# Looting and Conflict between Ethnoregional Groups

## LESSONS FOR STATE FORMATION IN AFRICA

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A game-theoretic model is analyzed for discussing the determination of looting and fighting activity during a civil war between two ethnoregional groups. The Nash equilibrium of this game emphasizes population size, production capacity and productivity, and access to external funding as the main determinants of the size of the armies and the intensity of looting activity. The Nash equilibrium of the game between the two warlords involves an excessive level of looting. Some lessons are drawn from this framework to bring out the minimum redistribution of resources between groups that must take place in a peaceful equilibrium.

The most striking feature of modern wars in poor countries, which are most of the time internal to a single country, is that they rarely involve a lot of direct fighting between two armies. As Edmund Cairns, an official from the worldwide nongovernmental organization (NGO) Oxfam, puts it,

> Modern conflict . . . challenges the very distinction between war and peace. It takes place typically not between armies, or even between the army of a state and its armed opposition in some easily-defined guerilla movement. The forces of both government and opposition, from Cambodia to Colombia, blend into illicit business and organised crime. (Cairns 1997, 5)

Looting and other forms of violence against civilians have thus become over the recent past the main activity of soldiers in poor countries, where civil wars take place predominantly. A striking effect of this form of military activity is that many more civilians become victims of war than soldiers. Although statistics are very hard to produce

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TABLE 1
War-Related Deaths in Some African Civil Wars

| | *Civilian Deaths* | *Military Deaths* |
|---|---|---|
| Angola 1975-1991[a] | 320,000 | 21,000 |
| Burundi 1972[b] | 80,000 | 20,000 |
| Mozambique 1975-1992[c] | 110,000 | 11,000 |
| Nigeria 1967-1970[b] | 1,000,000 | 1,000,000 |
| Rwanda 1956-1965[b] | 102,000 | 3,000 |
| Somalia 1980-1990[b] | 5,000 | 5,000 |
| Sudan 1983-1990[b] | 500,000 | 10,000 |
| Uganda 1981-1989[b] | 100,000 | 6,000 |

NOTE: War-related deaths data are more inclusive than battle-related deaths and include, for example, the impact of war-related famines and epidemics.
a. Rothchild (1997) (war-related deaths).
b. Courtesy of Milton Leitenberg (war-related deaths).
c. Stockholm International Peace Research Institute (1999) (battle-related deaths).

on these matters, a widely quoted figure states that, on average, 84% of all war-related casualties are civilians (Cairns 1997, 17). This figure does not include the 1994 genocide in Rwanda. Table 1 presents estimates of civilian and military war-related deaths in a sample of African conflicts. These data are by nature very approximate and should only be interpreted as suggesting the order of magnitude of the phenomenon. Massacres perpetrated by some African governments, in which the number of military deaths is nearly zero but the number of civilian casualties is very large, are not included in this table. For example, in Uganda, Idi Amin had about 300,000 civilians killed between 1971 and 1978, while Milton Obote, who replaced him, also had about 300,000 civilians killed between 1981 and 1985. Estimates for the Rwandan genocide range between 500,000 and 800,000 civilian deaths (Cairns 1997). There are no precise estimates of the number of civilian deaths inflicted by the Derg government in Ethiopia between 1974 and its fall in 1991 (de Waal 1991), but some moderate estimates suggest that more than 200,000 civilians died, not including those who died in the two famines of 1974 and 1984. de Waal describes how the Derg's army sometimes destroyed Oromo villages and killed their whole population, just for the sake of testing new weapons. It also made the 1984 drought-related famine more devastating by diverting the international relief operation to facilitate the pursuit of its military operations (de Waal 1991).

These staggering facts, to which should be added the suffering of millions of mutilated children, raped women, destroyed homes, stolen property, damaged crops, and millions of refugees displaced by the anticipation of massacres and looting, show that a proper theory of war and conflict should not focus on the fighting proper but should put a lot of emphasis on looting and violence against civilians in general as the main activity of soldiers during a war. This study is an attempt to use conventional economic analysis to explain this phenomenon and uncover some of its determinants.

Moreover, although observers have identified a negative trend in the number of conflicts taking place in the world since the end of the cold war, Africa seems to be

engaged in the opposite direction: "Africa is the most conflict ridden region of the World and the only region where the number of armed conflicts is on the increase" (Stockholm International Peace Research Institute [SIPRI] 1999). In particular, "all the new conflicts in 1997 were located in Africa" (SIPRI 1998). This suggests that a useful theory of conflict should allow for the role of ethnicity, which seems to be a more important feature of the political organization of the countries of this continent than of other parts of the world. This does not mean that ethnoregional division should necessarily be regarded as the cause of civil wars. In fact, Collier and Hoeffler (1998) have analyzed this issue econometrically using a worldwide sample and find that ethnolinguistic fractionalization (i.e., the probability that any two citizens from a given country will be drawn from a different ethnolinguistic group) affects quadratically the probability of a civil war occurring in that country, as well as its duration. The maximum impact occurs when the country is divided between two or three ethnic groups of similar size. As Collier and Hoeffler put it, "It is not ethno-linguistic fractionalization which is damaging to societies but that degree of fractionalization which most facilitates rebel coordination" (1998, 570). This entails that, given their actual level of ethnolinguistic fractionalization, most African countries would have a higher probability of a civil war erupting if their number of ethnolinguistic groups were to decrease. Hence, the important fact seems to be that ethnicity is a preexisting factor that enhances the ability of the opposing forces to organize themselves in case of war. Collier and Hoeffler (forthcoming) show that the interaction of high ethnolinguistic fractionalization and religious fractionalization strongly reduces the risk of civil war. This result is shown by Collier and Hoeffler (2002 [this issue]) to be consistent with the high incidence of civil wars in Africa because the pro-peace effect of social fractionalization in this continent is compensated by disastrous economic performances by world standards. Using a more encompassing concept of incidence, taking into account both the initiation and the duration of a civil war, Elbadawi and Sambanis (forthcoming) find some results that corroborate this point but also find a significant effect of political rights. Their results suggest that even a highly polarized country, with a small number of ethnic or religious groups facing one another, could maintain peace by adopting appropriate political institutions. Moreover, because international borders in Africa (and elsewhere) often cut through the land of some ethnoregional groups, the ethnic factor lies at the heart of some foreign interventions in internal conflicts, as illustrated by the recent situation in Congo-Kinshasa (Reed 1998).

The economic analysis of conflict has given rise recently to a burgeoning literature, which is reviewed briefly in the second section. The third section presents a simple theoretical framework for analyzing the microeconomics of looting and fighting. This is done in a framework in which two organized groups are facing each other, as in a civil war, rather than in the case when an incumbent government is facing a potential rebellion, as is often done in the literature. The results could readily be extended to more than two groups. It is shown how looting and fighting by the two sides are strategic complements (i.e., that an increased level of effort by one side in fighting or looting provides to the other side an enhanced incentive to step up its own effort in the same activity). This provides some foundation for the well-known escalation effect,

whereby increased violence responds to increased violence in a vicious spiral. Special attention is devoted to the problem of the external financing of the warlord and the impact of credit market imperfections on looting and fighting. The fourth section specializes the model a bit and analyzes its Nash equilibrium for the case in which two ethnoregional groups are facing each other in a civil war. The emphasis is put on the determinants of the level of looting activity, which is shown to entail an inefficient allocation of labor during a war. However, even if it were enforceable, a ban on looting would not necessarily be Pareto improving. The fifth section discusses briefly the constraint imposed on the sharing of the state resources that must be taken into account if majority rule is not to lead to a civil war in an ethnically divided society. The final section offers some concluding comments.

## RELATION TO THE LITERATURE

The model presented below differs from the seminal work of Grossman (1991) in that it focuses on the case in which two organized groups face each other. In this model by Grossman, set in the principal-agent framework, there is an asymmetrical treatment of the ruler, who chooses the amount of resources that he is investing in soldiering to reduce the probability of a successful insurrection, and the disorganized peasants, whose probability of insurrection only depends on the expected payoff from such an endeavor. In this framework, where the ruler is a Stackelberg leader, Grossman shows that the most likely outcome is an equilibrium in which the probability of a successful insurrection is not chosen to be zero by the ruler, who prefers to save on the size of his army while accepting the risk of being overthrown with a small probability. However, this model does not analyze the free-riding problems that may impede the organization of the insurrection movement, which are assumed to be somehow solved in equilibrium. Kuran (1989) offers an interesting analysis of this problem, based on a participation game in which each player is uncertain about the other players' types. Rebellion is then "catching" and spreads like a "prairie fire" as more agents discover that others are ready to engage in the rebellion. As usual with participation games, where the decision to participate by one agent depends on a large enough number of other agents deciding to participate, there are multiple equilibria in this game. Insignificant events may then act as "sparks," triggering a revolution in an otherwise peaceful society by shifting the country from one equilibrium to another one, where the underlying conflict breaks out in the open.

The model presented below analyzes the case of two ethnoregional groups facing each other, assuming that they are in fact organized, under the leadership of a warlord. This assumes, as is often done in the theoretical literature, that the internal organization of the groups is able to overcome any potential collective action problems. The reason for this choice is that, in the words of Hirshleifer (1995, 27), "While associations ranging from primitive tribes to modern nation-states are all governed internally by some form of law, their external relations with one another remain mainly anarchic." In the case of Africa, this is a useful assumption because ethnoregional groups preexist with an established internal organization before any rebellion arises. Anthro-

pologists have described the internal organization of ethnic groups, and Mappa (1998), for example, presents an interesting comparison of traditional power within the ethnic group and state power, taking her examples from Congo. Gates (2002 [this issue]) devotes much effort to analyzing the microeconomic foundations of the fighter's decision to participate in a rebellion and develops an intertemporal optimization model for capturing the trade-off between hardship now and reward later. In the model presented below, individual decisions are neglected, assuming that each group is led by a utilitarian leader. The ethnic dimension of conflicts in Africa has also played a prominent part in analyses by political scientists (e.g., Rothchild 1997). Hence, to assume that potential collective action problems are solved from the start within the ethnoregional group is a useful assumption to focus on the intergroup rivalry, at least as a first approximation. However, one must acknowledge that there are examples of African internal conflicts that do not fit within the confines of an ethnoregional partition of the population. For example, Abdullah and Muana (1998) show that the dramatic conflict in Sierra Leone was triggered by an alliance of dropouts from different social groups. Similarly, the recent war between the "Cobras," the "Ninjas," and the "Scorpios" in Congo-Brazzaville seems to defy any preestablished intellectual construct.

The theoretical literature on conflict has devoted much attention to the analysis of the technology of conflict, treating the contending groups "as unitary actors that have somehow managed to resolve the internal collective-action problem" (Hirshleifer 1995, 27). In a set of complementary papers, Grossman and Kim (1995), Hirshleifer (1995), and Skaperdas (1992) have thoroughly investigated the impact of different assumptions regarding this technology on the characteristics of the conflict prevailing in equilibrium. Hirshleifer defines the "decisiveness parameter" in relation to returns to scale in fighting: the decisiveness parameter is high when a small difference in the forces engaged in the fight entails a large difference in the probability of success. A small value of this parameter may result in a stable anarchic equilibrium. When this parameter is very low, Skaperdas even shows that a cooperative behavior may arise between the contenders. Grossman and Kim assume a different technology for aggression and defense and show that the resulting equilibrium will crucially depend on the relative effectiveness of offensive and defensive weapons. Neary (1997) discusses this theoretical approach and compares it to the rent-seeking literature. However, these analyses focus on the fighting technology and do not take into account the fact that contenders in a conflict may combine other means for improving their relative position than just engaging more forces in the fight.

Azam (1995) also discusses the case of two groups facing each other, treated as unitary agents, but treats them asymmetrically, one of them being in power. He contrasts the cases in which the government and the opponent act as Cournot-Nash players with the case in which the former is a Stackelberg leader. He then shows that a Stackelberg government might use the "gift" as a tool for staying in power, thus showing how the redistribution of the state resources may be used by a sophisticated ruler to stay in power while reducing the amount of resources wasted by the two sides in competing for the "prize." Azam, Berthélemy, and Calipel (1996) present an empirical test of this hypothesis, using the occurrence of political violence as the dependent variable of a probit analysis. This basic insight is elaborated on by Azam (2001), who links the

adoption of the Stackelberg leader's role to the possibility of a credible commitment by the government to its public expenditures policy. This point is consistent with the observation that "a striking feature of the conflicts in Africa . . . is the link between armed conflict and a weak state" (SIPRI 1998), if one interprets a "weak state" to mean one that is unable to commit credibly to its public expenditure policy. Therefore, the model analyzed in the following focuses on a Nash equilibrium setting in which the government is not treated differently from the rebel group and cannot commit credibly to a transfer for buying peace. However, the issue of redistribution crops up again in the penultimate section, which suggests that the adoption by the two sides of a ban on violence against civilians, somehow in the spirit of the Geneva conventions, would in general require such a transfer to be acceptable to both parties. Genicot and Skaperdas (2002 [this issue]) discuss the credibility issue from a different point of view; in a repeated game setting, they show how the adoption of a trigger strategy by the two sides can support a credible cooperative equilibrium. This is also ruled out here by looking at a one-shot Nash equilibrium. Blomberg and Hess (2002 [this issue]) discuss another type of deflection policy, whereby the ruler triggers a diversionary external conflict with a neighboring country to cloak his economic failure. They show how such a model can lead to a poverty-conflict trap, with some empirical support for the poorest countries. This possibility is not analyzed here.

The model analyzed by Noh (1999) is somehow close in spirit to the present one. It describes a two-stage game in which each group first determines a sharing rule among its members to maximize the group's income and then allocates its resources between productive and appropriative activities in a decentralized way. The conflict technology that determines the division of aggregate output between the two groups depends, classically, on the relative forces engaged in appropriation by the two groups. However, in Noh's model, each individual group member chooses the amount of resources devoted to appropriative activity in a decentralized way. This model shows that the egalitarian intragroup sharing rule produces outcomes with more resources devoted to production and fewer to predation than a less egalitarian sharing rule. The intuition is that if participation to the fight entails a larger share of the bounty, then agents will invest too much in the appropriative activity. The model analyzed below also equalizes utility among individuals by the use of taxes on producers and wages to soldiers, so that agents are indifferent about joining the army or staying behind as producers. However, it distinguishes between fighting proper, which affects the probability of winning the "prize," depending on the other side's defense effort, and looting (i.e., the appropriation of some of the other group's output, without military opposition). The latter reduces the resources readily available to the other group for paying the soldiers and thus provides an incentive for more looting. Like Noh (1999) and Grossman (1991), among others, ours is a general equilibrium model in which the decisions regarding production and fighting are taken simultaneously, but looting is added to the list of potential activities in the present model. It creates a disincentive to production. It is shown that the level of looting by the two sides and the level of fighting under some more restrictive conditions are strategic complements, as mentioned above. For some specification of the conflict technology, this could result in multiple equilibria, somewhat related to the Kuran (1989) model discussed above. However, this point is not pushed very far, and

the emphasis is put instead on the determinants of the Nash equilibrium under some assumptions that make it unique. This allows showing how an inefficient level of looting activity characterizes the Nash equilibrium, even if it is unique. In fact, because looting is to some extent a reciprocal and damaging activity, its efficient level, even during a war, is simply zero.

## THE MICROECONOMICS OF LOOTING AND FIGHTING

All the individuals in the country are assumed to be grouped into two preexisting ethnoregional groups (ERG), labeled 1 and 2. Each ERG is headed by an ERG leader or warlord who allocates the human resources from his group between production (say, farming in general) and joining the army and levies taxes on its own side. For the sake of simplicity, all the individuals are assumed to have the same utility function and to be risk neutral, so that their utility function is linear in income, broadly defined. If individual $i$ from group $k \in \{1, 2\}$ remains a producer, then his utility is

$$U_{ki}^{F} = f_{ki} - \tau_{ki} - \delta d_{/k} + \psi_{k}, \tag{1}$$

where $f_{ki}$ is the individual's output, $\tau_{ki}$ is the tax levied by his own group's army, and $d_{/k}$ is the per capita expected level of looting by the opponent's forces, inflicting a damage $\delta$ per unit, identical for the two sides,[1] whereas $\psi_k$ is the expected value of the gain in utility by a member of group $k$ if the latter wins the conflict, assumed identical for all group members. This is defined more precisely below. Assume that all the farmers from the same ERG are facing the same probability of being looted and the same expected damage. All the individuals from a group are ranked by decreasing levels of productivity as farmers, assuming that $f_{ki}$ is a continuously differentiable function such that

$$\frac{\partial f_{ki}}{\partial i} < 0,$$

so that the ERG's output has decreasing returns to scale:

$$Q_k = \int_0^{L_k} f_{ki}\, di = \theta_k F(L_k), \qquad s.t. \quad \theta_k F'(L_k) > 0, \qquad \theta_k F''(L_k) < 0. \tag{2}$$

If individual $i$ from group $k$ joins the army, then he will spend a fraction $0 \leq e_{ki} \leq 1$ of his time fighting and the remaining fraction $1 - e_{ki}$ looting, with a known return $\gamma$, identical for the two sides. The latter assumption is clearly a simplification, assuming that the level of looting activity is far below the maximum amount that the production level of the other side would allow without rationing the looters because of the resulting shortage of lootable production. The assumption $\delta > \gamma$ is made for capturing the fact that looting generally involves some waste. There are $A_k$ individuals so enrolled as soldiers. The warlord's orders are obeyed, say, because a soldier incurs an infinite penalty

1. The notation */k* is used throughout the model to indicate $k$'s opponent, $k \in \{1, 2\}$.

when caught shirking (i.e., in particular, when caught looting instead of fighting). The soldier keeps the loot that he grabs, gets a wage $w_k$, and incurs a disutility $\omega$ per unit of time spent fighting, again assumed identical for the two sides. Therefore, the utility level reached by an individual while in the army is

$$U_{ki}^{A} = w_k + \gamma(1 - e_{ki}) - \omega e_{ki} + \psi_k. \tag{3}$$

In an interior solution, the warlord will make sure that $U_{ki}^{A} = U_{ki}^{F}$ to avoid desertion or congestion in the army.[2] In other words, the warlord will not leave any rent to his ERG members so that they are indifferent about joining the army and staying behind as farmers. Moreover, attention is restricted to equilibria where all the soldiers are treated equally, so that $e_{ki} = e_k$, all $i$.

The warlord is assumed utilitarian and allocates the ERG's human endowment $H_k$ between $L_k$ individuals allocated to farming and $A_k$ to the army:

$$L_k + A_k \leq H_k. \tag{4}$$

The fighting performed today is aimed at gaining control of state power tomorrow, which is supposed to bring an exogenous benefit $T$. Victory occurs with the following probability:

$$p_k\left(\frac{e_k A_k}{e_{/k} A_{/k}}\right), \quad p_k' \qquad (-) > 0, \quad p_k''(-) < 0. \tag{5}$$

This captures the idea that it is the relative level of the forces engaged in fighting proper that contributes directly to enhancing the probability of winning the fight, whereas the other activities, looting and farming, may only do so indirectly by bringing in resources to be used by the group. This type of technology is a common assumption in the literature on conflict (Azam 1995; Grossman and Kim 1995; Neary 1997), and the parameters of the $p_i(-)$ function can be chosen to reflect the relative fighting strength of the two armies. If the ERG is defeated, then its future gain is simply set to zero. Hence, $p_k(-)\,T$ measures the expected value of the group's resources in the future period.

Assume that the warlord and the people that he represents have a much higher rate of time preference $\rho$ than the market (risk-adjusted) rate of interest $r$ but that, because of capital market imperfections, only a fraction of this amount can be mobilized today for paying the soldiers. This may reflect both the high rate of interest that the credit market charges to the warlord $r < r_k < \rho$ and a possible borrowing restriction, to the effect that only a fraction $0 < \mu < 1$ of the expected gain can be used as the counterpart to the loan. Thus, even if fighting a civil war is a positive present-value project, it may be difficult to get a loan on commercial terms for financing it for moral or political rea-

2. This is a sufficient condition, which we assume to hold, whereas the necessary condition is weaker but less convenient. Hence, other intragroup distribution rules are possible but do not affect the allocation of labor between farming, looting, and fighting. We thus focus on the simplest case for determining the soldiers wage rate and the taxes levied on farmers.

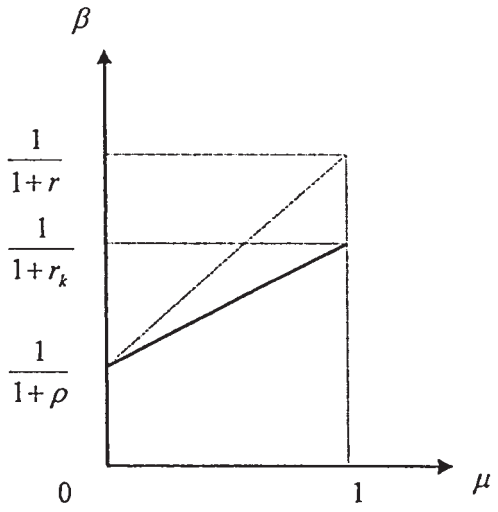


**Figure 1: The Effective Discount Factor**

sons. Then, the expected value of the ERG member's utility gain can be written as follows, after deducting the reimbursement of the loan in case of victory:

$$\psi_k = \frac{1-\mu}{1+\rho}\frac{p_k(-)T}{H_k}.$$

Now, to capture this access problem, define as follows the "effective discount factor" β as the weighted average of

$$\frac{1}{1+r_k} \text{ and } \frac{1}{1+\rho},$$

which is smaller the more restricted (or costly) the possibility of borrowing for funding the war:

$$\beta = \frac{1}{1+\rho} + \frac{\mu(\rho - r_k)}{(1+r_k)(1+\rho)}.$$

Figure 1 represents this parameter as a function of μ and $r_k$.

In the days of the cold war, the funding of a guerilla army was made easier by the possibility for trading off funding now in return for alignment to a superpower later. Here, it is assumed that the two sides are facing the same credit market conditions.

In addition, assume that a foreign power may provide some support by giving a lump-sum amount $B_k$. Then, the budget constraint facing the warlord can be written as follows:

$$w_k A_k = \int_0^{L_k} \tau_{ki}\, di + B_k + \frac{\mu}{1+r_k} p_k \left(\frac{e_k A_k}{e_{lk} A_{lk}}\right) T. \tag{6}$$

Now, given the budget constraint (6), the labor-time constraint (4), and the fact that $e_k$ is a fraction between 0 and 1, the utilitarian warlord will seek to maximize

$$\max W_k = \int_0^{L_k} U_{ki}^F \, d\, i + \int_{L_k}^{H_k} U_{ki}^A \, d\, i. \tag{7}$$

The notation used in (7) assumes that the $L_k$ most productive farmers are kept as producers, whereas the least productive ones are drafted first in the army. This is quite obviously a property of the optimal allocation of labor, which explains, among other things, why soldiers are usually selected from among the youngest males in the group. Using the definitions (1) and (3) and all the relevant constraints, this maximization exercise yields the following proposition:

*Proposition 1*. For an interior solution with a strictly positive level of looting, the allocation of labor by warlord $k$ obeys the following pair of first-order conditions:

$$\beta \frac{p_k'(-)T}{e_{/k}A_{/k}} - \omega = \gamma, \tag{8}$$

and

$$\theta_k F'(L_k) - \delta d_{/k} = \gamma. \tag{9}$$

*Proof.* Define

$$R_k = \theta_k F(L_k) - (\gamma + \delta d_{/k}) L_k,$$

and

$$Z_k = \beta p_k \left( \frac{e_k A_k}{e_{/k} A_{/k}} \right) T - (\gamma + \omega) e_k A_k,$$

as the ERG's profits from farming and fighting, respectively, valuing labor at its opportunity cost. Notice that these two functions are strictly concave in $L_k$ and $e_k A_k$, respectively.

Then, substituting (1) and (3) into (7), using (2) and (6), yields

$$W_k = \gamma H_k + B_k + R_k(L_k, \ldots) + Z_k(e_k A_k, \ldots).$$

Maximizing the latter under (4) and $0 \le e_k \le 1$ yields (8) and (9) for an interior solution with $0 < e_k < 1$, on which the analysis focuses here. It could easily be checked that all the second-order conditions, including the positive semidefinite Hessian matrix, hold in the neighborhood of an interior solution with (9) holding.

*Comments*. These two conditions simply say that the marginal returns to labor in its three possible uses should be equalized. Equation (8) shows that the marginal return to labor used in fighting, net of the disutility involved and taking due account of the possible capital market imperfection, should be equalized with the return to looting.

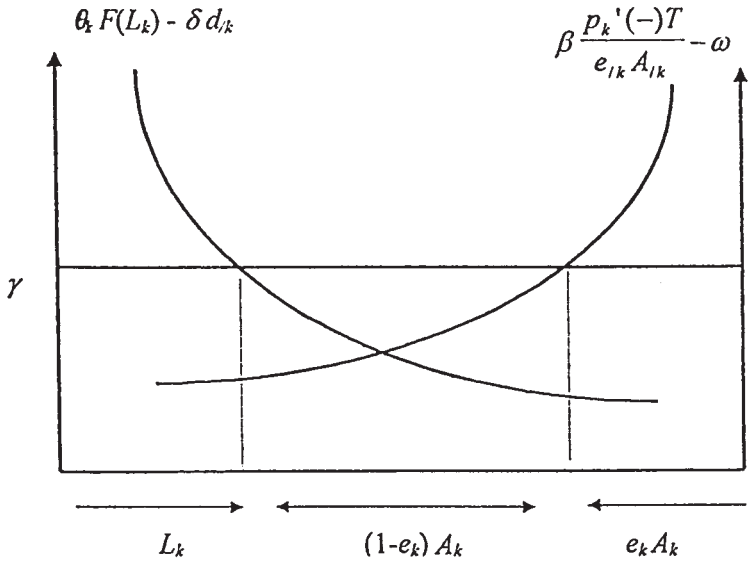


**Figure 2: The Allocation of Labor to Farming, Looting, and Fighting**

Similarly, equation (9) means that labor should be taken away from farming up to the point where its marginal return in this activity is equal to the return to looting. Figure 2 depicts the resulting optimal allocation of labor, given the values of the parameters of the model $\{\theta_k, \delta, \beta, T, \omega\}$ and the values of the relevant choice variables of the opponent $\{e_{/k}A_{/k}, d_{/k}\}$. Figure 2 assumes that an interior solution exists where the three types of activity are performed. However, it is clear from this figure that if the returns to farming or to fighting are too high, or if the returns to looting are too low, then looting will fall to 0 in equilibrium, with the marginal returns to farming and fighting being equalized at a level above $\gamma$.

To complete the description of the optimal choice made by the warlord, the level of taxation must be described, as well as the wage rate paid to the soldiers and the level of utility reached by each member of the ERG. In an interior solution, this is derived from the equal-utility or utility-arbitrage condition:

$$U_{ki}^{F} - \psi_k = U_{ki}^{A} - \psi_k = U_k. \tag{10}$$

Substituting from (1) immediately yields

$$\tau_{ki} = f_{ki} - \delta d_{/k} - U_k. \tag{11}$$

Hence, each farmer's differential rent is taxed away, net of the damage due to looting, so that all the farmers are left with a common utility level equal to the one granted to the soldiers. This provides a fairly idealized picture of the amount of information possessed by the warlord and of the level of control that he exerts on his soldiers when they collect the taxes. In the real world, it is often difficult to distinguish between the

TABLE 2
Comparative Statics of Best-Response Functions

| | $\theta_k$ | $\delta d_{/k}$ | $\gamma$ | $\beta$ | T | $e_{/k}A_{/k}$ | $\omega$ | $H_k$ | $B_k$ |
|---|---|---|---|---|---|---|---|---|---|
| $L_k$ | + | – | – | 0 | 0 | 0 | 0 | 0 | 0 |
| $e_k A_k$ | 0 | 0 | – | + | + | ?+ | – | 0 | 0 |
| $(1 - e_k)A_k$ | – | + | + | – | – | ?– | + | + | 0 |
| $e_k$ | + | – | – | + | + | ?+ | – | – | 0 |
| $w_k$ | + | ?– | – | + | + | ?+ | ?– | – | + |
| $U_k$ | + | – | + | + | + | – | – | – | + |

NOTE: The analysis is restricted to interior solutions for all the variables. The impacts of $e_{/k}A_{/k}$ are ambiguous but are as shown beside the question mark at the top four rows if

$$\frac{-p_k''(-)e_k A_k}{p_k'(-)e_{/k}A_{/k}} > 1$$

(i.e., if the probability of winning the war has strongly diminishing returns). Then, an increase in the opponent's forces engaged in fighting strongly increases the returns to engaging more of one's forces in fighting

taxation levied by the farmer's own ERG army and the looting inflicted by the opponent group.

Substituting from (11) in the budget constraint (6) and using definition (3) yield the following pair of equations that may be used to determine jointly $U_k$ and $w_k$:

$$U_k = w_k + \gamma - (\gamma + \omega)e_k, \tag{12}$$

and

$$w_k A_k = \theta_k F(L_k) - (U_k + \delta d_{lk})L_k + B_k + \beta\, p_k(-)T, \tag{13}$$

where the optimal values are substituted from above for the variables already determined using (8) and (9). Examination of (12) and (13) shows that a unique interior solution exists if

$$\theta_k F(L_k) - \delta\, d_{lk} L_k + B_k + \beta\, p_k(-)T > (\gamma - (\gamma + \omega)e_k)L_k. \tag{14}$$

In other words, farming and fighting, in addition to any possible transfer from abroad, must pay at least as much as looting if a positive wage is to be paid to the soldiers. Otherwise, the warlord would rely only on looting for compensating the soldiers. Now, focusing on the interior solutions with positive looting activity, the following proposition can be derived from this exercise:

*Proposition 2*. In an equilibrium with nonzero values of the endogenous variables, the decisions made by the warlord can be described by a structural model yielding the comparative-static predictions described in Table 2.

*Proof*. The first three rows of Table 2 can be derived by shifting the various curves of Figure 2. Only the $e_{/k}A_{/k}$ column yields an ambiguous impact, which can be removed as explained in the notes to Table 2. The fourth row can then be derived, taking due account of (4). The fifth row must be derived by substituting (12) into (13) and deriving the resulting expression while using the first-order conditions (8) and (9) for simplifying the resulting expressions. The last row is found by noticing that $U_k$ is determined by sharing equally the available resources among the ERG's members, taking into account the disutility of fighting and the damage inflicted by the other side.

*Comments*. Many cells of Table 2 are worth a comment. Let us focus on the third row, which describes the determinants of the level of looting activity. It clearly decreases with the returns to farming and to fighting proper. Hence, a policy that aims to protect the civilians from the damage inflicted by looters should aim to increase the productivity of farming or other productive activity (e.g., by increasing the human capital of young males or by distributing free seeds and fertilizer to farmers). It should aim to increase the current value of the expected postconflict benefits in case of victory (e.g., by making credit available on better terms to the warring factions). In a related way, the size of the ERG's population affects looting positively. On the contrary, the amount of lump-sum aid payment to the ERG, $B_k$, has no impact at all on looting, farming, or fighting and only affects the wage paid to the soldiers and the utility level of all the ERG's members. The difference between these two impacts on looting shows that altering the relative returns on farming or fighting, relative to looting, is important for protecting civilians. This is just another instance that unconditional aid is ineffective, which has been found in other settings (Adam and O'Connell 1999; Azam and Laffont 2000).

The impact of the damage inflicted by the opponent's looting activity is clearly positive, showing that looting by the two sides are strategic complements. As is well known from the theory of coordination games (e.g., Cooper 1999), this opens the possibility of Pareto-ranked multiple equilibria. In the present model, this would depend crucially on the specification of the fighting technology $p_k(–)$. In other words, there potentially exist specifications of the $p_k(–)$ function such that the level of looting activity could be too high as a result of a coordination failure. Then, a foreign intervention could be devised for helping the warring parties to coordinate on an equilibrium involving less looting by the two parties.[3] Similarly, Findlay (1996) discusses how various ideological or cultural constructs, including Ibn Khaldun's *assabiya* (solidarity of the nation), can help to select one equilibrium out of such a set of multiple ones. However, this theoretical possibility is not exploited here, and some simplifying assumptions are adopted instead that ensure that a unique Nash equilibrium exists with a convenient closed form.[4]

3. Rothchild (1997) discusses, as a political scientist, the potential role of a foreign mediator in settling ethnic conflicts in Africa. Regan (2002) suggests that foreign intervention is not necessarily a good thing for ending or even shortening a conflict.

4. Bhagwati is reported to tell his students, "If your model yields multiple equilibria, then go and mend it!" Whether or not this is true, we do obey this order.

## ANALYSIS OF THE NASH EQUILIBRIUM

To analyze the Nash equilibrium of the game taking place between the two warlords, the model is specialized a bit by using the following assumptions.

*Simplifying assumptions*:

(i) Assume that $p_1(-) = 1 - \exp\left\{-\alpha \frac{e_1 A_1}{e_2 A_2}\right\}$, $\alpha > 0$, and $p_2(-) = 1 - p_1(-)$, and

(ii) assume that $F'(L_k) = \frac{\pi - L_k}{L_k}$, $\pi > 0$.

Assumption (i) is a simple way to specify the probability of winning the war as a strictly increasing and concave function of the relative forces, whereas assumption (ii) is a convenient way of capturing diminishing returns in production. Notice that $\pi$ may be interpreted as the maximum quantity of labor that can be allocated to production without reducing the marginal product below 0. This parameter may be used to capture, as a fall in $\pi$, the effect of a shock that threatens the survival of a fraction of the ERG (e.g., nomadic herdsmen after a drought). The coefficient $\alpha$ is akin to Hirshleifer's decisiveness parameter. Then, using

$$d_k = \frac{(1 - e_k)A_k}{L_{/k}}, k \in \{1, 2\}, \tag{15}$$

and assuming again that the two sides face the same credit market conditions, have the same disutility of fighting, and master the same looting technology, one can derive easily the following proposition:

*Proposition 3*. Under the simplifying assumptions made above, the Nash equilibrium of the present model, if it exists, is unique and stable with respect to the Cournot-tâtonnement (i.e., the dynamics resulting from assuming alternating best response by the players) and is such that

$$\text{(i) } e_1 A_1 = e_2 A_2 = \frac{\alpha\beta T}{\gamma + \omega} \exp\{-\alpha\},$$

$$\text{(ii) } A_2 = A_1 + \frac{(\theta_1 - \theta_2)(\pi - L_1) + (\theta_2 + \gamma)(H_2 - H_1)}{\theta_2 + \delta + \gamma},$$

$$\text{(iii) } (1 - e_1)A_1 = \frac{(\theta_2 + \gamma)}{\Delta}\left((\theta_1 + \gamma)H_1 + \delta H_2 - \pi\left[\theta_1 + \frac{\delta\theta_2}{(\theta_2 + \gamma)}\right] - (\theta_1 + \gamma + \delta)\frac{\alpha\beta T}{\gamma + \omega}\exp\{-\alpha\}\right),$$

$$\text{(iv) } (1 - e_2)A_2 = \frac{(\theta_1 + \gamma)}{\Delta}\left(\delta H_1 + (\theta_2 + \gamma)H_2 - \pi\left[\frac{\delta\theta_1}{(\theta_1 + \gamma)} + \theta_2\right] - (\theta_2 + \gamma + \delta)\frac{\alpha\beta T}{\gamma + \omega}\exp\{-\alpha\}\right),$$

where $\Delta = (\theta_1 + \gamma)(\theta_2 + \gamma) - \delta^2 > 0$ for ensuring the stability of the Nash equilibrium with respect to the Cournot-tâtonnement.

*Proof.* Part (i) of proposition 3 follows from writing the first-order condition (8) for both warlords as

$$\frac{\alpha\beta T}{e_2 A_2}\exp\left\{-\alpha\frac{e_1 A_1}{e_2 A_2}\right\} = \gamma + \omega = \frac{\alpha\beta T}{e_2 A_2}\frac{e_1 A_1}{e_2 A_2}\exp\left\{-\alpha\frac{e_1 A_1}{e_2 A_2}\right\}.$$

Then, it is easily checked that (i) is the unique solution to this pair of equations.[5] The fighting effort is thus increasing in $\alpha$ if $0 \leq \alpha \leq 1$, and decreasing otherwise. Parts (ii), (iii), and (iv) of this proposition follow from writing the first-order condition (9) as

$$\theta_1 \frac{\pi - L_1}{L_1} = \gamma + \delta\frac{(1 - e_2)A_2}{L_1}$$

and

$$\theta_2 \frac{\pi - L_2}{L_2} = \gamma + \delta\frac{(1 - e_1)A_1}{L_2}$$

and rearranging using part (i) for computing (iii) and (iv) in turn.

The reaction functions of the two warlords may be written as

$$A_1 = H_1 - \frac{\theta_1\pi + \delta S}{\theta_1 + \gamma} + \frac{\delta}{\theta_1 + \gamma}A_2$$

and

$$A_2 = H_2 - \frac{\theta_2\pi + \delta S}{\theta_2 + \gamma} + \frac{\delta}{\theta_2 + \gamma}A_1, \tag{16}$$

where $S = \dfrac{\alpha\beta T}{\gamma + \omega}\exp\{-\alpha\}$.

Then one can easily derive the diagram of Figure 3, from which uniqueness and stability can be derived under the stated conditions. Proving existence of an interior equilibrium amounts essentially to assuming parameter values that ensure $A_1 > 0$ and $A_2 > 0$.

*Comments*. Proposition 3 deserves a few comments. First, uniqueness of the Nash equilibrium depends on the specification adopted for the success-probability function but should be relatively robust to changes in this specification, provided some regularity conditions are assumed. Then, (i) entails that the war effort by both parties is increasing in the share of the expected value of the "prize" that can be mobilized via the credit market, as well as in its size itself, but it is decreasing in the unit full cost of fighting $\gamma + \omega$. In other words, $\alpha\beta/(\gamma + \omega)$ can be defined as the "effective decisiveness

5. It could be checked easily that stability is also prevailing in the $\{e_1A_1, e_2A_2\}$ space.

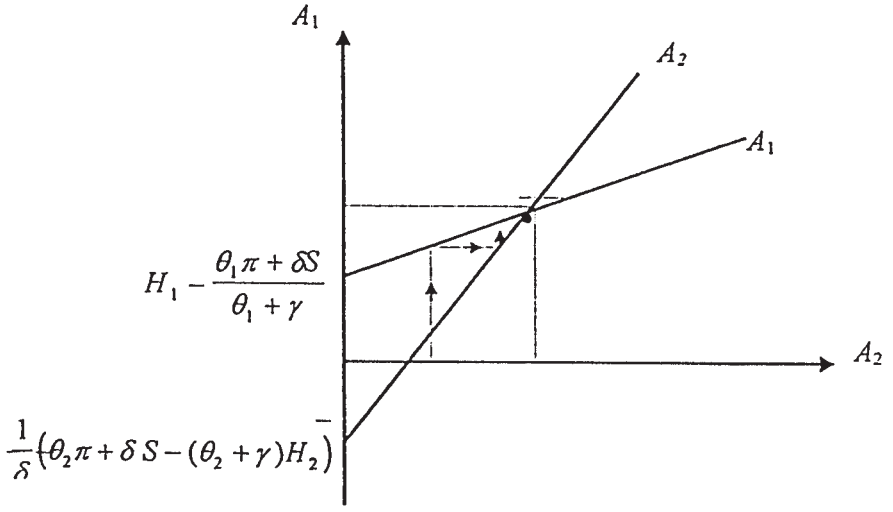


**Figure 3: Uniqueness and Stability of the Nash Equilibrium**

parameter," which depends on the technology of conflict, the conditions of the credit market, and the unit cost of fighting. Part (ii) of the proposition says that a warlord's army will be larger, relative to the opponent's, the larger its population, relatively, and the smaller its relative productivity, if the marginal product of labor in farming is positive. These results make good sense in light of the comparative static results presented in Table 2. Combining this prediction with part (i) of the proposition shows that a countervailing adjustment of the fraction of the soldiers' time devoted to fighting will be involved to let the latter hold true. Hence, the ERG with the larger population and/or the smaller productivity of the two will devote a lower fraction of its soldiers' time fighting and thus a larger fraction of their time looting. So, given the other side's army size, an increase in one group's population or a fall in its productivity leads it to increase its looting activity. In so doing, it reduces the incentive for the other group to leave farmers in the production sector and induces it to enlarge its army because of the strategic complementarity mentioned above.

Parts (iii) and (iv) spell out the reduced-form levels of equilibrium looting activity by the two sides. Three results come out clearly. First, population size, be it from one group or the other, has a positive impact on looting. Second, a fall in the production capacity of the group that reduces the maximum population that it can sustain productively, here captured by a fall in $\pi$, entails an increase in looting activity. Third, the mobilized share of the expected value of the "prize" has a negative impact on looting. Hence, access to external finance for funding the fighting has two opposing effects from a welfare point of view. On one hand, (i) shows that more funding entails more fighting, whereas (iii) and (iv) show that it also entail less looting. In view of the widely quoted figure that currently 84% of the casualties of wars are civilians (Cairns 1997) and that a large share of these casualties are related to looting, this result should probably be interpreted as leaning in favor of increasing the access of the warring parties to

external finance, on one hand, and increasing the expected value of the "prize" to be won by seizing power. Hence, for example, it is plausible in this framework that the prospect of declining aid to Africa (Lancaster 1999), by making the future value of exercising state power less attractive (lower $T$), is an incentive to increase looting now.

These two results confirm, in the equilibrium setting, the signs found in the structural relationships analyzed at Table 2. What is not confirmed unambiguously without qualification is the impact of productivity. The intuition for this ambiguity is that although an increase in farming productivity is an incentive for the group that benefits from it to reduce its allocation of labor time to looting, it also increases the incentive for the opponent to leave more farmers producing, reducing its own fighting army. The latter effect counteracts the former by reducing the incentive to fight, thus explaining the ambiguity. Ultimately, the net result will depend on the relative strength of these two opposing forces. If external funding is high enough, then examination of (iii) and (iv) shows that the negative impact of the group's own productivity on looting should prevail. Moreover, if we assume that the ERG has enough land and production capacity to support its whole population ($\pi > H_k$), then the impact of improving one's own group productivity on looting is definitely negative.[6] In fact, the impact of an improvement in productivity will only increase looting by both sides if the benefiting group is unable to support its population by its own production ($\pi < H_k$) and to get enough funding from outside.

Notice that this model may therefore be used to describe a fairly common type of civil war that often affects very poor countries, where the fighting intensity is pretty low because the prospect of victory has a low value, because either $\beta$ or $T$ is low (see (ii)) while a lot of looting is going on because of the poor level of productivity, with low $\pi$ or $\theta_k$. Then, such a war may be amplified by a fall in the latter, starting with an extremely low fighting intensity. This may happen in the real world when a negative external shock reduces productivity drastically on one side, such as a drought for a nomadic tribe living on pastoralism. This might explain, for example, why the Tubu from northern Chad started a victorious war against the richer southern groups after oil reserves were discovered in the territory of the latter in the wake of the 1974 oil shock, whereas the drought from 1973 to 1974 had decimated their herds (Azam et al. 1999). The nearly genocidal behavior of Hissène Habré's troops against the civilians in the south of this country in the mid-1980s, with no opposing army worth talking about, may be an illustration of this type of low-fighting/high-looting equilibrium. Such a state of affairs is not unrelated to the state of "anarchy" analyzed by Hirshleifer (1995), with a low "decisiveness parameter." This theoretical prediction is consistent with the empirical results discussed by Collier and Hoeffler (2002), showing that the recent increase in the incidence of civil wars in Africa can be explained by the deterioration of economic performance of these countries.

This example of a low-fighting/high-looting equilibrium epitomizes the revolting absurdity of reciprocal looting. It is intuitively obvious that looting is, to a large extent,

6. In the 14th century, Arab social scientist Ibn Khaldun was probably the first to notice that low-productivity groups had a definite advantage in appropriative activity. This is how he explained that, at regular intervals, the Bedouins (nomads from the desert) were taking over the cities as they became rich, often to reduce them to ruins (Ibn Khaldun [1967] 1978). See also Skaperdas (1992).

an inefficient allocation of resources due to the Nash conjecture (i.e., to the fact that each side determines its level of looting activity while taking the other's looting forces as given). In the Nash equilibrium, the two sides are, in a sense, "exchanging looters" as each side sends soldiers to appropriate some of the other side's production, with a negative impact on production incentives on both sides. Hence, without reducing the forces engaged in fighting proper, both sides would possibly benefit from reducing simultaneously the amount of looting that they perform and allocating more resources to production. In the Western world, this kind of reasoning provided the foundations of the well-known "Geneva conventions," signed in 1949 and updated by the 1977 protocols to the Geneva conventions, which tried to establish the so-called laws of war. Both sides in a war may have a clear interest in preventing looting and protecting civilians, provided the other side does the same. Proposition 4 below formalizes more precisely this argument. Let us define efficiency during a war in the following restricted sense:

*Definition*. Given the level of forces engaged in fighting proper, an efficient allocation of the remaining labor time between production and looting is efficient if it maximizes the joint utility of the two groups.

*Proposition 4*.

(i) Looting during a war is inefficient.
(ii) However, enforcing a ban on looting (if this were possible) would not necessarily be Pareto improving without side payments. It is more likely to be so, the more similar are the two sides.

*Proof.* Using equations (1) through (7) for both sides, we can write the joint utility of the two groups as

$$W_1 + W_2 = \theta_1 F(L_1) + \theta_2 F(L_2) + B_1 + B_2 + \beta T + (\delta - (\gamma + \omega))(e_1 A_1 + e_2 A_2) - (\delta - \gamma)(A_1 + A_2).$$

Then we know from our definition of efficiency during a war that, by proposition 3 (i), we have

$$e_1 A_1 = e_2 A_2 = S,$$

which is taken here as given. Then, using (4), we can write

$$A_k = \frac{S}{e_k} \text{ and } L_k = H_k - \frac{S}{e_k}.$$

Substituting for these into the joint utility of the two sides written above shows that the latter is increasing in $e_1$ and $e_2$, so that maximizing it requires setting $e_1 = 1$ and $e_2 = 1$ (i.e., reducing looting to zero).

For proving part (ii) of this proposition, we can write group $k$'s utility function under the looting ban, with the superscript $B$ as appropriate, as the following:

$$W_k^B = \theta_k F(L_k^B) + B_k + \beta p_k \left( \frac{A_k^B}{A_{/k}^B} \right) T - \omega A_k^B. \tag{17}$$

Then, using $W_k$ as previously defined and taking a Taylor expansion of $F(L_k^B)$ about $L_k$, one can write

$$W_k^B - W_k = \beta T[\, p_k^B(-) - p_k(-)] + \delta(1 - e_{/k}) A_{/k} \frac{L_k^B}{L_{/k}} + (\omega + \gamma)[e_k A_k - A_k^B],$$

which cannot be signed unambiguously.

*Comments*. Proposition 4 shows the potential for the intervention of a third party in a two-group conflict for reducing looting, as well as its limitations. The role of the third party would then be to help the warring sides to come out of the inefficient Nash equilibrium by reducing looting simultaneously. Using the case of Angola as his reference, Rothchild (1997) discusses how a group of foreign mediators can influence the outcome of a conflict and help the parties to reach a peace agreement. This case study is characterized by a conflict that had reached a stalemate in which the post–cold war disengagement of the superpowers had reduced the geopolitical stakes of the war. This case can be interpreted within the present theoretical framework as a low-fighting/high-looting equilibrium of a kind because the value of fighting proper had been reduced significantly. This seems to be the case in many African conflicts, where the contending armies seem to avoid carefully any violent encounter. As shown by Collier, Hoeffler, and Soderbom (1999), using a worldwide sample, civil wars tend to be of two different types: those that end within a year, which may correspond to high-fighting intensity, and those that tend to evolve into a stalemate. The latter probably correspond to a low-fighting intensity in which looting becomes the dominant activity of the two armies. It is for the latter type of civil wars that our framework is probably the most appropriate. Moreover, they show that long-duration conflicts are more likely to occur in an ethnically divided society (i.e., mainly in Africa). Hence, the kind of third-party intervention discussed by Rothchild (1997) is probably most relevant for this type of conflict. Then, proposition 4 suggests that this type of solution will be more difficult to enforce, the more dissimilar are the contending groups, and might require some side payments. The results presented by Regan (2002 [this issue]) do not address directly this problem because they only look at the impact of third-party intervention on conflict duration. However, their generally pessimistic outlook seems to confirm that the latter does not have a negative impact on looting because it tends to increase duration.

## LESSONS FOR PEACEKEEPING IN AFRICA: THE CASE OF MAJORITY RULE

In many African countries, majority rule had been established during the 1990s. However, the democratic process typically takes place under the control of the army. For example, in Côte d'Ivoire at the beginning of the year 2000, General Gueï over-

threw the democratically elected president Konan Bédié, with very broad support from the political elite, while promising to organize the elections on schedule. General Gueï justified this move on the grounds that President Konan Bédié was not giving the northern people a fair chance to run for the forthcoming elections after having sent to jail several of their leaders. The coup was bloodless and well accepted by the population because Konan Bédié's policy of excluding the northerners from participating fully in the political process was widely regarded as threatening the civil peace. In many other peaceful African countries, the army has thus been seen stepping in to enforce some restraint on the elected government's exercise of power to exclude some groups from the political process. This section shows the light that the present theoretical framework can thrown on this issue.[7]

The level of utility reached by a warlord in case of conflict is the basis for determining the minimum share of the state resources that his group can claim in a peaceful regime. In general, this precludes a "winner-takes-all" definition of majority rule from being applied in an ethnically divided society. To illustrate this, assume that $/k$ has the majority of the votes. Then, for the minority group $k$ to accept that a peaceful regime be established, the ruling group must be able to commit credibly that the following participation constraint will hold:

$$W_k^P \geq W_k,$$

where $W_k^P$ is the level of utility achieved by group $k$ in the peace regime and $W_k$ in the conflict regime:

$$W_k^P = \theta_k F(H_k) + G_k,$$

where $G_k$ is that part of the government resources that group $k$ gets. Hence, group $k$'s participation constraint can be written as

$$G_k \geq W_k - \theta_k F(H_k). \tag{18}$$

Substituting for $W_k$ shows that the right-hand side is not necessarily positive. In the case where it is negative, the peace dividend for this group is large enough for peace to be a workable project under majority rule. This is more likely, the more looting would be going on in case of war, if the ERGs were rather similar in size and productivity, as $W_k$ is lower, the higher is equilibrium looting in this case, as seen above. Otherwise, group $k$ will only accept to live in peace under majority rule if the majority group is able to commit credibly to fulfill the redistributive obligation implied by (18). As discussed by Azam (2001), the range of mechanisms that can be used for making this type of commitment credible in Africa is rather wide. For example, a widely used mechanism is to make sure that a large enough number of people from the minority groups are hired in the civil service and the army. Other systems of checks and balances can be devised for protecting the interest of the minority group. Another mechanism is for the government to invest in visible localized infrastructural assets that will provide to the

7. This section owes much to a discussion with Bruno Biais.

ERGs a lasting flow of public services.[8] The government could also invest in enhancing the productivity of the minority group, either through education or through agricultural extension, irrigation, and so on, with a view to reduce its claim on the state resources. In addition to the direct channel through the increase in peacetime production, such an investment would affect this claim by affecting this group's level of utility in case of war by increasing the cost of being looted while increasing its opportunity cost of devoting military forces to looting.

We know from the previous section that, ceteris paribus, the largest group is the one that makes the most out of looting during the war in our model. Hence, in a country divided between two ethnoregional groups of different enough sizes, an effective ban on looting during the war would make the participation constraint of the minority group to the peaceful regime more demanding.

Moreover, we can derive from (18) that, for some parameters of the model, low-productivity groups that would rely more on looting in the conflict equilibrium could be in a position to claim more from the government than the high-productivity groups for participating in the peaceful game. This might provide some arguments for explaining the type of political equilibrium that has prevailed since the end of their civil wars in countries such as Chad or Nigeria. Here, the northern groups from the low-productivity areas are claiming a large share of the state resources by various means (control of the army, corruption, etc.) and keeping the democratic game on a short lease. However, in a country where peace has prevailed for a long time, the actors have to guess how well each side would do in case of civil war. Therefore, the participation constraint of the minority (18) would only be known with some margin of uncertainty.

## CONCLUSION

In this study, we have focused on the problem of looting, which is the main activity of soldiers in most of the civil wars that afflict poor countries. This is strikingly illustrated by the fact that these wars mainly kill civilians. We have applied conventional economic analysis for investigating why this occurs and what are its determinants. We have shown that looting by the two sides in a civil war are strategic complements, which implies multiplier effects as more looting by one side entails more looting by the other one and vice versa. The intensity of looting has been shown to depend negatively on the credit market conditions because the former is to some extent a substitute to outside funding. We have also shown that looting during a war is inefficient in the sense that without changing the forces engaged in fighting proper, it would be possible to increase the joint utility of the two sides by effectively banning looting. However, even if this were possible, we have shown that it would not necessarily be Pareto improving, so that some side payments would be required if the two sides were to accept it. We

8. This point seems to have been overlooked by those who are currently in charge of the peace process in northern Mali, who are relying on decentralization without any credible commitment by the central government to redistribute any resources in favor of the north.

have not discussed the ways and means by which such a ban could be enforced, although the political science literature has produced some case studies in which this seems to have worked, starting from a low-fighting/high-looting intensity civil war. Then, finding an agreement for a cease-fire essentially amounts to stopping the looting performed by the two armies.

However, we have shown that the utility level achieved by the minority group in the conflict sets a minimum level of sharing of the state resources that must be pledged credibly by the majority group if a peaceful government is to be established by majority rule. This may provide some elements for understanding why the experiences of majority rule that have taken place in various African countries during the 1990s have remained visibly under the control of the army. There are various examples where the latter had to step in and keep a democratically elected government from excluding from the political process some potentially threatening ethnoregional groups, which came from low-productivity areas in general.

The latter analysis shows that the study of civil wars involving ethnoregional groups, those that broke out and those that did not, is an essential step for understanding state formation in Africa, where majority rule does not necessarily ensure the political participation of minority groups that could then face the prospect of doing better by triggering a conflict. Peace is only sustainable in this type of setting if there are mechanisms to ensure that minority groups will get a share of the state bounty commensurate with what they would get in case of war. Moreover, in the real world, the players would have only imperfect information about the latter. This shows the way to further research for better understanding the redistribution mechanisms that can be put in place to sustain peace in ethnically divided societies.

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