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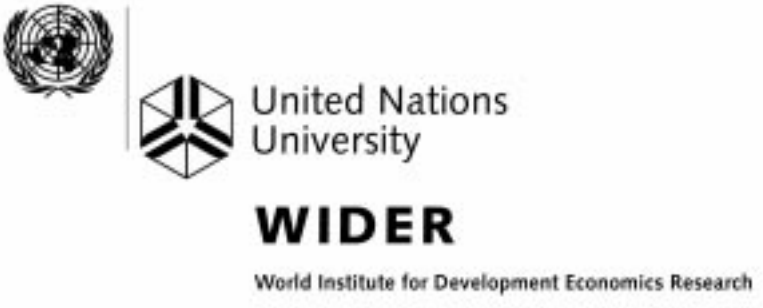
Published on: 01 Sep 2002 - Journal of African Economies (Oxford University Press)

Topics: Peacetime, Total war, Social conflict and Natural resource



Discussion Paper No. 2001/51

Conflict In Africa

The Cost of Peaceful Behaviour

Tony Addison,[1] Philippe Le Billon[2] and S. Mansoob Murshed[1]

August 2001

Abstract

War provides economic opportunities, such as the capture of valuable natural resources, that are unavailable in peacetime. However, belligerents may prefer low-intensity conflict to total war when the former has a greater pay-off. The paper therefore uses a two-actor model to capture the *continuum* from total war to complete peace that often characterises Africa's conflicts. This is in contrast to the existing literature with its focus on mutually exclusive states of total war *or* complete peace, an assumption which is more relevant to Europe's inter-state wars than to Africa's civil wars. The paper also discusses changes in the economic incentives of belligerents that may induce peaceful behaviour.

Keywords: aid; conflict; natural resources; sub-Saharan Africa

JEL classification: O10; O55

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This study has been prepared within the UNU/WIDER project on Why Some Countries Avoid Conflict While Others Fail? which is co-directed by Dr Tony Addison and Dr Mansoob Murshed.

Acknowledgements

We are grateful to Ali A Ali, David Bloom, Ibrahim Elbadawi, and participants at the March 2000 World Bank-Princeton University workshop on conflict, as well as participants at a seminar in the Kennedy School of Government (Harvard), for their comments on a previous version of this paper.

1 Introduction

Conflict, especially in the form of civil war, is not a new phenomenon in Africa—the last three decades have seen many civil wars and *coups d'etats*—but the last ten years or so have seen a disturbing escalation in the violence. At the present time (May 2000), fighting is ongoing in Angola, Eritrea/Ethiopia, the Democratic Republic of the Congo (DRC), Sierra Leone, and Sudan—to give just a few examples. Moreover, national conflicts increasingly cross borders: thus Angola's conflict has recently affected Namibia and Zambia, while Uganda is vulnerable to instability in the Great Lakes region. Thus, conflict not only impedes development in the countries directly affected, but it also has negative externalities for the Africa region as a whole. Indeed it can be argued that conflict along with inappropriate policy decisions, adverse economic shocks, and a disadvantageous tropical location (Bloom and Sachs, 1998) are the most important factors in Africa's poor economic performance.

For peacekeepers in the international community it is clearly desirable to understand the motives of belligerents, since only then can they hope to influence their actions in ways that are conducive to peace rather to war. But these motives are in turn determined by a wide range of variables including greed and grievance (see Collier and Hoeffler, 1999, 2000) which determine the respective pay-offs in peace and war. Accordingly, this paper uses game theory to set out a model of peace and conflict in which two actors engage with each other. The paper is therefore about the process of conflict rather than the origins of conflict.

The paper begins, in section 2, with a brief review of the issues as they relate to Africa, focusing in particular on recent conflicts in such countries as Angola, Eritrea/Ethiopia, and Guinea-Bissau. Section 3 presents the basic model in which the expected utilities of peace and conflict for both sides are defined, and a Cournot-Nash game is set out. Moral hazard is also introduced into actions and efforts to promote peace. We illustrate the model's relevance using a range of empirical African examples. Section 4 considers some policy-relevant variations in the model's parameters, and their implications for third parties intent on promoting peace. We give particular emphasis to the role of 'booty' in war (such as valuable natural resources), and discuss whether foreign aid can be used to induce peace. Section 5 concludes by highlighting the role of different types of natural-resource wealth in inducing war or peace.

2 Conflict in Africa

Over the last decade, there have been at least 20 major conflicts in Africa. The purpose of this paper is not to provide a comprehensive empirical review of conflict in Africa, or its causes (see instead Annan, 1998; Clarke and Herbst, 1997; and Gourevitch, 1998, among others). But, one feature does stand out: economic factors play a large role in determining the actions of actual and potential belligerents.

In a number of cases war is closely associated with economies relying on natural resource exploitation (see Table 1). The war economies sustaining belligerents depend on revenues from natural resources and reach a point at which economic—rather than political—motives become dominant. Thus, the revenue from fertile land capable of

producing an export-crop (bananas) was one of the prizes that Somalia's warlords sought to capture.[1] Collier and Hoeffler (1999) find that a relatively high dependence on primary commodity exports is strongly correlated, in a non-monotonic way, with the occurrence of war. Collier and Hoeffler (2000) emphasise that greed can often be disguised as grievance. This in turn produces greater grievances and fuels more conflict.

Table 1

Conflicts in Africa and the role of natural resources

Country	Date	Deaths	Point resources	Diffuse resources
Algeria	1992-	70,000	oil, gas	
Angola	1975-	500,000	oil, diamonds	timber, ivory
Cameroon/Nigeria	1997	<1,000	oil	
Chad	1980-94	300,000	oil, uranium	
Congo-Brazzaville	1993, 1997	9,000	oil	
Democratic Republic of the Congo / Zaire	1993-	200,000	copper, cobalt, diamonds, gold	timber
Kenya	1991-	2,000		cattle
Liberia	1989-96	175,000	iron, diamonds, rubber	timber, drugs
Mozambique	1976-95	1,000,000		shrimps, ivory, timber
Rwanda	1990-	650,000		*coffee*
Senegal	1997-	<1,000		*drugs*
Sierra Leone	1991-1999	80,000	*diamonds, rutile bauxite*	*timber*
Somalia	1988-	n.a.		*bananas, camels*
South Africa	1990s	200,000		drugs
Sudan	1983-	1,600,000	oil,	cattle, timber
Western Sahara	1976-	n.a.	phosphates	

Source: Balencie and de La Grange (1999).

Note: The number of deaths in South Africa includes crimes.

The nature and location of natural resources affects the occurrence of war. In this regard, two main type of resource can be identified. First, there are *point resources* such as minerals; these are non-renewable, geographically concentrated, and their extraction requires little labour input. Second, there are *diffuse resources* such as soils and water; these are renewable, geographically spread, and they are used in the production of crops and livestock usually mobilising large amounts of labour (Auty, 1998). Countries that are abundant in point resources are more likely to experience conflict than countries that possess only diffuse resources, especially when the latter also undertake land reform as in North-East Asia (de Soysa, 2000).

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1 This does not of course imply that the desire to capture fertile land constituted the sole source of conflict in Somalia. For a thorough discussion of Somalia's conflict see Clarke and Herbst (1997).

The character, number, and spread of natural resources can affect the course of conflict. In Congo-Brazzaville, for example, where there is one mineral resource (offshore oil) it was necessary for rebels to capture the capital city (the centre of the state apparatus) and the main port, Pointe-Noire, as they did during the 1997 civil war. In contrast, Angola's two mineral resources (offshore oil and alluvial diamonds in the interior) have enabled both sides (the MPLA government and the UNITA rebels) to engage in protracted conflict. Government and UNITA leaders enjoy considerable wealth (from oil and diamonds, respectively) and, in the absence of decisive victory by either side, the MPLA retains control of the capital city and the state apparatus, while UNITA controls many rural areas (Le Billon, 1999). In Liberia and Sierra Leone, the diversity of resources (rubber, timber, diamonds, and iron ore) and their geographical spread have led to the development of warlords and a highly fragmented conflict between a weak government (holding the capital cities) and numerous armed groups controlling resources in the interior (Reno, 1998).

In summary, natural resources, especially minerals but also fertile lands or fisheries, constitute booty for potential belligerents. The state itself—and the resources that it commands through general taxation—also represents booty (in addition to the natural resource wealth that capturing the state and its territory may deliver to the successful belligerent). Thus, Guinea-Bissau—which has little natural resource wealth—experienced a military revolt in 1998-99, resulting in the overthrow of the incumbent president by his army commander (Kovsted and Tarp, 1999). However, while many of Africa's civil wars are driven by the prospects for personal wealth of rebel (and government) leaders, mass rebellion can also occur in which an oppressive state is overturned. Thus, Eritrea's war for national liberation (1961-1991) eventually resulted in the overthrow of the Derg dictatorship by Eritrean forces in alliance with Ethiopian rebels. In this case, capturing the state is driven by a desire to spread wealth more equitably rather than by the desire of leaders to accumulate personal wealth.

Our examples above tend to imply that belligerents prefer outright victory. But this is not always the case. For long periods, some or all belligerents may prefer a situation of war to either peace or decisive victory.[2] Thus, the military forces of both the government and the rebels may derive considerable wealth and status from the continuation of war, while decisive victory would imply demobilization and loss of accumulation opportunities. The result is often an avoidance of 'total war' and instead a form of conflict ('low-intensity') that minimises direct losses (thereby reducing the cost of conflict to the belligerent) and increases the direct gains (booty).[3] Large battles are avoided, and at the local level belligerents may in fact cooperate for extended periods when it is mutually profitable (splitting booty, profitable smuggling across frontlines, and cooperation or non-interference in looting civilians and humanitarians). This behaviour leads to what Zartman (1995) refers to as a 'comfortable military stalemate'.

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2 Kaldor (1999: 120) develops this theme. She writes: 'Since the power of the warring parties depends largely on fear and/or self-interest and not on consent, they need an insecure environment to sustain themselves both politically and economically. Politically, identity is based on fear and hatred of the other; economically, revenues depend on outside assistance for the war effort and on various forms of asset transfer based on loot and extortion or on price distortions resulting from restrictions on freedom of movement. In peacetime, these sources of sustenance are eroded'.

3 Formally, for belligerents the net present value (NPV) of low-intensity conflict may exceed that of either outright victory or peace.

Angola, Liberia, and Sierra Leone are just a few examples of 'profitable conflicts', often characterised by periods of cooperation between belligerents (on Liberia see Reno, 1998).

The 'low intensity' of these conflicts does not imply a low impact on populations. On the contrary, most are characterised by extreme violence against civilians. This violence is itself often economically motivated, being associated with looting, forced labour, or the expulsion of local communities to secure exclusive control over resources—thereby enabling migrant labour or international corporations to exploit resources (Keen, 1998). In such circumstances, civilians themselves may engage in violence in order to protect themselves or as a means of livelihood as the cost of peaceful behaviour becomes life-threatening and unbearable.

In summary, war provides economic and political opportunities for belligerents that cannot be achieved during peace. Moreover, control of natural resource wealth, aside from the state itself, is a considerable motivating force in contemporary African conflicts. Other African examples could be presented—the current turmoil in the DRC for instance—but enough has been said to highlight the importance of modelling incentives to engage in peace versus conflict. It is to this that we now turn.

3 The model

Conflict is clearly a multi-faceted phenomenon. But because of its complexity, it is important to focus on the core issues. This we do by developing a model with the following features.

There are two parties to the conflict, whom we define as the government, G, and the rebels, R. We will assume that each party's utility function is at least partially representative of the group. Leaders of warring parties to a conflict cannot, for all time, ignore the interests of those whom they purport to represent. This means that at the very least they have to satisfy the participation constraints of their followers. We do not deal with problems of collective action, and intra-group revenue sharing.

The government's utility is denoted by U and the rebel's utility is given by V. There are two states of nature: one more peaceful (P) and the other associated with greater conflict (C). Their probabilities are defined as π and 1 - π, respectively. An important feature of our model is that states of conflict, or peace, are *relative*. Peace, in some circumstances, can be associated with low-intensity warfare or a temporary cease-fire or armistice as discussed in section 2. Angola has, for example, had a succession of temporary cease-fires, and periods of all-out war (the situation at present) interspersed with periods of low-intensity conflict (Le Billon, 1999). Of course, a state of all out war, which Thomas Hobbes described more than three centuries ago as the 'state of nature', will occur when $\pi = 0$. As will become apparent below, similar conclusions can be drawn about either party's attitudes to belligerence.

The probability of either state is in turn affected by an action (a) by the government and effort (e) by the rebels. These are also the strategic variables employed by the two sides to the conflict. We postulate that the probability of the good (peaceful) state π rises with the input of action and effort by the two sides, but at diminishing rates. Most papers in

this area have fighting or conflict as the strategic choice variable. Our model differs in that it has an action or effort akin to *promoting* peacefulness. These actions or efforts are drawn from a continuum, similar to the opposite: war-like behaviour. In other words, they will not normally assume (0,1) values. In this way, we capture situations in which belligerents may prefer low-intensity conflict to total war. One can imagine a range of activities by one or both sides if they wish to promote peace, including a greater willingness to compromise, devote resources to peaceful economic development, or a greater willingness to respond to calls for peace by third-parties such as the UN or the OAU.

Even though actions and efforts to seek peace may be construed as virtues that should be practised for their own sake, we assert that they do entail costs for each party—they enter as negative values in their utility functions—and these are explicitly modelled via cost functions. The costs of actions to promote peace could take a variety of forms including monetary expenditures, measures to increase security, or redistributive public finance reform (in the case of the government side).

Finally, since war often reflects the competition for resources (as discussed in section 2), we introduce war booty (B) into both sides pay-off or utility from belligerency. The more booty is available, the less likely is the belligerent to seek peace. Booty can take the form of natural resource rents, although in the cold war era it could have included aid to belligerents.

Before going further, it is worth pausing to note how our model differs from other models of intra-state conflict and insurrection. For example, Hirshleifer (1995) considers conflict between rival societies in an anarchical state that is defined as the absence of a social contract between the warring factions. The outcome of the model, where the different sides are modelled in a symmetric fashion, depends upon conflict technology and relative belligerency. In our model there is also the absence of a social contract, otherwise fighting could not erupt. Azam's (1995) model of insurrection examines the fiscal dimension of conflict: military expenditure, foreign aid, as well as re-distribution in the form of bribes from the government to the rebels. He also considers Stackelberg behaviour by the government, where the government can make a credible commitment by making a gift to the rebels.[4] Unlike these two models, we have peaceful action, rather than war, as the strategic variables in our model, and they might be strategic substitutes as well as complements. Peaceful action is, therefore, not a perfect dual of aggressiveness. Also a degree of asymmetry is introduced in the government and rebel cost functions. In general, the prospect of complete annihilation (in either state of nature) is excluded from our model.

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4 This assumption of credibility is crucial to Azam's (1995) results.

The expected utility of the government side is given by

$$U = \pi(a,e)U^P(T) + (1-\pi)(\cdot)U^C(F + B^G) - C(a) \qquad (1)$$

Where U^P and U^C denote utilities or pay-offs in peace and conflict respectively, weighted by the probabilities of the two states. As far as the model is concerned, payoffs are exogenous whereas the strategic choices are endogenous. T is the revenue obtained by government in peacetime and could also include foreign aid. F is the pay-off during war, and B^G stands for any booty accruing to the government.[5] C is the cost function of undertaking the action, a, which increases the probability of peace, π. Note that the pure pay-off or utility in a state of war, F is less than in times of peace, T due to the cost of conducting a war. Also, $\pi_a > 0$, but $\pi_{aa} < 0$. Both $C_a > 0$ and $C_{aa} > 0$.

Turning to the rebel side, we have

$$V = \pi(a,e)V^P(D) + (1-\pi)(\cdot)V^C(S + B^R) - \theta E(e) \qquad (2)$$

Again, V^P and V^C denote the rebel's utilities in peace and conflict respectively, weighted by the probabilities of the two states. D is the income obtained by the rebels in peacetime and S is the pay-off during war which may be supplemented by war booty, B^R, $D > S$. E is the cost of effort, e, which increases the probability of peace, π. Also, $\pi_e > 0$, but $\pi_{ee} < 0$, $E_e > 0$, and $E_{ee} > 0$. We introduce a shift parameter, θ which affects the rebel cost function. We postulate that $0 < \theta < 1$. A rise in θ could be caused by an increase in poverty or a greater perception of injustice; it serves to increase the cost of peaceful effort and raises belligerency levels amongst rebels. The parameter θ could also reflect the income gap between the government and rebels. We return to this issue again in section 4. We rule out situations where $T + D$ = national income, as the government and rebel sides are not the sum total of society.

The nature of the non-cooperative or Cournot-Nash game played by the two sides involves a two-stage process. In the first stage the pay-offs or utility levels from the two states of nature to both sides are determined. During the second stage the strategic choices regarding levels of a and e are made. Both sides move simultaneously. The solution to the model involves backward induction given sub-game perfection. Each side, therefore, maximises its own utility function with respect to its own choice variable. For the government it implies maximising utility, Equation (1), with respect to a as shown by

$$\frac{\partial U}{\partial a} = \pi_a\left[U^P(\cdot) - U^C(\cdot)\right] - C_a = 0 \qquad (3)$$

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5 Note that the gains from booty are not weighted by the chances of success in obtaining it. We omit this feature for the sake of algebraic tractability.

Rebels maximise Equation (2) with respect to *e*

$$\frac{\partial U}{\partial e} = \pi_e \left[V^P(\cdot) - V^C(\cdot) \right] - \theta E_e = 0 \tag{4}$$

Note that in Equations (3) and (4) each side will equate its marginal benefit from exercising their own strategic choice to the corresponding marginal cost. We rule out situations where $U^C > U^P$ and $V^C > V^P$, implying negative equilibrium levels of action and effort. This is because we are mainly concerned with low intensity conflict, and the states of nature we refer to imply relative war and peace.

It is interesting to consider a counter-factual situation where both sides are compelled to cooperate by an outside power or agency. This will lead to the joint maximisation of welfare (*W*), by summing Equations (1) and (2) together. The single grand welfare function is maximised with respect to *a* in

$$\frac{\partial W}{\partial a} = \pi_a \left[U^P(\cdot) + V^P(\cdot) \right] - \pi_a \left[U^C(\cdot) + V^C(\cdot) \right] - C_a = 0 \tag{5}$$

and with respect to *e* in

$$\frac{\partial W}{\partial e} = \pi_e \left[U^P(\cdot) + V^P(\cdot) \right] - \pi_e \left[U^C(\cdot) + V^C(\cdot) \right] - \theta E_e = 0 \tag{6}$$

It is immediately apparent from comparing Equation (3) with Equation (5), and Equation (4) with Equation (6), that the levels of both *a* and *e* are greater when the two parties can be brought to the negotiating table and coaxed into cooperative action. Hence, cooperation is Pareto superior to non-cooperative Cournot Nash behaviour, as the global marginal benefit of both *a* and *e* is equated to marginal cost. Note, however, that even the cooperative outcome may not be completely free of strife.

Returning to the non-cooperative game, each side's strategic choices will depend on the first order conditions given in Equations (3) and (4), along with a fixed conjecture about the opposition's strategic choice. These lead to the (linear) reaction functions for both sides, obtained by totally differentiating Equations (3) and (4) with respect to *a* and *e*. For the government this is indicated by

$$\frac{de}{da/R_G} = \frac{C_{aa} + \pi_{aa}\left[U^C(\cdot) - U^P(\cdot) \right]}{\pi_{ae}\left[U^P(\cdot) - U^C(\cdot) \right]} \gtreqless \ldots 0 \ldots if \cdots \pi_{ae} \gtreqless 0 \tag{7}$$

and for the rebels by

$$\frac{de}{da/R_R} = \frac{\pi_{ae}\left[V^P(\cdot) - V^C(\cdot) \right]}{\theta E_{ee} + \pi_{ee}\left[V^C(\cdot) - V^P(\cdot) \right]} \gtreqless \ldots 0 \ldots if \ldots \pi_{ae} \gtreqless 0 \tag{8}$$

Note that $\pi_{ae} = \pi_{ea}$ by symmetry.

The reaction functions are positively sloped if $\pi_{ae} > 0$, implying that the two strategies are complements (Figure 1). This is the standard assumption in the literature on conflict. In our model, however, we allow for the possibility that $\pi_{ae} < 0$, the choice variables are strategic substitutes, and the reaction functions could slope downwards (Figure 2). This can occur because the strategy space is defined in terms of peace. Thus if one side behaves more peacefully it increases the utility of both parties, and the other side may free ride on this action by not bringing about a corresponding increase in their action. It must also be remembered that action and effort are not without their costs. Also recall that we are concerned with relative states of war and peace. Thus the two strategies can become substitutes the closer is society to complete peace or the lower is the state of belligerency. For example, the model in Azam (1995) allows for strategic responses to become substitutes at high levels of the opponent's strategy.

Figure 1

Strategic complements

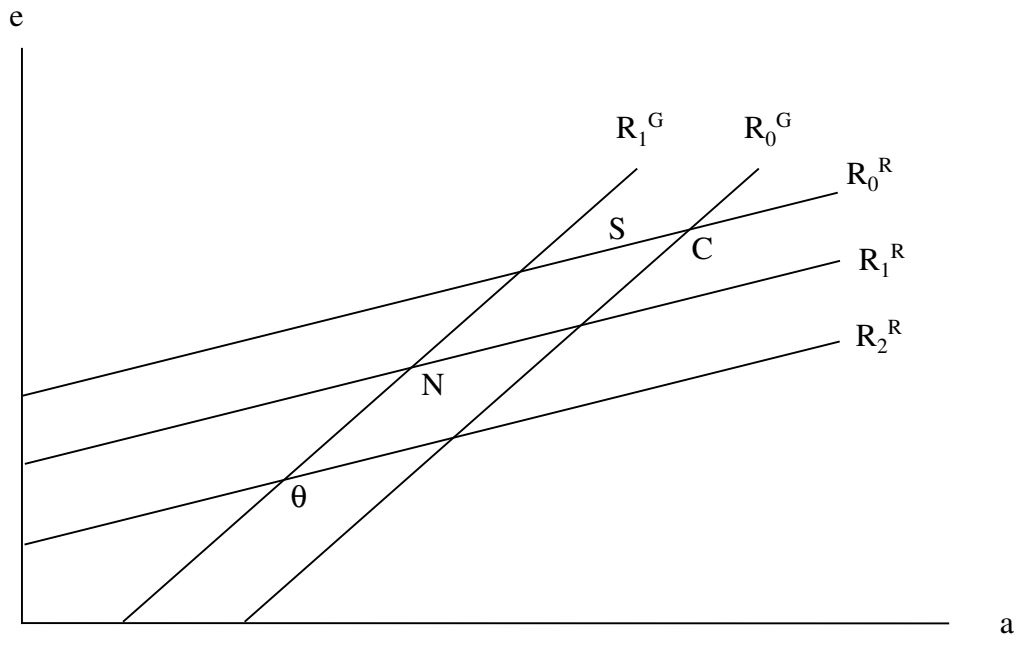
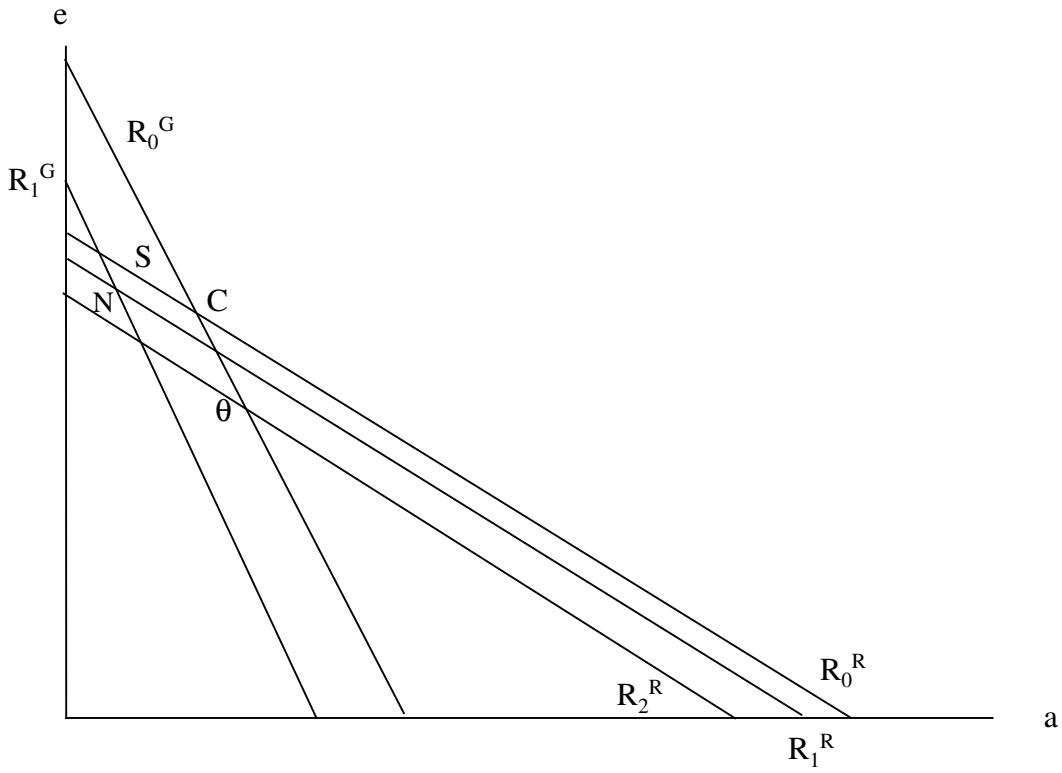


Figure 2

Strategic substitutes



Furthermore, the non-cooperative solution to the model generates moral hazard. From the viewpoint of domestic non-combatants and the rest of the world, the actions and efforts by the governments and rebels are not always observable or verifiable. Also, neither side has the incentive to engage in globally optimal levels of action or effort. Since the moral hazard is found in both parties, we have double moral hazard, as analysed in Murshed and Sen (1995). In both Figures 1 and 2, the non-cooperative solution associated with moral hazard is given by point N. The fully cooperative and Pareto optimal solution is illustrated at point C.

Also, in Figure 2, when the strategies are substitutes we have an additional ‘equity’ problem. In the non-cooperative equilibrium (point N) the government has effectively passed on some of the burden of adjustment to the rebels. In fact the level of effort exercised by the rebels is greater than in the cooperative solution. We could say that the government is free riding on the rebels. The positions could equally be reversed, so it was the rebels who were passing on the burden of action to the government. The elimination of double moral hazard requires the design of a mechanism that induces cooperation and transparency.

What if one side, say the government, acts as a Stackelberg leader, as discussed in Azam (1995)? Analytically speaking, this means the leader takes the follower's reaction function into account while maximising its utility. Diagrammatically, the leader's utility function is made tangent to the follower's reaction function. A variety of multiple equilibria are possible under Stackelberg leader-follower situations. We depict some of the possibilities by the point S in Figures 1 and 2. These are associated with Pareto

improvements on Cournot-Nash behaviour. But this is not necessarily always the case, as a variety of equilibria are possible.[6] In Azam's (1995) model a Pareto improvement does occur, but in a very specific setting. The government is in a position to pay the opposition a bribe, in the form of an unrequited fiscal transfer. This could also be easily construed as a power sharing agreement (the outcome in Sierra Leone in 1999) or the promise of future income through the political power gained by participating in multi-party elections after a formal peace agreement (the incentive implicitly offered to Mozambique's rebels, Renamo, to make peace in 1992). But it could also take the form of privatizing an asset in favour of the rebels: the aborted proposal for privatizing Angola's state diamond-mining company in favour of UNITA is one example (Addison, 1998).

For the government the alternative to not ruling is simply ceasing to exist. By contrast, the opposition is faced with two outcomes: either acquire power (become the government) by force of arms, or alternatively receive the transfer from the government in a state of rebellion. In this situation, it might pay the government to move first as a Stackelberg leader, precisely because it has this gift in hand, which in turn lowers the probability of its own extinction. This, however, may not always be the case especially because commitments made by the government are not *credible* or time consistent given the government's past reputation. If the government is not in a position to make a credible fiscal transfer to the rebels (or to offer a power sharing agreement), Cournot-Nash behaviour as characterised in our model above is more relevant. It is our contention that it is the role of outside agencies to somehow resolve the credibility problem, and compel the two factions to cooperate so as to improve on the Pareto-inferior Cournot-Nash equilibrium.

The theory therefore illuminates a recurring problem—that of credibility—which is frequently encountered in processes to end civil wars. In a detailed empirical study, Walter (1999) finds that negotiations to end civil wars break down more frequently than negotiations to end wars between states.[7] This she attributes to the greater difficulties encountered by each side in making credible commitments. Guinea-Bissau's conflict provides one African example of this problem (see Kovsted and Tarp, 1999). The military revolt that sought to overthrow President Vieira in June 1998 resulted in a year of intense fighting. During the course of the war, ECOWAS successfully achieved a negotiated settlement between the two parties, and a government of national unity was formed in February 1999, in which Vieira continued to hold the presidency while rebel supporters took cabinet positions. A peacekeeping force, ECOMOG, was deployed, but the military reneged on the agreement and overthrew President Vieira in May 1999. This led to ECOMOG's humiliating withdrawal. In this case, it was the rebels, and not Vieira, who free-rode on the agreement. The Angola conflict is also a tragic example of the credibility problem; the peace process has now broken down twice (in 1992 and 1999) and the credibility of UNITA in any future peace-agreement is now very low—at least under its present leadership (Le Billon, 1999).

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6 Quite often a Stackelberg leader is worse off than the follower in relative terms, when compared to the Cournot-Nash outcome.

7 In her sample of 29 cases of full-scale civil war between 1940 and 1992, peace lasted more than five years in only 8 out of 17 cases in which the beligerents had embarked on serious negotiations to end hostilities (Walter, 1998).

4 Variations in parameters

Further insights can be gained from considering variations in the parameters of the model. We take four: an increase in the cost of peaceful effort to the rebel side (i.e. an increase in θ); a rise in booty; an increase in belligerency; and an increase in foreign aid.

4.1 An increase in the cost of peaceful effort to the rebel side (θ)

Recall, from section 2, that θ is a shift parameter ($0 < \theta < 1$) such that a rise in θ increases the costs to the rebels of engaging in peaceful activity. Such a rise may be induced by several factors. Rebels may have an increased perception of the injustice perpetrated by the government (a factor that induced the intensification of military efforts by Eritrea's rebels against Ethiopia's governments over 1961-1991). Alternatively (or in addition), the income/wealth gap between the rebels and the government may rise, disadvantaging the former. Recent empirical research suggests that high and rising inequality is a determinant of conflict's occurrence in low-income countries (Nafziger and Auvinen, 1997). In the African context (but also elsewhere) regional inequality is a strong motivation for rebellion when a region is a source of natural resource wealth (oil for example) but receives little of the bounty and suffers from the environmental impact of extraction. The conflict in the Delta region of Nigeria and the creation of the rebel movement in Equatorial Guinea are just two examples. Also, θ may rise due to rising income inequality along an ethnic dimension—for instance rising discrimination in the access of an ethnic group to public spending and public employment (a factor in Burundi's conflict). Finally, the emergence of a poverty-conflict trap as discussed in Blomberg, Hess, and Thacker (2000) could result in an increase in θ. Whatever the reason, the participation constraint for group members in the rebel camp is relaxed.

In both Figures 1 and 2 a downward movement in the rebel's reaction functions represents this increase in θ, and the new intersection points are denoted by θ. In Figure 1 when the two activities are strategic complements there is a clear welfare loss. In Figure 2, however, the two strategies are substitutes. The decrease in effort by the rebels is matched by an increase in government action. In the cases where the strategies are substitutes and the government had shifted some of the burden of action to the rebels (Figure 2), there could be a Pareto improvement on the prior situation in terms of equity.

4.2 A rise in booty

This has the effect of raising relative utility in the state of conflict. During the cold war period, booty could take the form of strategically motivated assistance to parties in a conflict that had an ideological element. At present, however, a rise in booty is more

likely to reflect an increase in the endowment of natural resources or an increase in its value. The negative impact of 'Dutch disease' effects on economic growth are well known, and evident across much of Africa—Botswana being the exception (see Auty, 1998, and Collier and Gunning *et al*, 1999). The associated appreciation in the real exchange rate is often highlighted as the source of growth collapse, but the potential for conflict to arise over the distribution of natural resource wealth may be just as important as a cause of economic decline. Thus, Botswana—one of the few African countries to manage its resource wealth reasonably well—distributed the rents widely, and thus avoided conflict.

In Figures 3 and 4 we consider the rise in available war loot, bearing in mind that this increase could be relevant to either or both sides. Figure 3 represents the case where the two strategies are complements. An increase in available booty to the government (B^G) shifts its reaction function leftwards, indicating a lower optimal choice of *a* for any level of *e*. For the rebels a greater availability of lootable resources (B^R) has the effect of a downward shift in its reaction function pointing to reduced *e* for every level of *a*. When both sides have equal access to booty the shift is to point B with an obvious decline in activities to promote peace. When it is exclusive to the government point G becomes applicable, when it is only the rebels, point R is the new equilibrium. The side receiving the booty lower its action or effort accompanied by a corresponding, but less than proportionate, decline in its opponent strategic variable.

Figure 3

Booty (complements)

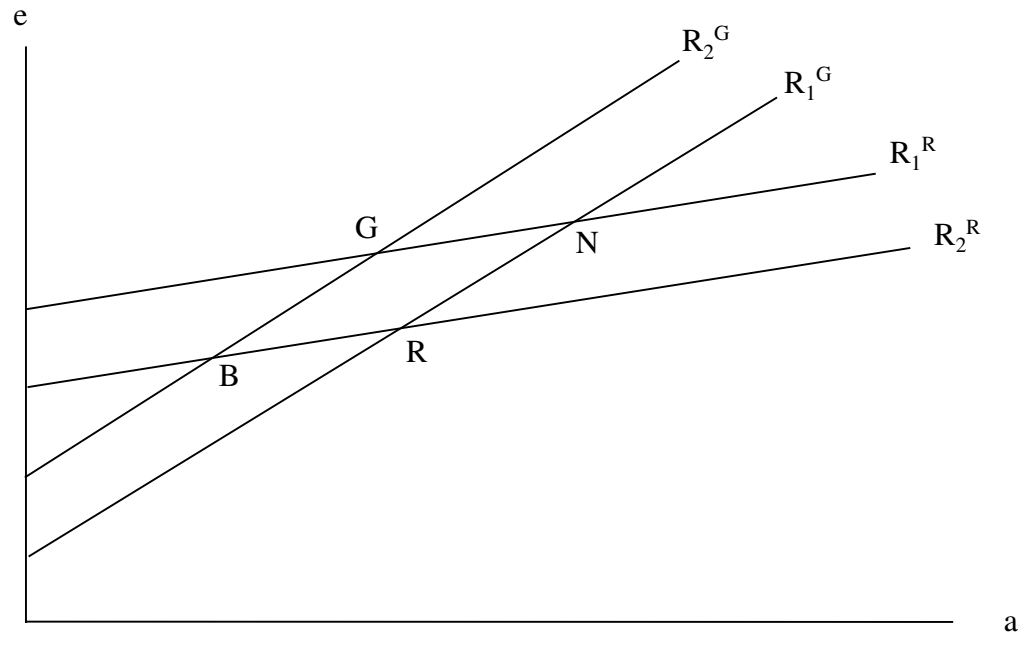
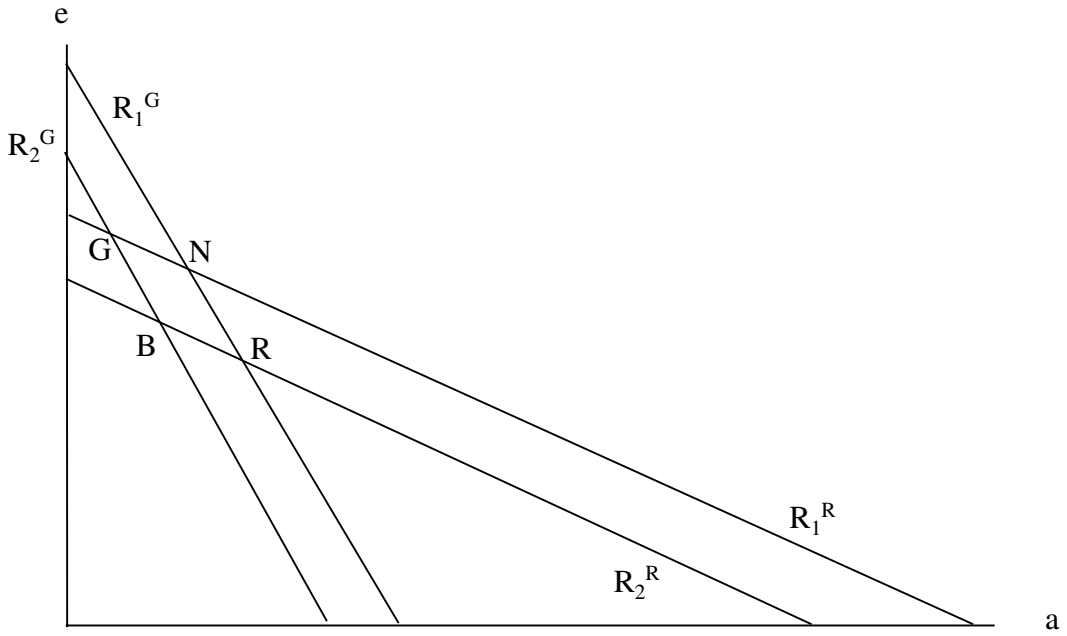


Figure 4

Booty (substitutes)



A qualitatively different picture emerges in Figure 4 where the strategies are substitutes. Greater loot shifts reaction functions in a downward direction. Here the greater endowment of booty by one side exclusively not only reduces its incentive to undertake its own relevant strategic action or effort, but also causes it to shift part of the burden of peaceful behaviour to its opponent.

In general, the greater availability of booty or lootable resources to both sides (as opposed to one side only) reduces the equilibrium levels of peaceful behaviour as illustrated by point B in Figure 3 and 4.

4.3 An increase in belligerency

Aside from the motivation to make war to gain wealth or reverse perceived inequalities, conflict may arise (or be exacerbated by) an increase in 'pure' belligerency. Thus, during a war over a natural resource, either side may start to play-up its ethnic or religious differences with the enemy. This then becomes a force promoting war (and reducing the incentive to make peace) irrespective of changes in the other parameters. For instance, in Angola's conflict, the government has increasingly emphasised the fact that UNITA draws much of its support from the Ovimbundu people. As wars intensify, and atrocities mount, it becomes easier for leaders to promote hatred and to dehumanise the enemy. Thus, both sides may wish to continue waging war—to 'ethnically cleanse', take revenge etc.—aside from any economic motivation (which we model through shifts in, for example, the θ, B^G, and B^R parameters).

A rise in belligerent attitudes may be captured by a decline in the probability of the peaceful state of nature with respect to its own strategic decision variable, π_a and π_e for the government and rebels respectively. From Equations (3) and (4) we can deduce that it lowers the marginal benefit of action and effort. This in turn will alter the slope of the reaction functions. It will make the government's reaction function steeper and the rebels reaction function flatter. Equilibrium quantities of *a* and *e* may not alter, as optimal strategies also depend upon the opponent's strategic choices. But it will have the effect of making other variations in exogenous parameters more pronounced as far as the total effect on the new equilibrium values of *a* and *e* are concerned. Thus, in the worst conflicts large amounts of booty and pure belligerency (ethnic hatred) interact to drive war forward—making it very difficult for outside parties to encourage the two parties to negotiate. These are, incidentally, the worst conflicts in which to attempt the deployment of peacekeeping forces (as Sierra Leone in 2000 demonstrates).

4.4 Variations in foreign aid

There is much discussion of whether donors can induce peace by withholding or granting more aid. For example, would withholding aid from the governments of Eritrea and Ethiopia induce movement to peace?[8] In the case of Mozambique the promise of generous post-war aid appeared to help in inducing both sides to start negotiations. But in Angola, aid appears to be useless as a form of leverage since both sides have access to mineral revenues; these provide both a source of wealth as well as a means to pay for armies (in contrast to Mozambique which has little mineral wealth). Thus, the use of aid to induce peace is a complex question and it would take another paper to do the issue justice. Nevertheless, we can make three points here.

First, in terms of our model, if donors make foreign aid conditional on peace it will only be paid out in peaceful situations, augmenting *T* and *D* in Equations (1) and (2) respectively.[9] In Figure 1 it will shift the R^G curve rightwards when the government receives aid in a state of peace only (rise in *T*); when rebels receive aid conditional on not fighting (rise in *D*) R^R moves upwards. In Figure 2 a similar conditional gift causes the recipient's reaction function to move upwards. In either case there is greater peace and more *a* and *e*. Aid to parties that increases their utility in times of peace could even replicate the cooperative outcome at point C, and solve the double moral hazard problem caused by non-cooperation. Even conditional assistance to one-party may represent a Pareto improvement.

However, such aid conditionality is notoriously difficult to achieve (our second point). The recipient may accept aid and then renege on its commitment to work towards peace. Or, when aid is fungible, the recipient may transfer all or part of the resources to its military effort. Indeed, Deger and Sen (1992) point out that foreign aid is often

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8 Since Ethiopia has received much more aid than Eritrea (which is generally wary of borrowing from the multilateral donors), withdrawing aid will have asymmetric effects on incentives to negotiate a peace in this case.

9 We ignore the possibility that aid might induce governments to go to war either against rebels or neighbouring states, or the possibility that a promise of aid could be used to induce the overthrow of a government opposed to the donor power. Aid was sometimes used in these ways during the cold war.

siphoned-off to the military. Furthermore, aid may induce one sub-group within the recipient group to commit to peace (the presidency for example) but another sub-group (the military) may not commit, because of personal interests in continuing with war (in which case our model's assumption that collective action problems have been resolved by each group no longer holds). And, the existence of natural resource wealth or a non-aid source of external finance will dilute the incentive of belligerents to cooperate with donors, as already noted. It is thus important that aid aimed at peaceful behaviour is strongly associated with building institutions of commitment to peace. This often requires third party intervention.

Third, we are *not* advocating the suspension of humanitarian aid during wartime emergencies as a means to influence behaviour. Recently, some observers have deployed the maxim 'do no harm' to argue against the provision of humanitarian aid during civil wars, on the grounds that it can be looted by belligerents (see for instance Luttwak, 1999). While in our model humanitarian aid might prolong conflict (if looted it constitutes an increase in booty), aid is often of marginal importance to the war machinery of belligerents (especially when booty in the form of natural resource wealth exists). Humanitarian aid can also be provided in ways that significantly reduce its value to belligerents, and the solution to aid-looting lies in deploying peacekeepers (to protect humanitarian relief and to separate genuine refugees from combatants) not in its suspension (see Addison, 2000) This was the lesson of the Rwandan refugee crisis in Eastern Zaire (now DRC) in 1996. Furthermore, an embargo on relief goods raises the rents associated with market scarcity, and thereby increases the criminalisation of trade (which is often run by Mafia-type gangs associated with the warring factions—the case in Somalia, for instance). If a civil war erupts in association with a famine, it is in fact better to remove all conditionality on food-aid delivery and flood the country with food, thereby decreasing its value as a commodity and its relevance as a weapon. Note that in terms of our model, complete aid suspension creates a situation of complete non-existence for those affected, such that V^C or $U^C \rightarrow -\infty$.

5. Conclusions

This paper has set out a two-actor model of the incentives to seek peace or engage in war. We have explored a number of parameter variations to illustrate the influence of such factors as a rise in the cost of peacefulness (due to rising inequality say), an increase in contestable booty, a rise in belligerency, and variations in foreign aid to induce peace. We have given a variety of African examples, but no doubt many more could be added.

War is a highly complex phenomenon, and wars vary in their determinants. Thus, a model, whatever the necessary simplifications, is a useful means for cutting through complexity, to identify core processes—in particular to identify variables that external third parties can influence to promote peace. The format of our model attempts to capture the profitability of war in Africa, the cost of peaceful behaviour, and the continuum from total war to complete peace that this gives rise to (rather than the mutually exclusive states of total war or complete peace that are used in other models). Most of Africa's contemporary wars bear a closer resemblance to Europe's thirty years war of the seventeenth century (in which booty figured predominantly) than to much of

European warfare since the Napoleonic wars (the present Eritrea/Ethiopia war being the major exception).

In this regard, we can make one final point that returns us to our theme of conflict as a contest over natural resource wealth. It is not natural resource revenues per se but the type of natural resource that matters. In Africa, countries with point resources have a high propensity for conflict: this ranges from the high levels of political violence evident in Equatorial Guinea to the outright conflicts of Angola, Congo-Brazzaville, DRC and Sierra Leone. Point resources often result in poor economic growth and patrimonial regimes sustained by the control and redistribution of rents (Auty, 1998). They also expose governments to a drastic loss of power when armed groups working in association with unregulated international trading networks succeed in capturing such key resources (giving rise to merchant-capital wars). Some countries with diffuse resources have also experienced intense conflict (for example, Somalia), but overall it seems that conflict is less likely in this group. Moreover, there appear to be better chances of ending wars in countries with diffuse resources than those with point resources, since total booty is lower in the former, and aid—and thus third-party intervention—has more leverage on belligerents. Mozambique's success in achieving peace and multi-party democracy, and Angola's failure in both, supports this conclusion.

In the final analysis, the economic basis for conflict only ceases to exist when the utility from states of belligerency diminishes and eventually vanishes. The analysis of the credibility and durability of peaceful arrangements, as well as mechanisms of commitment technology needed for this purpose are beyond the scope of the present paper.

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Camera-ready typescript prepared by Anna Kervinen at UNU/WIDER
Printed at UNU/WIDER, Helsinki

ISSN 1609-5774
ISBN 952-455-226-4 (printed publication)
ISBN 952-455-227-2 (internet publication)