Law – Genocide – U.N. Tribunal. Prosecutor v. Nahimana, Barayagwiza, Ngeze (Media Case). Case No. ICTR-99-52-T (Int’l Crim. Trib. for Rwanda Trial Chamber I Dec. 3, 2003).” *Harvard Law Review* 117, 8: (2004) 2769–2776.
- Sachs, Jeffrey D., and Andrew M. Warner. “The Curse of Natural Resources.” *European Economic Review* 45, 4–6: (2001) 827–838.
- Schollaert, Arne, and Dirk Van de gaer. “Boycotts, power politics or trust building: how to prevent conflict?” *Journal of Institutional and Theoretical Economics* 164, 2: (2008) 356–379.
- Skaperdas, Stergios. “Cooperation, Conflict, and Power in the Absence of Property Rights.” *American Economic Review* 82, 4: (1992) 720–739.
- Smillie, Ian, Lansana Gberie, and Ralph Hazleton. *The Heart of the Matter: Sierra Leone, Diamonds and Human Security*. Partnership Africa Canada, 2000.
- Switzer, Jason. “Oil and Violence in Sudan.” *International Institute for Sustainable Development Case studies*: (2002) 1–19.
- Uvin, Peter. “Tragedy in Rwanda: The political ecology of conflict.” *Environment* 38, 3: (1996) 6–17.
- . “Prejudice, Crisis, and Genocide in Rwanda.” *African Studies Review* 40, 2: (1997) 91–115.
- Weingast, Barry R. “Constructing Trust: The Political and Economic Roots of Ethnic and Regional Conflicts.” In *Institutions and Social Order*, edited by Karol Sołtan, Eric M. Uslaner, and Virginia Haufler, Ann Arbor, The University of Michigan Press, 1998, 163–200.
- Wood, Elisabeth J. “Modeling Robust Settlements To Civil War: Indivisible Stakes And Distributional Compromises.”, 2003. Santa Fe Institute, Working Paper 03-10-056.

Chapter 3

- Azam, Jean-Paul, Paul Collier, and Anke Hoeffler. “International policies on civil conflict: an economic perspective.” *Unpublished Working Paper*.
- Betts, Richard K. “The Delusion of Impartial Intervention.” *Foreign Affairs* 73, 6: (1994) 20–33.
- Boyce, James K. “Aid Conditionality as a Tool for Peacebuilding: Opportunities and Constraints.” *Development and Change* 33, 5: (2002) 1025–1048.

- DellaVigna, Stefano, and Eliana La Ferrara. "Detecting Illegal Arms Trade." Mimeo, 2008.
- Doyle, Michael W., and Nicholas Sambanis. "International Peacebuilding: A Theoretical and Quantitative Analysis." *American Political Science Review* 94, 4: (2000) 779–801.
- Gates, Scott. "Recruitment and Allegiance: The Microfoundations of Rebellion." *Journal of Conflict Resolution* 46, 1: (2002) 111–130.
- Hirshleifer, Jack. "The Analytics of Continuing Conflict." *Synthese* 76, 2: (1988) 201–233.
- . "The Paradox of Power." *Economics and Politics* 3, 3: (1991) 177–200.
- . "Anarchy and Its Breakdown." *Journal of Political Economy* 103, 1: (1995) 26–52.
- Kydd, Andrew. "Trust, Reassurance, and Cooperation." *International Organization* 54, 2: (2000) 325–357.
- Leeson, Peter T. "Endogenizing fractionalization." *Journal of Institutional Economics* 1, 1: (2005) 75–98.
- . "Balkanization and Assimilation: Examining the Effects of State-Created Homogeneity." *Review of Social Economy* 65, 2: (2007) 141–164.
- Mandell, Brian S. "Getting to Peacekeeping in Principal Rivalries." *Journal of Conflict Resolution* 40, 2: (1996) 238–271.
- Maxwell, John W., and Rafael Reuveny. "Continuing conflict." *Journal of Economic Behavior & Organization* 58, 1: (2005) 30–52.
- Montague, Dena. "Stolen Goods: Coltan and Conflict in the Democratic Republic of Congo." *SAIS Review* XXII, 1: (2002) 103–118.
- Murdoch, James C., and Todd Sandler. "Economic Growth, Civil Wars, and Spatial Spillovers." *Journal of Conflict Resolution* 46, 1: (2002) 91–110.
- Neary, Hugh M. "Equilibrium Structure in an Economic Model of Conflict." *Economic Inquiry* 35, 3: (1997) 480–494.
- Porsholt, Lars. "On Methods of Conflict Prevention." *Journal of Peace Research* 3, 2: (1966) 178–193.
- Regan, Patrick M. "Conditions of Successful Third-Party Intervention in Intrastate Conflicts." *Journal of Conflict Resolution* 40, 2: (1996) 336–359.
- . "Choosing to Intervene: Outside Interventions in Internal Conflicts." *Journal of Politics* 60, 3: (1998) 754–779.
- Robinson, James A. "Social Identity, Inequality and Conflict." *Economics of Governance* 2, 1: (2001) 85–99.

- Samset, Ingrid. "Conflict of Interests or Interests in Conflict? Diamonds & War in the DRC." *Review of African Political Economy* No. 93/94: (2002) 463–480.
- Schollaert, Arne, and Dirk Van de gaer. "Natural resources and internal conflict." Mimeo, 2008.
- Skaperdas, Stergios. "Cooperation, Conflict, and Power in the Absence of Property Rights." *American Economic Review* 82, 4: (1992) 720–739.
- Smillie, Ian, Lansana Gberie, and Ralph Hazleton. *The Heart of the Matter: Sierra Leone, Diamonds and Human Security*. Partnership Africa Canada, 2000.

Chapter 4

- Addison, Tony. "Agricultural Development for Peace." *WIDER Research Paper* No. 2005/07: (2005) 17.
- Azam, Jean-Paul. "Looting and Conflict between Ethnoregional Groups: Lessons for State Formation in Africa." *Journal of Conflict Resolution* 46, 1: (2002) 131–153.
- Collier, Paul. "Rebellion as a Quasi-Criminal Activity." *Journal of Conflict Resolution* 44, 6: (2000) 839–853.
- Collier, Paul, V. L. Elliott, Havard Hegre, Anke Hoeffler, Marta Reynal-Querol, and Nicholas Sambanis. *Breaking the Conflict Trap: Civil War and Development Policy*. A World Bank Policy Research Report. Copublication with Oxford University Press, 2003.
- Collier, Paul, and Anke Hoeffler. "Greed and grievance in civil war." *Oxford Economic Papers* 56, 4: (2004) 563–595.
- DellaVigna, Stefano, and Eliana La Ferrara. "Detecting Illegal Arms Trade." Mimeo, 2008.
- Dube, Oeindrila, and Juan F. Vargas. "Are all Resources Cursed? Coffee, Oil, and Armed Conflict in Colombia." *Weatherhead Center for International Affairs, Harvard University, Working Paper* 2007-1: (2007) 1–53.
- FAO. *The State of Agricultural Commodity Markets (SOCO)*. Commodities and Trade Division, Food and Agriculture Organization of the United Nations, 2004.
- Fearon, James D. "Why Do Some Civil Wars Last So Much Longer than Others?" *Journal of Peace Research* 41, 3: (2004) 275–301.
- . "Primary Commodity Exports and Civil War." *Journal of Conflict Resolution* 49, 4: (2005) 483–507.
- Fulginiti, Lilyan E., Richard K. Perrin, and Bingxin Yu. "Institutions and agricultural productivity in Sub-Saharan Africa." *Agricultural Economics* 31, 2-3: (2004) 169–180.
- Grossman, Herschel I. "A General Equilibrium Model of Insurrections." *American Economic Review* 81, 4: (1991) 912–921.

- Hirshleifer, Jack. "Anarchy and Its Breakdown." *Journal of Political Economy* 103, 1: (1995) 26–52.
- Imai, Kosuke, and Jeremy M. Weinstein. "Measuring the Economic Impact of Civil War." CID Working Papers 51, Center for International Development at Harvard University, 2000.
- Kamola, Isaac A. "The global coffee economy and the production of genocide in Rwanda." *Third World Quarterly* 28, 3: (2007) 571–592.
- Lacina, Bethany. "From Side Show to Centre Stage: Civil Conflict after the Cold War." *Security Dialogue* 35, 2: (2004) 191–205.
- Mehlum, Halvor, Karl Moene, and Ragnar Torvik. "Cursed by Resources or Institutions?" *The World Economy* 29, 8: (2006) 1117–1131.
- Miguel, Edward, Shanker Satyanath, and Ernest Sergenti. "Economic Shocks and Civil Conflict: An Instrumental Variables Approach." *Journal of Political Economy* 112, 4: (2004) 725–753.
- Newman, Saul. "Does Modernization Breed Ethnic Political Conflict?" *World Politics* 43, 3: (1991) 451–478.
- Regan, Patrick M. "Third-Party Interventions and the Duration of Intrastate Conflicts." *Journal of Conflict Resolution* 46, 1: (2002) 55–73.
- Sambanis, Nicholas. "A Review of Recent Advances and Future Directions in the Quantitative Literature on Civil War." *Defence and Peace Economics* 13, 3: (2002) 215–243.
- SIPRI. *Yearbook of Armaments, Disarmament and International Security*. Stockholm International Peace Research Institute, 1998.
- . *Yearbook of Armaments, Disarmament and International Security*. Stockholm International Peace Research Institute, 1999.
- Tierney, Dominic. "Irrelevant or malevolent? UN arms embargoes in civil wars." *Review of International Studies* 31: (2005) 645–664.
- Woods, Dwayne. "The tragedy of the cocoa pod: rent-seeking, land and ethnic conflict in Ivory Coast." *The Journal of Modern African Studies* 41, 4: (2003) 641–656.

A.1 Proof of Theorem 1

Let group $H \in \{K, L\}$ play strategy $X, Z \in \{C, F\}$. Let $u_H(X, Z)$ be the average payoff of a member of an opportunistic group H if group K plays strategy X and group L plays strategy Z .

- (a) First we consider equilibria in pure strategies. Player K will cooperate (fight) if and only if the expected advantage of cooperating is larger (smaller) than the expected advantage of fighting: K chooses C (F) \Leftrightarrow

$$\begin{aligned} & \left[\pi_g^L + (1 - \pi_g^L) \pi_{c|o}^L \right] u_K(C, C) + (1 - \pi_g^L)(1 - \pi_{c|o}^L) u_K(C, F) \\ & \geq (<) \left[\pi_g^L + (1 - \pi_g^L) \pi_{c|o}^L \right] u_K(F, C) + (1 - \pi_g^L)(1 - \pi_{c|o}^L) u_K(F, F) \\ \Leftrightarrow & \left[\pi_g^L + (1 - \pi_g^L) \pi_{c|o}^L \right] \left[Y - \frac{1}{\alpha} \delta_1 Y + c \right] \\ & \geq (<) (1 - \pi_g^L)(1 - \pi_{c|o}^L) \left[\frac{\rho}{\alpha} \delta_1 \delta_2 Y - c \right]. \end{aligned} \quad (\text{A.1})$$

For player L we obtain a similar result: L chooses C (F) \Leftrightarrow

$$\begin{aligned} & \left[\pi_g^K + (1 - \pi_g^K) \pi_{c|o}^K \right] \left[Y - \frac{1}{1 - \alpha} \delta_1 Y + c \right] \\ & \geq (<) (1 - \pi_g^K)(1 - \pi_{c|o}^K) \left[\frac{1 - \rho}{1 - \alpha} \delta_1 \delta_2 Y - c \right]. \end{aligned} \quad (\text{A.2})$$

A first equilibrium is the cooperative equilibrium: $\pi_{c|o}^L = \pi_{c|o}^K = 1$. With K choosing C and $\pi_{c|o}^L = 1$, (A.1) requires that:

$$Y - \frac{1}{\alpha} \delta_1 Y + c \geq 0 \quad \Leftrightarrow \quad \delta_1 \leq \delta_{1,K}.$$

Similarly, with L choosing C and $\pi_{c|o}^K = 1$, (A.2) yields:

$$Y - \frac{1}{1 - \alpha} \delta_1 Y + c \geq 0 \quad \Leftrightarrow \quad \delta_1 \leq \delta_{1,L}.$$

A second equilibrium is the fighting equilibrium: $\pi_{c|o}^L = \pi_{c|o}^K = 0$. In this case statements (A.1) and (A.2) show that the sign of the inequalities has to be reversed. Reversed inequality (A.1) with $\pi_{c|o}^L = 0$ requires:

$$\begin{aligned} & \pi_g^L \left[Y - \frac{1}{\alpha} \delta_1 Y + c \right] < (1 - \pi_g^L) \left[\frac{\rho}{\alpha} \delta_1 \delta_2 Y - c \right] \\ \Leftrightarrow & (1 - \pi_g^L) \frac{\rho}{\alpha} \delta_1 \delta_2 Y > \pi_g^L \left[Y - \frac{1}{\alpha} \delta_1 Y \right] + c \Leftrightarrow \delta_2 > \delta_{2,K}. \end{aligned}$$

Similarly, the reversed inequality (A.2) with $\pi_{c|o}^K = 0$ requires that: $\delta_2 > \delta_{2,L}$.

In the third pure strategy equilibrium, group K fights, while group L cooperates: $\pi_{c|o}^K = 0$ and $\pi_{c|o}^L = 1$. It is easy to verify that this requires $\delta_1 > \delta_{1,K}$ and $\delta_2 \leq \delta_{2,L}$. The final equilibrium in pure strategies is the one in which group K cooperates and group L fights. This happens if and only if $\delta_2 \leq \delta_{2,K}$ and $\delta_1 > \delta_{1,L}$.

(b) The expected utility of player K when his strategy is $p_{c|o}^K$ is:

$$\begin{aligned} E(u) &= p_{c|o}^K \left[\pi_g^L + (1 - \pi_g^L) \pi_{c|o}^L \right] Y \\ &\quad + \left(1 - p_{c|o}^K \right) \left[\pi_g^L + (1 - \pi_g^L) \pi_{c|o}^L \right] \left[\frac{1}{\alpha} \delta_1 Y - c \right] \\ &\quad + \left(1 - p_{c|o}^K \right) (1 - \pi_g^L) (1 - \pi_{c|o}^L) \left[\frac{\rho}{\alpha} \delta_1 \delta_2 Y - c \right]. \end{aligned}$$

Mixed strategy equilibria are interior solutions. Therefore, they satisfy the first order condition: $\partial E(u) / \partial p_{c|o}^K = 0 \Leftrightarrow$

$$\left[\pi_g^L + (1 - \pi_g^L) \pi_{c|o}^L \right] \left[Y - \frac{1}{\alpha} \delta_1 Y + c \right] - (1 - \pi_g^L) (1 - \pi_{c|o}^L) \left[\frac{\rho}{\alpha} \delta_1 \delta_2 Y - c \right] = 0.$$

This yields:

$$\pi_{c|o}^L (1 - \pi_g^L) [\alpha - \delta_1 + \rho \delta_1 \delta_2] = \left(\rho \delta_1 \delta_2 - \alpha \frac{c}{Y} \right) - \pi_g^L [\alpha - \delta_1 + \rho \delta_1 \delta_2]. \quad (\text{A.3})$$

Equating $\pi_{c|o}^L$ to $p_{c|o}^L$ and solving expression (A.3) yields the expression for $p_{c|o}^L$ given in the theorem. It can be verified that for the probability $p_{c|o}^L$ to lie between zero and one, either $\delta_1 > \delta_{1,K}$ and $\delta_2 < \delta_{2,K}$ or $\delta_1 < \delta_{1,K}$ and $\delta_2 > \delta_{2,K}$ must hold.

The result for $p_{c|o}^K$ can be obtained analogously. A similar reasoning then shows that $0 < p_{c|o}^K < 1$ holds if either $\delta_1 > \delta_{1,L}$ and $\delta_2 < \delta_{2,L}$, or $\delta_1 < \delta_{1,L}$ and $\delta_2 > \delta_{2,L}$ hold.

A.2 Proof of Corollary 5

From Theorem 1 (b), mixed strategy equilibria can, in principle, arise in three cases. First, in areas where 1 (ii) and 2 (ii) hold true. In that case the necessary and sufficient conditions of the same theorem, part (a) for pure strategy equilibria of type (C, C) and (F, F) are satisfied. Second, in areas where 1 (i) and 2 (i) hold true, the conditions for pure strategy equilibria of type (F, C) and (C, F) are met. Third, in areas where 1 (i) and 2 (ii) hold true, none of the conditions for pure strategy equilibria are met. This is the mixed strategy equilibrium of type (c). Note that we can drop the case where conditions 1 (ii) and 2 (i) are satisfied simultaneously. Condition 1 (ii) requires that $\delta_1 < \alpha (1 + c/Y)$ while condition 2 (i) requires that $\delta_1 > (1 - \alpha) (1 + c/Y)$. Since $\alpha \leq 1 - \alpha$, these two conditions are irreconcilable.

A.3 Proof of Corollary 6(a)

The probability of group L to be cooperative: $p_{c|o}^L$.

In a mixed strategy equilibrium of type (a) we have:

$$\delta_1 < \delta_{1,K} \Rightarrow A \equiv -[\alpha - \delta_1 + \alpha \frac{c}{Y}] < 0 \quad (A1)$$

$$\delta_2 > \delta_{2,K} \Rightarrow -\pi_g^L [\alpha - \delta_1] > -\rho \delta_1 \delta_2 (1 - \pi_g^L) + \alpha \frac{c}{Y} \quad (A2)$$

From (A1), $\alpha \frac{c}{Y} > -[\alpha - \delta_1]$ such that it follows from (A2) that

$$B \equiv (1 - \pi_g^L) \left[\rho \delta_1 \delta_2 - \alpha \frac{c}{Y} \right] \quad (A3)$$

Equation (3.1) in the main text can then be rewritten as

$$B(1 - p_{c|o}^L) + A \left[\pi_g^L + (1 - \pi_g^L) p_{c|o}^L \right] = 0. \quad (A.4)$$

An increase in ρ (or δ_2) makes (B) more positive, so that (A.4) can only hold true if $p_{c|o}^L$ increases. An increase in δ_1 makes (B) more positive and (A) less negative so that $p_{c|o}^L$ has to increase. It is easy to verify that in the mixed strategy equilibria of type (b) and (c), where $\delta_1 > \delta_{1,K}$ and $\delta_2 < \delta_{2,K}$ and, therefore, the inequalities (A1) and (A3) are reversed, opposite changes in $p_{c|o}^L$ will occur.

The probability of group K to be cooperative: $p_{c|o}^K$.

In a mixed strategy equilibrium of type (a) we have:

$$\delta_1 < \delta_{1,L} \Rightarrow C \equiv -[(1 - \alpha) - \delta_1 + (1 - \alpha) \frac{c}{Y}] < 0 \quad (A4)$$

$$\delta_2 > \delta_{2,L} \Rightarrow -\pi_g^K [(1 - \alpha) - \delta_1] > -(1 - \rho) \delta_1 \delta_2 (1 - \pi_g^K) + (1 - \alpha) \frac{c}{Y} \quad (A5)$$

From (A4), $(1 - \alpha) \frac{c}{Y} > -[(1 - \alpha) - \delta_1]$ so that it follows from (A5) that

$$D \equiv (1 - \pi_g^K) \left[(1 - \rho) \delta_1 \delta_2 - (1 - \alpha) \frac{c}{Y} \right] \quad (A6)$$

The equivalent of Equation (3.1) in the main text can then be rewritten as

$$C(1 - p_{c|o}^K) + D \left[\pi_g^K + (1 - \pi_g^K) p_{c|o}^K \right] = 0. \quad (A.5)$$

An increase in ρ (or a decrease in δ_2) makes (D) less positive, so that (A.5) can only hold true if $p_{c|o}^K$ decreases. An increase in δ_1 makes (D) more positive and (C) less negative such that $p_{c|o}^K$ has to increase. It is easy to verify that in the mixed strategy equilibria of type (b) and (c), where $\delta_1 > \delta_{1,L}$ and $\delta_2 < \delta_{2,L}$ and, therefore, the inequalities (A4) and (A6) are reversed, opposite changes in $p_{c|o}^K$ will occur.

A.4 Proof of Corollary 6(b)

The proof follows directly from the expressions for $p_{c|o}^L$ and $p_{c|o}^K$ given in Theorem 1.

An increase in π_g^L , group K 's belief that group L is cooperative:

$$\frac{\partial p_{c|o}^L}{\partial \pi_g^L} = \frac{1}{(1 - \pi_g^L)^2} \left[\frac{\rho\delta_1\delta_2 - \alpha\frac{c}{Y}}{\rho\delta_1\delta_2 - \delta_1 + \alpha} - 1 \right]. \quad (\text{A.6})$$

Recall that $0 < p_{c|o}^L < 1$, i.e.:

$$\begin{aligned} 0 &< \frac{1}{(1 - \pi_g^L)} \left[\frac{\rho\delta_1\delta_2 - \alpha\frac{c}{Y}}{\alpha - \delta_1 + \rho\delta_1\delta_2} - \pi_g^L \right] < 1 \\ \Leftrightarrow 0 &< \frac{\rho\delta_1\delta_2 - \alpha\frac{c}{Y}}{\alpha - \delta_1 + \rho\delta_1\delta_2} - \pi_g^L < 1 - \pi_g^L \\ \Leftrightarrow \pi_g^L &< \frac{\rho\delta_1\delta_2 - \alpha\frac{c}{Y}}{\alpha - \delta_1 + \rho\delta_1\delta_2} < 1 \end{aligned} \quad (\text{A.7})$$

From inequality A.7 we know that the term between brackets in Equation (A.6) is negative. Therefore we know that an increase in group K 's belief that group L is cooperative decreases group K 's probability to cooperate: $\frac{\partial p_{c|o}^L}{\partial \pi_g^L} < 0$.

An increase in π_g^K , group L 's belief that group K is cooperative:

$$\frac{\partial p_{c|o}^K}{\partial \pi_g^K} = \frac{1}{(1 - \pi_g^K)^2} \left[\frac{(1 - \rho)\delta_1\delta_2 - (1 - \alpha)\frac{c}{Y}}{(1 - \rho)\delta_1\delta_2 - \delta_1 + (1 - \alpha)} - 1 \right]. \quad (\text{A.8})$$

Recall that $0 < p_{c|o}^K < 1$, i.e.:

$$\begin{aligned} 0 &< \frac{1}{(1 - \pi_g^K)} \left[\frac{(1 - \rho)\delta_1\delta_2 - (1 - \alpha)\frac{c}{Y}}{(1 - \alpha) - \delta_1 + (1 - \rho)\delta_1\delta_2} - \pi_g^K \right] < 1 \\ \Leftrightarrow 0 &< \frac{(1 - \rho)\delta_1\delta_2 - (1 - \alpha)\frac{c}{Y}}{(1 - \alpha) - \delta_1 + (1 - \rho)\delta_1\delta_2} - \pi_g^K < 1 - \pi_g^K \\ \Leftrightarrow \pi_g^K &< \frac{(1 - \rho)\delta_1\delta_2 - (1 - \alpha)\frac{c}{Y}}{(1 - \alpha) - \delta_1 + (1 - \rho)\delta_1\delta_2} < 1 \end{aligned} \quad (\text{A.9})$$

From inequality A.9 we know that the term between brackets in Equation (A.8) is negative. Therefore we know that an increase in group L 's belief that group K is cooperative decreases group L 's probability to cooperate: $\frac{\partial p_{c|o}^K}{\partial \pi_g^K} < 0$.

A.5 Proof of Lemma 1

The partial derivative of $\delta_{2,K}$ with respect to π_g^L can be shown to be positive for $\delta_1 < \alpha(1 + \frac{c}{Y})$, which is the δ_1 -coordinate of δ_K^* . Hence, an increase in π_g^L rotates the $\delta_{2,K}$ -curve clockwise through the point δ_K^* . Similarly, the partial derivative of $\delta_{2,L}$ with respect to π_g^K is positive only when $\delta_1 < (1 - \alpha)(1 + \frac{c}{Y})$, the δ_1 -coordinate of δ_L^* .

The partial derivative of $\delta_{2,K}$ with respect to ρ can be shown to be negative for $\delta_1 < \alpha \left(1 + \frac{1}{\pi_g^L} \frac{c}{Y}\right)$, which is the δ_1 -coordinate of the point where the $\delta_{2,K}$ -curve cuts the δ_1 -axis. Hence an increase in ρ rotates the $\delta_{2,K}$ -curve counterclockwise through the point where the $\delta_{2,K}$ -curve cuts the δ_1 -axis. In contrast, the partial derivative of $\delta_{2,L}$ with respect to ρ is positive when $\delta_1 < (1 - \alpha) \left(1 + \frac{1}{\pi_g^K} \frac{c}{Y}\right)$, the δ_1 -coordinate of the point where the $\delta_{2,L}$ -curve cuts the δ_1 -axis, implying that an increase in ρ rotates the $\delta_{2,L}$ -curve clockwise through the point where the $\delta_{2,L}$ -curve cuts the δ_1 -axis.

Obviously, since ρ has no impact on the $\delta_{1,H}$ -curves, while shifting $\delta_{2,K}$ down and $\delta_{2,L}$ up, the respective δ^* will shift vertically in the direction stated in the lemma.

A.6 Proof of Corollary 7

In order to rule out the fighting equilibrium, we need that:

$$\delta_2 \leq -\frac{\pi_g^L}{(1 - \pi_g^L)\rho} + \frac{\alpha}{(1 - \pi_g^L)\rho\delta_1} \left[\pi_g^L + \frac{c}{Y} \right], \quad (\text{A.10a})$$

$$\text{or} \quad \delta_2 \leq -\frac{\pi_g^K}{(1 - \pi_g^K)(1 - \rho)} + \frac{(1 - \alpha)}{(1 - \pi_g^K)(1 - \rho)\delta_1} \left[\pi_g^K + \frac{c}{Y} \right]. \quad (\text{A.10b})$$

Rearranging terms leads to the following conditions on the costs of fighting:

$$\frac{c}{Y} \geq \frac{\delta_1 - \alpha}{\alpha} \pi_g^L + \frac{\rho\delta_1\delta_2}{\alpha} (1 - \pi_g^L), \quad (\text{A.11a})$$

$$\text{or} \quad \frac{c}{Y} \geq \frac{\delta_1 - (1 - \alpha)}{1 - \alpha} \pi_g^K + \frac{(1 - \rho)\delta_1\delta_2}{1 - \alpha} (1 - \pi_g^K). \quad (\text{A.11b})$$

- (a) The right-hand side of (A.11a) or (A.11b) is increasing in δ_1 . Ultimately, δ_1 can be reduced to 0, which makes the conditions:

$$\begin{aligned} \frac{c}{Y} &\geq -\pi_g^L, \\ \text{or} \quad \frac{c}{Y} &\geq -\pi_g^K. \end{aligned}$$

These conditions are always met.

- (b) The right-hand side of (A.11a) or (A.11b) is increasing in δ_2 . Ultimately, δ_2 can be reduced to 0, which makes the conditions:

$$\begin{aligned} \frac{c}{Y} &\geq \frac{\delta_1 - \alpha}{\alpha} \pi_g^L, \\ \text{or} \quad \frac{c}{Y} &\geq \frac{\delta_1 - (1 - \alpha)}{1 - \alpha} \pi_g^K. \end{aligned}$$

- (c) The right-hand side of (A.11a) is increasing in ρ . Ultimately, ρ can be reduced to 0, which makes the condition:

$$\frac{c}{Y} \geq \frac{\delta_1 - \alpha}{\alpha} \pi_g^L.$$

The right-hand side of (A.11b) is decreasing in ρ . Ultimately, ρ can be increased to 1, which makes the condition:

$$\frac{c}{Y} \geq \frac{\delta_1 - (1 - \alpha)}{1 - \alpha} \pi_g^K.$$

- (d) Trust can be manipulated in four ways.

· π_g^L

if $\frac{\delta_1 - \alpha}{\alpha} > \frac{\rho \delta_1 \delta_2}{\alpha} > 0$, the right-hand side of (A.11a) is increasing in π_g^L . So, decreasing π_g^L to 0 is effective if:

$$\frac{c}{Y} \geq \frac{\rho \delta_1 \delta_2}{\alpha}.$$

if $\frac{\delta_1 - \alpha}{\alpha} < \frac{\rho \delta_1 \delta_2}{\alpha}$, the right-hand side of (A.11a) is decreasing in π_g^L . So, increasing π_g^L to 1 is effective if:

$$\frac{c}{Y} \geq \frac{\delta_1 - \alpha}{\alpha}.$$

· π_g^K

if $\frac{\delta_1 - (1 - \alpha)}{1 - \alpha} > \frac{(1 - \rho) \delta_1 \delta_2}{1 - \alpha} > 0$, the right-hand side of (A.11b) is increasing in π_g^K . So, decreasing π_g^K to 0 is effective if:

$$\frac{c}{Y} \geq \frac{(1 - \rho) \delta_1 \delta_2}{1 - \alpha}.$$

if $\frac{\delta_1 - (1 - \alpha)}{1 - \alpha} < \frac{(1 - \rho) \delta_1 \delta_2}{1 - \alpha}$, the right-hand side of (A.11b) is decreasing in π_g^K . So, increasing π_g^K to 1 is effective if:

$$\frac{c}{Y} \geq \frac{\delta_1 - (1 - \alpha)}{1 - \alpha}.$$

A.7 Proof of Corollary 8

In order to rule out the fighting equilibrium without information about $\delta_1, \delta_2, \rho, \pi_g^L$ and π_g^K , the restrictions on the costs of fighting should hold for all the possible values of these parameters. Therefore, the conditions should hold for the values of $\delta_1, \delta_2, \rho, \pi_g^L$ and π_g^K that generate the strongest conditions.

We therefore substitute the parameters by their value for which the conditions we derived in the proof of Corollary 7 are the strongest:

- (a) The right-hand side is decreasing in π_g^L and π_g^K respectively, so ultimately π_g^L and π_g^K can be 0:

$$\frac{c}{Y} \geq 0,$$

or

$$\frac{c}{Y} \geq 0.$$

These conditions are always met.

- (b) The right-hand side is increasing in δ_1 and in π_g^L and π_g^K respectively, which can ultimately increase to 1:

$$\frac{c}{Y} \geq \frac{1-\alpha}{\alpha},$$

or

$$\frac{c}{Y} \geq \frac{1-(1-\alpha)}{1-\alpha} \Leftrightarrow \frac{c}{Y} \geq \frac{\alpha}{1-\alpha}.$$

- (c) The right-hand side is increasing in δ_1 and π_g^L , which can ultimately increase to 1:

$$\frac{c}{Y} \geq \frac{1-\alpha}{\alpha}.$$

The right-hand side is increasing in δ_1 and π_g^K , which can ultimately increase to 1:

$$\frac{c}{Y} \geq \frac{1-(1-\alpha)}{1-\alpha} \Leftrightarrow \frac{c}{Y} \geq \frac{\alpha}{1-\alpha}.$$

- (d) Trust can be manipulated in four ways.

· π_g^L

if $\frac{\delta_1-\alpha}{\alpha} > \frac{\rho\delta_1\delta_2}{\alpha} > 0$, the right-hand side is increasing in ρ, δ_1 and δ_2 , which can ultimately increase to 1:

$$\frac{c}{Y} \geq \frac{1}{\alpha}.$$

if $\frac{\delta_1-\alpha}{\alpha} < \frac{\rho\delta_1\delta_2}{\alpha}$, the right-hand side is increasing in δ_1 , which can ultimately increase to 1:

$$\frac{c}{Y} \geq \frac{1-\alpha}{\alpha}.$$

Where the second restriction is obviously weaker.

· π_g^K

if $\frac{\delta_1-(1-\alpha)}{1-\alpha} > \frac{(1-\rho)\delta_1\delta_2}{1-\alpha} > 0$, the right-hand side is decreasing in ρ , which can ultimately decrease to 0, and increasing in δ_1 and δ_2 , which can ultimately increase to 1:

$$\frac{c}{Y} \geq \frac{1}{1-\alpha}.$$

if $\frac{\delta_1 - (1-\alpha)}{1-\alpha} < \frac{(1-\rho)\delta_1\delta_2}{1-\alpha}$, the right-hand side is increasing in δ_1 , which can ultimately increase to 1:

$$\frac{c}{Y} \geq \frac{1 - (1-\alpha)}{1-\alpha} \Leftrightarrow \frac{c}{Y} \geq \frac{\alpha}{1-\alpha}.$$

Where the second restriction is obviously weaker.

A.8 Proof of Corollary 9

Policy Implication 4 states that only a strong boycott can impose the (C, C) equilibrium as the only equilibrium in pure strategies. The combination of these results with Corollary 7 allows us to derive a ranking of the intervention tools.

- From Policy Implication 2 and Corollary 7 we know that a strong boycott can always ensure that (C, C) is a BN equilibrium, and (F, F) is not.
- From policy implications 2 and 3 and Corollary 7 we know that a weak boycott and power politics can not ensure that (C, C) is a BN equilibrium but can rule out the (F, F) equilibrium for all parameter values in S if: $\frac{c}{Y} \geq \min \left\{ \pi_g^L \left[\frac{1-\alpha}{\alpha} \right], \pi_g^K \left[\frac{\alpha}{1-\alpha} \right] \right\}$.
- The discussion in Corollary 7 shows that in order to rule out the fighting equilibrium, both the strong and the weak boycott need to be strengthened: both δ_1 and δ_2 need to be decreased. The required direction of change in relative power and trust, on the other hand, will depend on the other parameter values: in some areas an increase of ρ or π_g^H is required, while in other areas ρ or π_g^H need to be reduced.

B.1 π_i^* is decreasing in n

Differentiate equation (4.16) w.r.t. n :

$$\frac{d\pi_i^*}{dn} = \frac{\partial \pi_i^*}{\partial n} + \frac{\partial \pi_i^*}{\partial w^*} \frac{dw^*}{dn}.$$

Denote the rhs of equation (4.15) by A , and differentiate this equation w.r.t. n :

$$0 = \frac{\partial A}{\partial w^*} \frac{dw^*}{dn} + \frac{\partial A}{\partial n}.$$

After substitution, we have that:

$$\frac{d\pi_i^*}{dn} = \frac{\partial \pi_i^*}{\partial n} + \frac{\partial \pi_i^*}{\partial w^*} \frac{-\frac{\partial A}{\partial n}}{\frac{\partial A}{\partial w^*}}.$$

Straightforward computation shows that his expression is negative for $n \geq 1$.

B.2 $\pi_i^*(2)$ is increasing in p_m

Differentiate equation (4.18) with respect to p_m :

$$\frac{d\pi_i^*(2)}{dp_m} = \frac{\partial \pi_i^*(2)}{\partial p_m} + \frac{\partial \pi_i^*(2)}{\partial w^*} \frac{dw^*}{dp_m}.$$

Denote the rhs of equation (4.19) by A , and differentiate this equation w.r.t. p_m :

$$0 = \frac{\partial A}{\partial w^*} \frac{dw^*}{dp_m} + \frac{\partial A}{\partial p_m}.$$

After substitution, we have that:

$$\frac{d\pi_i^*(2)}{dp_m} = \frac{\partial \pi_i^*(2)}{\partial p_m} + \frac{\partial \pi_i^*(2)}{\partial w^*} \frac{\frac{\partial A}{\partial p_m}}{\frac{\partial A}{\partial w^*}}.$$

Straightforward computation shows that this expression is positive.

B.3 $\pi_i^*(2)$ is decreasing in p_a

Differentiate equation (4.18) with respect to p_a :

$$\frac{d\pi_i^*(2)}{dp_a} = \frac{\partial\pi_i^*(2)}{\partial w^*} \frac{dw^*}{dp_a}.$$

Denote the rhs of equation (4.19) by A , and differentiate this equation w.r.t. p_a :

$$0 = \frac{\partial A}{\partial w^*} \frac{dw^*}{dp_a} + \frac{\partial A}{\partial p_a}.$$

After substitution, we have that:

$$\frac{d\pi_i^*(2)}{dp_a} = \frac{\partial\pi_i^*(2)}{\partial w^*} \frac{-\frac{\partial A}{\partial p_a}}{\frac{\partial A}{\partial w^*}}.$$

Straightforward computation shows that this expression is negative.