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Violence Against Civilians in Civil Wars

Looting or Terror?

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Abstract

A simple two-stage game-theoretic model of conflict is analysed, where the government can send raiders for terrorising the population to flee before the fighting proper begins. The resulting displacement of population reduces the efficiency of the guerrilla in the fight against the government. Conditions are spelled out for a sub-game perfect equilibrium to exist where terror substitutes for fighting, when the government can afford it. The model's predictions are tested using data on refugees in Africa, showing that, after controlling for war, ODA has a positive impact on the outflow of refugees, as predicted.

Keywords: civil war, Africa, game theory, refugees

JEL classification: C21, C72, O55

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Introduction

In the words of an Oxfam official: "Conspicuous atrocity against civilians is used effectively to kill some, terrorise the rest to flee, and undermine the sense of society which could help to build peace again. This is a purposeful targeting of the enemy's 'social capital'" (Cairns 1997 :17). While the same author states that "estimates of the proportion of civilians among all those now being killed range upwards from 84 percent", the former quotation contains a hypothesis that is investigated with the tools of modern economics in the present paper, namely that violence against civilians is used as a military tactics, and is not just a by-product of the normal course of war. Later in this book, he also claims tha : "attacks on civilians by their governments have been part of the 'counter-insurgency' tactics of colonial and independent rulers for much of this century" (Cairns 1997 :26). However, this hypothesis is not clearly distinguished in this book from another, rather close one, which he expresses as: "modern conflict [...] challenges the very distinction between war and peace. [...] The forces of both government and opposition [...] blend into illicit business and organised crime" (Cairns 1997: 5). Whereas the first quotation above points out the tactical aims pursued through violence against civilians, the latter views it as an input in the pursuit of gainful activity by violent means, which in times of civil conflict will take the form of looting. Bayart, Ellis and Hibou (1999) concur with this diagnosis. Azam (2000.a) analyses a theoretical model of looting, where, to cut a long story short, a share of the time of the soldiers is used for looting the enemy, in order to grab additional resources and complement the soldiers' pay with the loot.

The present paper aims at investigating the alternative hypothesis described above, namely that terrorising the civilian population plays a military role. A theoretical model is first presented, in order to bring out some testable predictions, that run counter to the ones derived from the looting model. In the latter, violence against civilians is a substitute for deficient finance, so that bringing in additional funds would induce the armies to reduce looting, and hence to inflict less damage to the civilian population. On the contrary, the argument developed below suggests that additional finance would induce a terror-seeking army to increase its raiding against civilians, in order to enhance its chances of winning the war. Hence, these two views lead to radically different predictions, and thus lead to diametrically opposed policy recommendations regarding the financing of warring parties. While the former view would support a policy of increased aid in times of civil war, in order to reduce the plight of civilians, the latter view leans in favour of starving the governments involved of any kind of outside funding, either through aid or exports. An attempt is made at testing these predictions against data from African civil wars. As violence against civilians cannot be observed directly in a precise way, we focus instead on one of its most striking expressions, namely the outflow of refugees from war-torn countries. As shown in the appendix, millions of people are often thrown out of their countries by civil wars in Africa. We thus offer below a first-cut econometric analysis of the latter phenomenon.

1 The terror model

As in most of the recent economics literature on conflict, recently surveyed by Neary (1997), there are in this model two opposing groups which are assumed to have somehow solved any collective action problem that the organisation of an insurrection, or the running of an army, might entail. Notable exceptions are Kuran (1989) and Noh (1999), who analyse specifically this issue. Here, we simply assume that each group has a well defined objective function, as if it obeyed strictly the orders of a utilitarian leader. We assume right away that a conflict is on, and we focus on the type of military action that is going to take place, contrasting violence against civilians and fighting between the two armies. We thus side-step the issue of the choice between waging a war and giving away the price of peace, treated in Azam (1995, 1999 and 2000.b). As in Grossman (1991) and Azam (1995), the two opposing groups are treated asymmetrically, one of them being regarded as the incumbent government, and the other one as the (potential) rebel group. The new feature introduced in the present model, relative to the looting model of Azam (2000.a), is the endogenous determination of the fraction of the population displaced φ. The crucial part played by this variable in this model is military, as it is assumed that the efficiency of the rebel group's forces is higher, the larger the population among which the guerrillas can hide and find support. In order to capture this effect, while keeping the model as simple as possible, the following battle technology is assumed, where p is the probability of overthrowing the government :

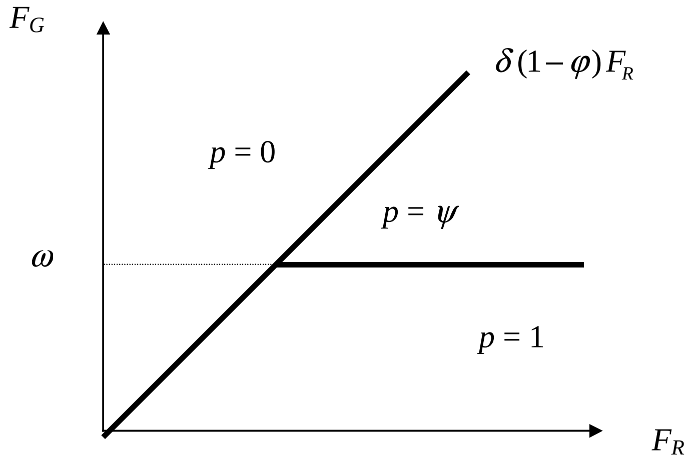
- $p = 1$ if $\delta(1-\varphi)F_R \geq F_G$ and $F_G < \omega$, (1)
- $p = \psi$, $0 < \psi < 1$, if $\delta(1-\varphi)F_R \geq F_G \geq \omega$, (2)
- $p = 0$, if $\delta(1-\varphi)F_R < F_G$. (3)

In this formulation, F_G represents the combat forces engaged by the government, and F_R those engaged by the rebel group, all measured in units of output. This battle technology captures in a simple way the idea that the larger the fraction of the population displaced, the less efficient are the rebel forces, as they need to be engaged in a larger number for achieving the same probability of overthrowing the government. The parameter δ is a hybrid one, which may reflect both a feature of the warfare technology, more or less favourable to the guerrilla, and the degree of mobilisation of the rebel troops. The latter might similarly result from both a pre-existing propensity to organise as a fighting group, say, because of a strong ethnic background, and a specific effort by the rebel elite at ideological mobilisation. For short, it is referred to below as the degree of mobilisation. The parameter ω captures some local scale economies in defending the government's position, such that a minimum defence effort is required, unless the probability of staying in power is reduced to zero, should any odd challenge arise, no matter how small.

Figure 1 represents this probability function, as a function of F_G and F_R. This probability step-function, also used in Azam (2000.b), differs from the continuous specification usually adopted in the conflict literature, as in Grossman (1991), Skaperdas (1992), Hirshleifer (1995), Grossman and Kim (1995) and Azam (1995), for example. It presents two advantages: it makes the algebra very simple, while it captures the main point brought about by the local non-concavity of the conflict technology discussed by Skaperdas (1992), Azam, Berthélemy and Calipel (1996), and Azam (1999): given the government's defence effort, there is no use in entertaining a small rebellion ; there are locally increasing returns to scale, such that a sizeable impact is only achieved at a high enough level of military effort, beyond which decreasing returns to scale come rapidly into play. Hence, this step-function may be viewed as a simplified S-shaped function as used by Skaperdas (1992).

Figure 1

The conflict technology



Assume that the group in power gets an initial endowment y_G , and the rebel group gets (1- φ) y_R . The latter assumption reflects the lost production due to the displacement of the population. In the real world, especially in Africa, it is not uncommon that some refugees leave their camps and sneak back to their village from time to time in order to secure a minimum output, should they escape the enemy's vigilance. However, we can safely neglect this production behaviour, the yield of which is not significant. The refugees are assumed to leave their villages and farms in order to escape the damage inflicted by some raiding government troops *z*, sent there specifically to terrorise the population by inflicting some violence on the remaining villagers. It is clear that the ability to inflict some damage to the remaining people should diminish as the remaining peasants are more sparsely scattered over the area, as it becomes more difficult to locate them and to trap them. This is captured here by assuming that the damage inflicted by the raiders increases with the square of the remaining population. Lastly, it is assumed that the unit cost of the government's troops $\gamma > 1$ is larger than their opportunity cost, reflecting the negative externality entailed by running an army (disruption, extortion, accidents, wage premium, etc.), and such that $y_G - \gamma\omega > 0$. Then, neglecting risk aversion, each group is assumed to maximise:

$$u_G = (1-p)[y_G - \gamma(F_G + z)], \tag{4}$$

or

$$u_R = y_R(1-\varphi) - F_R - \frac{\nu}{2} z(1-\varphi)^2 + p[y_G - \gamma(F_G + z)], \tag{5}$$

for the government and the rebel group, respectively. These expressions bring out clearly the stake of the conflict, i.e. the expected value of the transfer of the government's resources, net of defence expenditures, to the rebel group, with the endogenous probability *p*.

Now, in order to capture the different nature of the decisions involved in fighting proper and in raiding civilians, with the aim of spreading terror among them and to induce them to flee the place and seek refuge elsewhere, we model this conflict as a two-stage game. In Stage 1, the government chooses z and the rebel group chooses φ, with a view to affect the trade-offs governing the choices taking place at Stage 2. In Stage 2, the two sides choose the level of their forces engaged in the fight proper, F_G and F_R, respectively. At each stage, the players are supposed to play simultaneously, so that we analyse the Nash equilibrium of each sub-game, and we assume that at Stage 1 the two players anticipate correctly the Nash-equilibrium pair of actions of Stage 2. The four variables are thus determined to form the sub-game perfect outcome of this conflict game. So, Stage 2 must be analysed first, in order to determine the best-response functions and the Nash equilibrium actions required for the analysis of Stage 1. They are described in proposition 1 and 2, respectively.

2 Analysis of Stage 2

The outcome of the Stage 2 game is driven by the expected net benefit from the fighting. The government will put up a fight for defending its position in power if the cost of doing so does not exhaust the initial endowment, net of the cost incurred at Stage 1. The rebel group will put out a challenge if the expected take from the government is larger than the cost of the fight. This intuition is stated formally as follows:

Proposition 1: The government chooses $F_G = \omega$ if $y_G > \gamma(z+\omega)$, and $F_G = 0$ otherwise;

The rebel group chooses

$F_R = \dfrac{\omega}{\delta(1-\varphi)}$ if $F_G = \omega$ and if

$\psi[y_G - \gamma(z+\omega)] > \dfrac{\omega}{\delta(1-\varphi)}$, and it chooses $F_R = 0$, otherwise.

Proof: The government maximises (4), under the conditions specified by (1), (2) and (3). Hence, if p = 1, the government chooses $F_G = 0$ and gets a payoff $u_G = 0$, whereas if p < 1 it chooses $F_G = \omega$, with a payoff $u_G = (1-p)(y_G - \gamma[z+\omega])$. Therefore, it prefers the second outcome if the latter is positive. The rebel group maximises (5) under the same conditions. Define $R = (1-\varphi)(y_R - \frac{v}{2}z[1-\varphi])$ as the rebel group's net endowment. If $F_G = 0$ and p = 1, then $F_R = 0$, and the rebel group's payoff is $R + y_G - \gamma(z+\omega)$; if $F_G = \omega$ and p = 0, then $F_R = 0$, and the rebel group's payoff is R ; if $F_G = \omega$ and p = ψ, then $F_R = \frac{\omega}{\delta(1-\varphi)}$, and its payoff is $R + \psi[y_G - \gamma(z+\omega)] - \frac{\omega}{\delta(1-\varphi)}$. Therefore, the best-response function given in proposition 1 follows.

Given these best-response functions, we can characterise the Nash equilibrium of Stage 2 as follows:

Proposition 2: Given z and φ, determined at Stage 1, the Nash-equilibrium pair of actions by the two players at Stage 2 are given at Table 1, as a function of y_G and other parameters.

Table 1

Stage 2 nash-equilibrium levels of forces engaged

	F_G	F_R
$y_G \le \gamma(z+\omega)$	0	0
$\gamma(z+\omega) < y_G \le \gamma(z+\omega) + \frac{\omega}{\psi\delta(1-\varphi)}$	ω	0
$\gamma(z+\omega) + \frac{\omega}{\psi\delta(1-\varphi)} < y_G$	ω	$\frac{\omega}{\delta(1-\varphi)}$

Proof: Table 1 is easily derived from the proof of proposition 1.

Inspection of Table 1 shows that *ceteris paribus* the level of the forces engaged by the two sides depends crucially on the initial endowment of the government. Both its own level of combat forces and the level of combat forces of the rebel group are increasing with it. Given this endowment, one can read off the table that *ceteris paribus* the level of military effort by the two sides is decreasing in z, the size of the raiding forces used by the government to displace the civilians. Similarly, a very small degree of mobilisation of the rebel group δ would make the third row very unlikely, as it makes the potentially required level of the rebel group's forces very high, but it does not affect the choice between the first and the second row. Lastly, the fraction of the population remaining in the country after the others have been displaced acts basically like δ does. In other words, the two sides will invest more resources in fighting, the larger the remaining population.

Figure 2

The Stage 2 Nash-equilibrium forces engaged

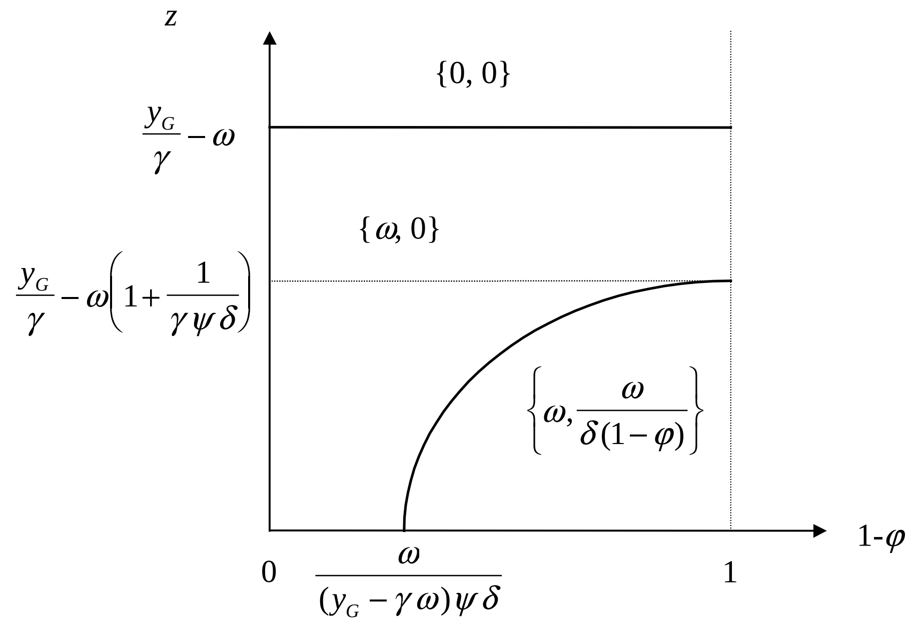


Figure 2 represents the Stage 2 equilibrium choice of forces in the most relevant {z, 1-φ} space. The first variable in the curly brackets is the government's choice, and the second one the rebel group's one. This figure shows graphically how the raiding of civilians may be used by the government as a substitute for fighting, as the level of the rebel forces decreases as we move upwards in this space. The channel of impact involved in this deterrence effect is via the fall in the government resources remaining to capture that is entailed by a higher z. Similarly, the level of the government's forces is also decreasing in this direction. On the rebel group's side, we see also that there is some substitution between fighting and displacing the population. For a low enough level of z, the rebel group's military effort decreases as the displaced population increases. This is due to the impact of the remaining population on the efficiency of the guerrilla fighters, such that a fall in the former increases the cost of the fight. Of course, as table 1 makes it clear, all these comparative statics results must not be understood as strictly increasing or strictly decreasing, as appropriate, as the structure of the model entails mostly discrete jumps.

Of particular significance is the borderline between the bottom two areas. Above it, the expected benefit of fighting for the rebel group is lower than its cost, because the government spends too much in defence and raiding expenditures, while the remaining population is too low to offer a good shelter, whereas below it, the net expected benefit of fighting is positive for the rebels. It has been assumed above that the borderline itself, where the net expected benefit of fighting is exactly zero for the rebel group, belongs to the set above it, as fighting will be the rebel group's preferred course of action only if its net expected benefit is strictly positive. This may be interpreted as capturing a non-utilitarian additional, albeit infinitesimal, cost of war. Along this curve, the amount of resources invested by the government in terrorising civilians does not exhaust the government's rent, as it is such that the expected gain by the rebels is exactly offset by the cost of fighting. The latter is thus the source of the government's rent. This rent is thus larger, the smaller the remaining civilian population, i.e. the more costly it is for the rebels to fight.

3 Analysis of Stage 1

We now analyse Stage 1. Using the three cases identified at Table 1, or Figure 2, we work backward, determining Stage 1 choices, taking due account of the equilibrium response that will follow at Stage 2. We can now prove proposition 3:

Proposition 3: (i) The government always chooses $F_G = \omega$, and

(ii) it chooses either $z = \frac{y_G}{\gamma} - \omega\left(1 + \frac{1}{\gamma\delta\psi(1-\varphi)}\right)$ if :

$$\frac{\omega}{(y_G - \gamma\omega)\psi\delta} < 1 - \varphi \leq \frac{\omega}{(1-\psi)(y_G - \gamma\omega)\psi\delta}, \tag{6}$$

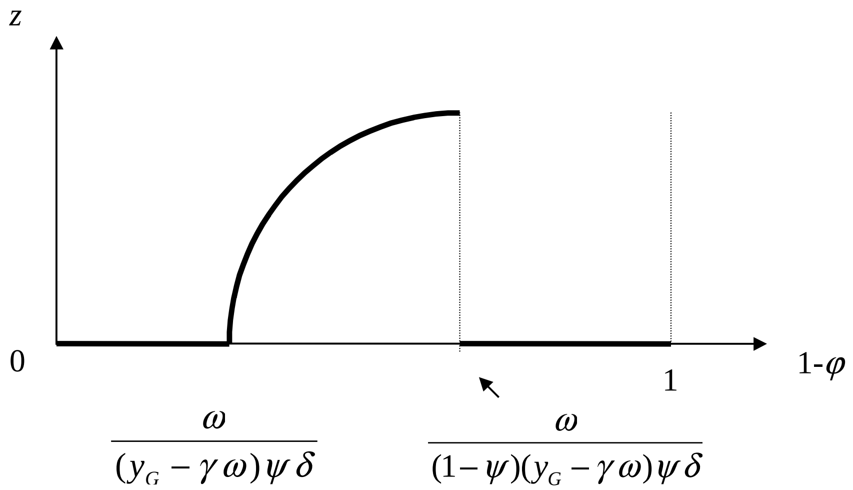
or $z = 0$, otherwise.

Proof: If $F_G = 0$, then $p = 1$ and $u_G = 0$. If $F_G = \omega$ and $F_R = 0$, then $p = 0$, and the government minimises z under the constraints $z \geq \frac{y_G}{\gamma} - \omega\left(1 + \frac{1}{\gamma\delta\psi(1-\varphi)}\right)$ and $z \geq 0$. Its payoff is then either $u_G = \frac{\omega}{\delta\psi(1-\varphi)} > 0$, if $z > 0$, or $u_G = y_G - \gamma\omega$, if $z = 0$, i.e. if $1 - \varphi \leq \frac{\omega}{(y_G - \gamma\omega)\psi\delta}$. If $F_G = \omega$ and $F_R = \frac{\omega}{\delta(1-\varphi)}$, then $p = \psi$, and the government minimises z under the only constraint of non-negative z. Then, $z = 0$, and its payoff is $u_G = (1-\psi)[y_G - \gamma\omega] > 0$. It will choose this solution if the latter value of its payoff is larger than the former one, with $z = \frac{y_G}{\gamma} - \omega\left(1 + \frac{1}{\gamma\delta\psi(1-\varphi)}\right)$, which occurs when the second part of the inequality in (6) is reversed.

Figure 3 represents this reaction function of the government, as the three-part thick broken curve. It is not monotone, with a positive level of raiding against civilians being performed for intermediate values of the fraction of the population remaining in place. Within this range, violence against civilians is used as a substitute to fighting, and serves to deter the rebel group from arming. Its role is to increase the cost for the rebel group of securing a (strictly) positive probability of overthrowing the government, as the displaced population reduces the efficiency of the rebel fighters, and to make the expected value of the conquest of power worthless. Notice that it is a portion of the borderline between the two bottom areas of Figure 2, discussed above. For lower values of 1-φ, the rebel group does not arm anyway. For larger values of 1-φ, deterring the rebel group from arming by terrorising its potentially supportive population becomes too expensive, and a straightforward battle becomes more attractive as a prospect for the incumbent government.

Figure 3

The government's reaction function



Proposition 4: The rebel group's best-response function may be written implicitly in terms of the values of z corresponding to each level of 1-φ as :

(i) when $F_R = 0$, $z = \frac{y_R}{\nu(1-\varphi)}$, if 1-$\varphi$ < 1, or $z \le \frac{y_R}{\nu(1-\varphi)}$, if 1-$\varphi$ = 1, or

(ii) when $F_R = \frac{\omega}{\delta(1-\varphi)}$,

$$z = \frac{y_R}{\nu(1-\varphi)} + \frac{\omega}{\nu\delta(1-\varphi)^3}, \text{ if } 1\text{-}\varphi < 1,$$

$$\text{or } z \le \frac{y_R}{\nu(1-\varphi)} + \frac{\omega}{\nu\delta(1-\varphi)^3}, \text{ if } 1\text{-}\varphi = 1.$$

In particular 1-φ = 1 if z = 0.

Comment: The first part of the rebel group's best-response function may be interpreted as that level of raiding against civilians that makes the marginal benefit of an additional person staying inside the country nil, if no fighting is planned to take place at the next stage. Below this, the marginal value to the rebel group's leadership of having more population remaining in place is strictly positive, while it is negative above it. The second part of the rebel group's best-response function takes into account the additional benefit due to the enhanced efficiency of the fighters brought about by the remaining population, in the fighting planned to take place at the next stage. Therefore, the government's raiders should then inflict a higher cost to get the same result in terms of displaced population. Hence, the rebel group's best response function may be understood as its demand for civilians, as a function of their marginal cost imposed by the raiders.

Proof: On the rebel group's side, if $F_R = 0$, whatever the value of F_G, which requires

$$z \geq \frac{y_G}{\gamma} - \omega\left(1 + \frac{1}{\gamma\delta\psi(1-\varphi)}\right),$$

1-φ is chosen to maximise R, defined above in the proof of proposition 1, yielding the first part of the best-response function.

If $F_G = \omega$ and $F_R = \dfrac{\omega}{\delta(1-\varphi)}$, which requires

$z < \dfrac{y_G}{\gamma} - \omega\left(1 + \dfrac{1}{\gamma\delta\psi(1-\varphi)}\right)$, then $p = \psi$, and the rebel group maximises

$$y_R(1-\varphi) - \frac{\nu}{2}z(1-\varphi)^2 - \frac{\omega}{\delta(1-\varphi)} + \psi(y_G - \gamma[z+\omega]),$$

under the constraint 1-$\varphi \leq 1$, with $z \geq 0$. If $z = 0$, then 1-$\varphi = 1$. This yields the second part of the best-response function.

4 Existence and description of the equilibria

Definitions: Now, define a *pure terror equilibrium* E_T as a sub-game perfect equilibrium of the conflict game under study where the government has the monopoly of military violence, with $F_R = 0$, while $z > 0$. Similarly, define a *pure fighting equilibrium* E_F as a sub-game perfect equilibrium of the conflict game under study where the government has lost its monopoly over military violence, with

$F_R = \dfrac{\omega}{\delta(1-\varphi)}$, and $z = 0$.

We can now prove the following proposition:

Proposition 5:

i) A *pure fighting equilibrium* always exists. In this case $F_R = \dfrac{\omega}{\delta}$ and 1-$\varphi = 1$.

ii) In addition, a *pure terror equilibrium* exist:

$$y_R \leq \frac{\nu\omega}{(1-\psi)\gamma\delta}. \tag{7}$$

In this equilibrium, $F_R = 0$ and $1-\varphi = \dfrac{\nu\omega + \psi\gamma\delta y_R}{(y_G - \gamma\omega)\nu\psi\delta}$.

Proof: The pure fighting equilibrium exists if the curve

$z = \dfrac{y_R}{\nu(1-\varphi)} + \dfrac{\omega}{\nu\delta(1-\varphi)^3}$ lies above the $z = 0$ axis when $1-\varphi = 1$.

This is necessarily true. The pure terror equilibrium exists if the curve

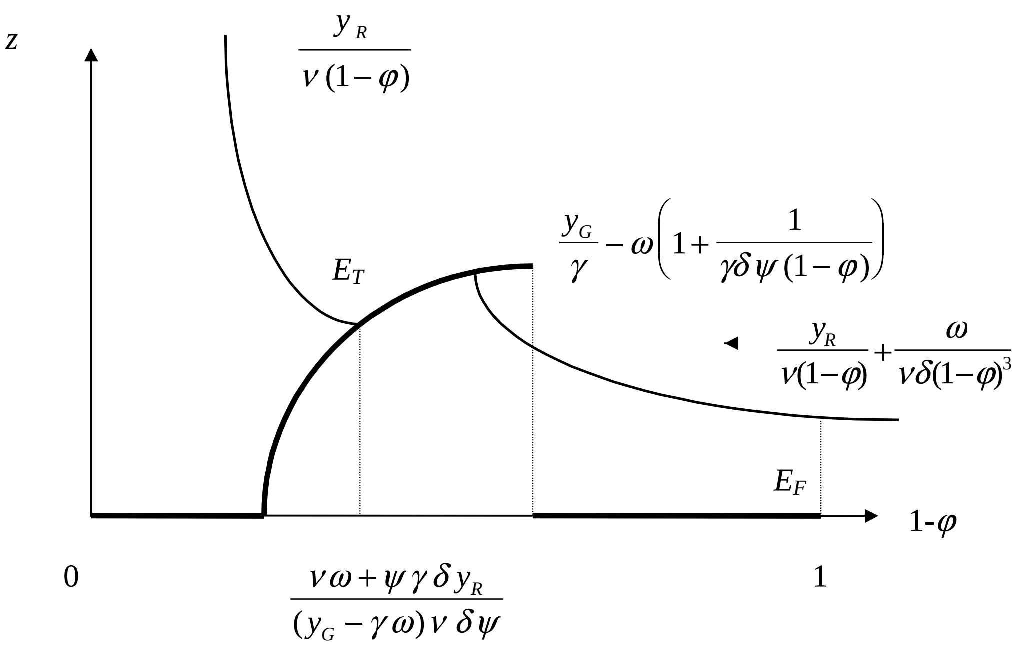
$z = \dfrac{y_R}{\nu(1-\varphi)}$ intersects

$z = \dfrac{y_G}{\gamma} - \omega\left(1 + \dfrac{1}{\gamma\delta\psi(1-\varphi)}\right)$ to the left of

$1-\varphi = \dfrac{\omega}{(1-\psi)(y_G - \gamma\omega)\,\psi\delta}$. This requires (7) to hold.

Figure 4

The case of two equilibria

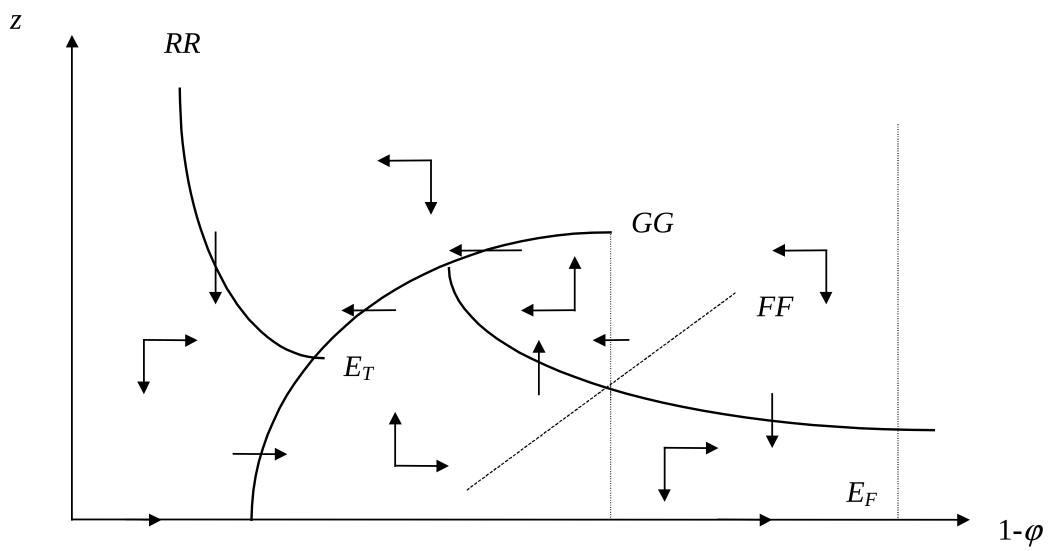


The pure fighting equilibrium exists because the cost of driving the rebel group's excess demand for civilians down is too high for the government when the remaining population is high, and a fight is planned for the next stage. The pure terror equilibrium exists only if the parameters are such that the government can afford to raid the civilians. The case where two equilibria E_T and E_F exist is depicted at Figure 4. The government's best response function is taken from Figure 3, while the two-part downward sloping curve describes the rebel group's best-response function, as described in proposition 4. By shifting the different curves, it is easy to find cases where there is only one equilibrium, of the pure fighting type. Proposition 5 gives a precise content to these different possible cases. The case of two equilibria, although it is not necessarily more likely to be observed in reality than the other, is especially interesting. It suggests that a threshold effect might be at work in some instances. The dynamic analysis performed at Figure 5 helps to see this point. This phase diagram shows the equilibrium selection that can be derived from the initial conditions by using a continuous-time variant of Cournot-stability analysis. In other words, this analysis assumes that after an initial shock, liable to push the $\{z, 1-\varphi\}$ pair anywhere in the phase space, the two player's strategies are returning gradually to an equilibrium without jumps. As we know from the previous discussion, any point below the rebel group's 'demand for civilians' curve *RR*, the marginal benefit of having one more civilian remaining in the country is larger than its marginal cost, so that we may assume that $1-\varphi$ is increasing in that zone, and this is marked by an arrow pointing to the right. By a symmetrical reasoning, any point above this curve is marked with an arrow pointing to the left. Regarding the government's moves, we know that the latter is spending too much in raiding civilians above its reaction function. It is therefore natural to assume that it will reduce the raiding activity in this case. This is marked by arrows pointing downwards in the corresponding zones of the phase space. Below its reaction function, the government increases its raiding expenditures, as shown by the arrows pointing upwards. Now, the overall dynamics in this phase space will result from the combination of these two forces, and a careful examination of Figure 5 shows that the two equilibria E_T and E_F are locally stable, and that the frontier *FF* separates their respective basins of attraction. The *FF* trajectory is akin to a standard saddle path, except that it converges to a non-equilibrium point. Any point below (or on) *FF* belongs to a trajectory converging to E_F , while any point above *FF* belongs to a trajectory converging to E_T.

It is natural to assume that the initial equilibrium is of the E_F type, as the latter always exists. Now, assume that this equilibrium is shocked by an exogenous disturbance that leads to some significant reduction in the remaining civilian population and/or to some exogenous increase in the raiding of civilians by government troops. As long as the shock leaves the remaining population and the level of raiding activity below the *FF* frontier, the choices of the two players will return to E_F. However, if the shock is large enough to send the displaced population and/or the level of raiding above or to the left of this threshold, then the pair of actions chosen by the two players will converge to the E_T equilibrium point. This suggests that in this case, history matters, as the final outcome is path-dependent. In other words, a pure terror equilibrium is more likely to be observed if the country analysed has been hit by a violent shock in the past. Examples of the type of shocks that might trigger this type of effects are : drought, epidemics, natural disasters, as far as the reduction in the remaining population is concerned, and mutiny, loss of discipline, looting spree, *hubris*, etc., as far as the behaviour of the raiders is concerned. This prediction can be used in the empirical analysis, as explained below.

Figure 5

Continuous-time cournot dynamics

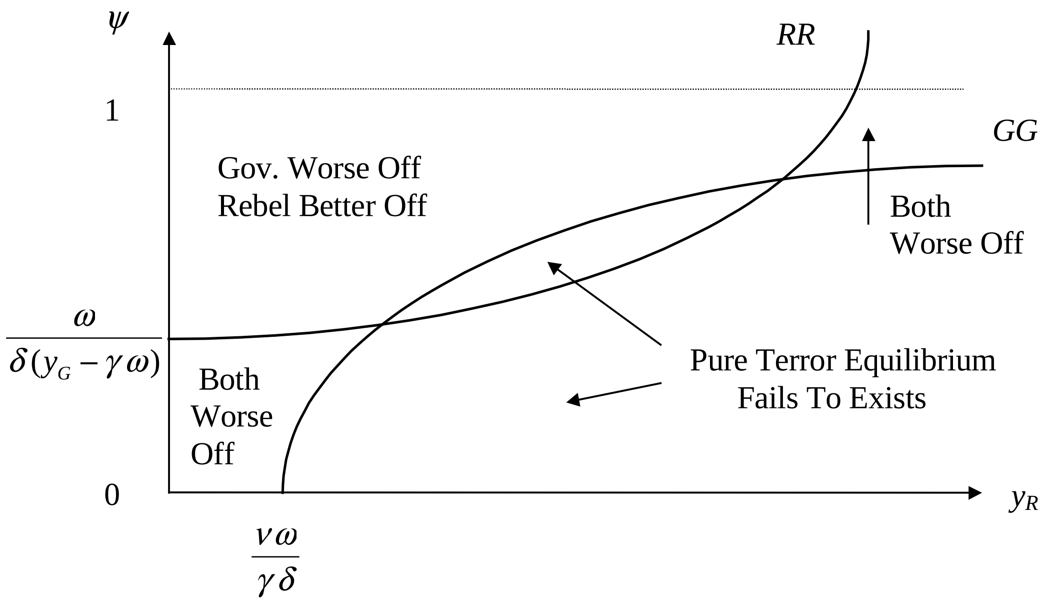


Before turning our attention to the econometric investigation, it is useful to analyse the welfare consequences of the two types of equilibria. In case of conflict, it is especially un-natural to sum, or otherwise compare, the utilities of the two sides, so that we must be content with a Paretian analysis. Proposition 6 shows the limits of the resulting welfare ranking. Because of the widespread concern with protecting civilians, as embedded in the well-known 'Geneva Convention', we present the analysis as the welfare gain that would be reaped by moving from a pure terror equilibrium to a pure fighting equilibrium, as if a ban on the victimisation of civilians was enforceable from outside. It suggests that such a move would not in general be accepted by both parties without side payments, a pretty difficult thing to arrange in conflict time. This can be expressed as follows:

Proposition 6: The pure fighting equilibrium and the pure terror equilibrium cannot generically be Pareto-ranked. Figure 6 shows that the set of $\{\psi, y_R\}$ pairs such that both parties are better off in the pure fighting equilibrium than in the pure terror equilibrium is empty.

Figure 6

Welfare comparison of pure fighting v. pure terror equilibria



Proof: The government is better off in the pure fighting equilibrium if:

$$(1-\psi)[y_G-\gamma\omega] \geq \frac{\nu\omega}{\nu\omega+\psi\gamma\delta y_R}[y_G-\gamma\omega], \text{ i.e. if:}$$

$$\psi \leq 1-\frac{\nu\omega}{\gamma\delta y_R}. \qquad (8)$$

In this case, the pure terror equilibrium fails to exist, as (8) contradicts (7). The *GG* locus in Figure 6 represents the lower frontier of the set where (8) holds.

The rebel group is better off in the fighting equilibrium than in the terror equilibrium if:

$$y_R-\frac{\omega}{\delta}+\psi[y_G-\gamma\omega] \geq \frac{y_R}{2}\left(\frac{\nu\omega+\psi\gamma\delta y_R}{[y_G-\gamma\omega]\nu\psi\delta}\right).$$

This expression does not simplify into a nice analytic expression, but may look like the *RR* locus in Figure 7 for some parameter values. That the rebel group is better off above this locus can be checked by trying the two extreme values of ψ.

Comments: The set of Pareto-improvement, where both parties are better off in the pure fighting equilibrium than in the pure terror equilibrium is empty. Hence, in most cases, at least one party is better off in the pure terror equilibrium. In particular, when the rebel group is poor and the government's position fragile, the latter is better off in the pure terror equilibrium, as it is cheap to drive a large population out of the country, whereas running a battle would be very risky. In this case the rebel group is worse off, as it looses the expected value of seizing power with a high probability. What is more surprising is that there exists a non-empty set of values of $\{\psi, 1-\varphi\}$ where both parties are better off in the pure terror equilibrium. This occurs when the welfare loss due to the population displacement and the raiding of civilians by the government is lower than the cost of fighting to the rebel group, while the government spends less in raiding civilians than the expected value of the transfer of its remaining resources to the rebels in case of defeat.

5 Testable predictions

Since we have found that the pure fighting equilibrium is liable to exist in all cases, while the occurrence of the pure terror equilibrium is only likely to prevail if the country has been subjected to a large shock in the past, while this equilibrium is locally stable, our first testable prediction is that the fraction of the population displaced should display some strong auto-correlation. Then, once the terror equilibrium is established, we know from proposition 5 the determinants of the fraction of the population displaced. First, it is decreasing with the productivity of the rebel group's members, which increases its opportunity cost. Second, it is increasing with the government's initial endowment, net of the military expenditures engaged by the government in fighting proper, which determines the stakes of the conflict. Similarly, it is increasing with the probability of overthrowing the government in case of fighting, which induces the government to invest more resources in terror spreading. It is increasing with the degree of mobilisation of the rebel group, which works like a substitute for the remaining population. A larger unit cost of running an army reduces the incentive for the government to raid civilians in this terror model, with a negative impact on the fraction of the population displaced. A higher efficiency of the raiders at inflicting damage to the remaining population also has a positive impact on the fraction of the population displaced.

Some of these predictions are worth contrasting with those of the looting model of Azam (2000.a). In the latter, violence against civilians is the means to substitute for missing resources, for compensating soldiers. The displaced population is not explicitly modelled there, but it is understood that it can be regarded as the natural fall out of the damage inflicted by each army to the opposing group. Therefore, the strikingly different prediction between the looting and the terror models is that in the former, violence against civilians should be higher, the lower the resources of the government, while in the terror model, it is the opposite. A richer government runs a larger risk when accepting a battle, and has more resources available to pay for the raiders. This has a strikingly different implication for aid policy, if the donor community cares more about civilians than about soldiers, which seems realistic in view of the reactions of public opinion in the West to the images of displaced populations and of massacres of civilians. If the looting motive is the driving force behind this type of violence against civilians, the donors should increase the resources available to the warring parties for fighting proper, in order to spare civilians from the side effects of looting. If on the contrary the terror motive is the engine of violence against civilians, then the boycott of the warring factions, cutting off the government from outside funding and export revenue, should be the rule, as more money to the government would lead to more violence against civilians.

This contrast does not extend to the impact of productivity, which is predicted to have the same negative sign on violence against civilians in both models, for different reasons. In the looting model, a higher productivity allows the leaders to get more tax revenues, and thus to be able to pay the soldiers better, and to order them to spend more time fighting rather than looting. In the terror model, a higher productivity increases the opportunity cost of fleeing, and induces the rebel leader to keep more producers in place. Either way, in both models, investing in agricultural productivity would be advisable, as an advanced protection for civilians against future raiding and displacement, should a civil conflict arise subsequently.

6 Empirical results

The detailed definitions and sources of the various variables used in the regressions are given in the appendix A.3. Also in the appendix, Tables A.1 and A.2 present the list of countries included in the sample, as well as a ranking of the highest numbers of refugees, giving the largest stock of refugees in different years from the various countries included in that table. Ethiopia figures prominently in this list, as it a large country which had an endless civil war. Smaller countries like Rwanda, Mozambique, Burundi and Liberia also account for large outflows of refugees, at some dates in their history.

Table 2 presents the results from a large number of regressions. The dependent variable is the number of refugees by origin seeking refuge in other African countries. The data source is UNHCR. The sample is unbalanced, pooling an unequal number of years of observations, covering at most the period 1970-99, for 22 countries. The core equation is equation 1. As predicted by the theoretical analysis, the dependent variable is included in this equation, as it is in all the subsequent ones, and turns out to be highly significant. However, as is well known from the panel data literature, the coefficient of the lagged endogenous variable might be biased upward, because of an omitted variable bias, when no fixed effects are included. In order to get an idea of the resulting bias, we included in equation 4 country-dummy variables, in order to control for fixed effects. However, the panel data literature also warns us that in this case, a downward bias may affect the estimate of the coefficient of the lagged dependent variable. A comparison of equations 1 and 4 suggests that these biases are probably not sizable in this case, as these coefficients are pretty close to each others. The joint significance of the fixed effects is tested by a standard F-test, and rejected, as can be read from the table. Moreover, equation 1 has no intercept, but this does not affect the estimates, as shown by a comparison with equation 3, which includes one. Then, a dummy variable is included indicating when a country is at war, as well as its lagged value. Together with the auto-regressive term mentioned above, this distributed lag effect is meant to capture the type of dynamics analysed above. In the Hendry terminology, we thus have an ADL(1, 1) model, which offers a fairly flexible specification for capturing the potentially infinitely lagged effects of past shocks (Banerjee, Dolado, Galbraith and Hendry 1993).

Equations 1 and 2 are very similar, but they differ by the definition of war that is being used. In all the equations of Table 2, except equation 2, the dummy variable indicates war if there is a conflict resulting in at least 1000 deaths per year, for the duration of the conflict. In equation 2, a lower level conflict dummy variable is included. It takes the value 1 if the conflict results in at least 1000 deaths in total, over its whole duration. It thus indicates conflicts of a lower intensity. Although the size of the coefficients are predictably lower, insofar as lower intensity conflicts entail a smaller number of refugees fleeing the country, this equation yields qualitatively similar results.

Beside the refugees-war ADL(1, 1) specification described above, these equations include three variables which are meant to test for some of the impacts identified in the theoretical model. As a proxy for the degree of mobilisation of the rebels, or rather for the lack of it, we include a democracy index, from Jaggers and Gurr (1995). This is based on the idea that in more democratic societies, it is more difficult to mobilise the population for supporting an insurrection, as the people have other means of expressing their discontent, and opposition to the government will hardly crystalise as an outright popular insurrection. Then, civilians are much less of a shelter for guerrillas, and thus much less of a target for the government. We find a negative significant effect, supporting the view that democratic institutions offer some protection to civilians that extend after the outbreak of a civil conflict.

Then, as a proxy for the resources available to the government, we include ODA, which captures the availability of overseas development assistance. This is the crucial test variable for discriminating between the terror model and the looting model. Here, we find the positive effect predicted by the terror model, and which contradicts the looting model. However, this variable is only significant at the 10% level, and its significance level varies according to the list of variables included, as seen from equations 3 to 15. Equation 14 is especially interesting in this respect. With a smaller sample size, this equation is augmented by including the ratio of primary commodity exports to GDP as an additional regressor. The latter turns out to be highly significant, with a positive sign, while its inclusion makes ODA insignificant, with the wrong sign. It does not seem that this could be due to some simple multicollinearity, as the partial correlation coefficient between these two variables is -0.064, i.e. negligible, with the wrong sign. However, inclusion of this primary commodity export variable also affects markedly the other estimated coefficients, which suggests that there might be a strong correlation between the latter and a sub-set of the other included variables. Moreover, the sample size is noticeably smaller, which is another cause of coefficient variation. Nevertheless, insofar as primary commodity exports capture another source of government finance, as royalties and export taxes are usually an important source of funds for the state in Africa, this result concurs with the previous one in supporting the terror model against the looting model.

Agricultural value added is included as a measure of the productivity of the civilian population, and it acts on the outflow of refugees with the predicted negative sign. Therefore, investing in agricultural productivity is a good protection for civilians in case of conflicts.

Then, in order to test the robustness of this model, a series of other variables are included in turn. Equation 5 tests for some additional geographical effect, rejecting the idea that the fraction of the country which is mountainous matters, although one might have thought that mountains being a better place to hide from the army, this might have a negative impact on the outflow of refugees. Similarly, equation 13 rejects the significance of forest coverage. The next three equations test for the impact of ethno-linguistic fractionalisation, religious fractionalisation and social fractionalisation. No significant impact is found. Similarly, equation 15 rejects the effect of ethnic dominance. Lastly, population density, a cold-war dummy, and a trend, are all rejected. This suggests that, controlling for the occurrence of a civil conflict, recent years have not witnessed an increase in terror and in the outflow of refugees.

Table 2

Refugees equations

Refugees	Eq. 1	Eq. 2*	Eq. 3	Eq . 4	Eq . 5	Eq . 6
Refugees (-1)	0.673 (0.000)	0.705 (0.000)	0.673 (0.000)	0.549 (0.001)	0.661 (0.000)	0.672 (0.000)
War	49 927.21 (0.043)	29 933.56 (0.091)	48 959.78 (0.047)	46 752.6 (0.061)	46 069.92 (0.069)	50 391.62 (0.040)
War (-1)	67 312.67 (0.060)	50 416.77 (0.044)	67 437.54 (0.060)	68 376.9 (0.044)	71 010.13 (0.056)	67 754.18 (0.058)
Democracy	- 2 728.35 (0.020)	- 2 643.04 (0.016)	- 2 922.72 (0.011)	- 3 495.37 (0.051)	- 2 548.30 (0.037)	- 2 538.02 (0.022)
ODA	0.0049 (0.076)	0.0034 (0.161)	0.0040 (0.156)	0.0038 (0.082)	0.0045 (0.066)	0.0048 (0.085)
Agric. V.A.	-7.21 e-06 (0.088)	-3.77 e-06 (0.195)	-7.21 e-06 (0.088)	17.1 e-06 (0.045)	-9.23 e-06 (0.023)	-7.15 e-06 (0.088)
Intercept	-	-	2 871.56 (0.585)	-	-	-
Fixed Effects	-	-	-	*F*(22,434) = 1.20 (0.247)	-	-
Mountains	-	-	-	-	288.32 (0.333)	-
Ethno. Ling. Fractionnal.	-	-	-	-	-	- 38.61 (0.417)
Nb. Of Obs.	462	462	462	462	462	462
R^2	0.818	0.807	0.788	0.818	0.820	0.818
F-Test	72.83	97.79	50.09	72.83	76.99	73.16

Notes: *p*-values in parentheses, computed from White's robust standard errors.

* Equation 2 uses a different definition of war, of lower intensity, as it includes conflicts resulting in at least 1000 battle-related deaths in total, against 1000 battle-related deaths per year, for the other equations.

Table 2

(continued): Refugees equations

Refugees	Eq. 7	Eq. 8	Eq. 9	Eq . 10	Eq . 11	Eq . 12
Refugees (-1)	0.673 (0.000)	0.673 (0.000)	0.669 (0.000)	0.673 (0.000)	0.674 (0.000)	0.672 (0.000)
War	49 223.4 (0.046)	50 252.97 (0.041)	46 396.16 (0.064)	49 001.15 (0.048)	49 240.00 (0.047)	48 894.8 (0.047)
War (-1)	67 286.45 (0.060)	67 682.71 (0.058)	69 855.97 (0.061)	67 420.65 (0.060)	66 523.72 (0.063)	67 643.79 (0.060)
Democracy	- 2 883.66 (0.014)	- 2 627.89 (0.023)	- 2 944.77 (0.026)	- 2 565.29 (0.050)	- 2 702.52 (0.022)	- 3 053.04 (0.013)
ODA	0.0041 (0.123)	0.0046 (0.079)	0.0043 (0.133)	0.0041 (0.136)	0.0042 (0.108)	0.0038 (0.212)
Agric. V.A.	-7.02 e-06 (0.107)	-7.37 e-06 (0.087)	-8.82 e-06 (0.046)	-7.35 e-06 (0.074)	-7.38 e-06 (0.079)	-7.30 e-06 (0.079)
Religious Fractional.	40.02 (0.586)	-	-	-	-	-
Ethno-Relig. Fractional.	-	- 0.4167 (0.541)	-	-	-	-
Population Density	-	-	88.09 (0.431)	-	-	-
Autocracy	-	-	-	314.31 (0.610)	-	-
Cold War Dummy	-	-	-	-	3128.26 (0.396)	-
Trend	-	-	-	-	-	140.31 (0.617)
Nb. Of Obs.	462	462	442	462	462	462
R^2	0.818	0.818	0.821	0.818	0.819	0.818
F-Test	76.59	69.27	72.78	83.77	67.48	90.11

Note: *p*-values in parentheses, computed from White’s robust standard errors.

Table 2

(continued): Refugees equations

Refugees	Eq. 13	Eq. 14	Eq. 15
Refugees (-1)	0.567 (0.018)	0.466 (0.008)	0.674 (0.000)
War	92 187.65 (0.067)	41 955.22 (0.022)	49 498.09 (0.044)
War (-1)	54 455.48 (0.060)	4 977.6 (0.044)	67 106.5 (0.060)
Democracy	158.84 (0.936)	- 1 521.78 (0.114)	- 2 912.97 (0.024)
ODA	- 0.0024 (0.188)	- 0.0016 (0.123)	0.0042 (0.075)
Agric. V.A.	-3.78 e-06 (0.525)	-6.54 e-06 (0.025)	-7.47 e-06 (0.091)
Forest Cover	214.00 (0.196)	-	-
Primary Com. Exports	-	40 762.03 (0.035)	-
Ethnic Dominance	-	-	4 057.33 (0.421)
Nb. Of Obs.	104	356	462
R^2	0.772	0.771	0.818
F-Test	19.39	56.01	76.26

Notes: *p*-values in parentheses, computed from White's robust standard errors.

7 Conclusion

In this paper, we have first analysed a game-theoretic model that provides a military role to the type of violence against civilians that is so conspicuous in African civil wars. In this model, the displacement of a fraction of the civilian population reduces the efficiency of the fighters from the rebel group, as they cannot hide as easily from the army amidst a lower population, and they get less support. The model is set up as a two-stage game, where the players choose simultaneously the level of the forces that they engage in the fighting proper at Stage 2, and the level of raiding against civilians by the government, and the fraction of the population displaced, by the rebel group, at Stage 1. Both groups, the one in power, and the rebel group, are assumed to have solved somehow their collective action problem, so that the model assumes that each group has a well-defined objective function. There are two types of sub-game perfect equilibria in this model. There is first a pure fighting equilibrium, which exists in all cases, where no raiding takes place. There is also a pure terror equilibrium, which exists only for some combinations of parameter values. It this type of equilibrium, the level of the nondisplaced population is determined by the rebel group's demand for civilians, as a function of the damage inflicted by the government's raiders. The cost of the latter may be viewed as the price at which the government is prepared to supply the remaining civilians in the country to the rebels. The equilibrium raiding effort by the government is aimed at making the rebel group's expected gain from fighting just equal to its cost, in order to deter it from arming. However, for high enough values of the remaining population, the cost of fighting is somewhat low for the rebels, so that deterrence becomes too expensive. In this case, the government prefers to run the risk of the fight, rather than to bear the too high cost of deterrence.

The testable propositions from this model are first that the displaced population should display some strong serial correlation. This is due to the local Cournot-stability of the two equilibria, which are locally stable with clearly separated basins of attraction. The effect of past shocks that send the actions of the players in one or the other of the basins of attraction should thus be felt for a long period. This prediction is borne out by the data, in the econometric exercises presented, which uses the number of refugees by country of origin in Africa as the dependent variable. Then, the model predicts that the level of raiding should increase with the financial resources available to the government. This prediction is also borne out to some extent by the data, as we find that the level of ODA received by the government has a positive impact on the number of refugees. However, the level of statistical significance of this variable falls between 5% and 10%, in most of the regressions presented, while it is outperformed by the share of primary commodity exports in GDP, on a smaller sample. The latter also vindicates the terror model, insofar as primary commodity exports provide most of the government's fiscal resources in Africa. Notice that the positive impact of ODA found in most of these equations, controlling for the fact that the country is at war, does not contradict the result found by Collier and Hoeffler (2000.b) that aid reduces the probability of the outbreak of a civil war. What it says is that, conditional upon the war situation, there will be more refugees if the government gets more resources than if it gets less. It is thus a result on the type of war being waged, mainly military or otherwise focused on raiding civilians. Hence, our results provide some support to the various activists that support the idea of cutting donor funding to governments at war, and of boycotting the exports from their country, if the protection of civilians is regarded as more important than the fate of the fighters.

Appendix: Data and variables definitions

A.1 Sample of 22 countries

Angola

Burundi

Central African Republic

Chad

Congo, Dem. Rep.

Ghana

Guinea-Bissau

Malawi

Mali

Mauritania

Morocco

Mozambique

Namibia

Niger

Rwanda

Senegal

Sierra Leone

South Africa

Togo

Uganda

Zambia

Zimbabwe

A.2 Highest number of refugees

Country	year	refugees
Ethiopia	1980	2,436,300
Rwanda	1994	2,254,100
Rwanda	1995	1,808,100
Ethiopia	1979	1,514,300
Ethiopia	1985	1,504,900
Ethiopia	1988	1,498,500
Ethiopia	1987	1,482,800
Ethiopia	1986	1,395,800
Mozambique	1992	1,344,700
Mozambique	1991	1,316,600
Mozambique	1993	1,313,000
Ethiopia	1989	1,290,400
Mozambique	1990	1,239,100
Ethiopia	1983	1,208,700
Ethiopia	1984	1,202,500
Ethiopia	1982	1,196,600
Ethiopia	1990	1,166,900
Ethiopia	1981	1,151,600
Mozambique	1989	1,120,200
Mozambique	1988	920,300
Burundi	1993	809,200
Liberia	1994	789,500
Ethiopia	1992	781,000
Liberia	1996	771,000

A.3 List of variables

Refugees

Denotes the number of refugees; We would like to thank Béla Hovy at UNHCR for assistance with the data. In order to obtain the number of refugees per country we added the refugees by origin. However, the origin of the refugee population is not available for a number of countries. Most of these missing countries are industrialized countries, thus our data contains only the refugee population originating from African countries seeking refuge in other African countries. Refugee data is available for 1970-99 for 22 countries. Data for some countries is missing, most notably we had to exclude Nigeria and Djibouti from our study.

Refugees (-1)

Is the lagged value of **Refugees.**

War

Is a dummy variable indicating whether the country is at war. We are only considering internal wars which resulted in at least 1000 battle related deaths (civilian and military) per year. We use mainly the data collected by Singer and Small (1982, 1994) and used the updates as discussed in Hoeffler and Sambanis (2000) for 1992-99.

War (-1)

Is the lagged value of **War**.

War* (Eq. 2)

Is a dummy variable indicating whether the country is at war, of a lower intensity than the previous one. We including internal wars which resulted in at least 1000 battle related deaths (civilian and military) during the entire period of the conflict. Thus, conflicts included in this definition are less intense than the ones included in **War** above.

Democracy

Is the lagged value of a democracy index. It is a measures the general openness of political institutions. The democracy score ranges from 0 to 10 where 10 denotes a highly open regime. The source is Jaggers and Gurr (1995). As an alternative polity measure we tried the autocracy score from this data source.

ODA

Measures overseas development assistance in constant 1995 US dollars. The source is the World Bank Africa 2000 Database. The ODA series is provided in current US dollars and we deflated the series using the GDP deflator for each country. Data are given in 100 US dollars.

Agric. V.A.

Is the value added in agriculture. It measures the output of the agricultural sector less the value of intermediate inputs. The series is in constant 1995 US dollars and the data source is the World Bank Africa 2000 Database.

Mountains

Measures the percentage of a country which is mountainous. The data was compiled by a specialist on the subject, Dr John Gerrard at the University of Birmingham.

Ethno. Ling. Fractionnal

Measures ethnic diversity. It measures the probability that two randomly drawn individuals from a given country do not speak the same language. Data is only available for 1960. In the economics literature this measure was first used by Mauro (1995).

Ethnic Dominance

This is and indicator of ethnic dominance. This data was obtained from Collier and Hoeffler (2000.a). They used the ethno-linguistic data from the original data source (Atlas Naradov Mira, 1964) to calculate this indicator. It takes the value of one if one single ethno-linguistic group makes up 45 to 90 percent of the total population and zero otherwise.

Religious Fractional.

Measures religious diversity. Using data from Barrett (1982) on religious affiliations we constructed a religious fractionalisation index. Following Barro (1997)[1] we aggregated the various religious affiliations into nine categories: Catholic, Protestant, Muslim, Jew, Hindu, Buddhist, Eastern Religions (other than Buddhist), Indigenous Religions and no religious affiliation. Data is available for 1970 and 1980 and the values are very similar.

The fractionalization indices range from zero to 100. A value of zero indicates that the society is completely homogenous whereas a value of 100 would characterize a completely heterogeneous society.

Ethno-Relig. Fractional.

We calculated a social fractionalisation index as the product of the ethno-linguistic fractionalisation and the religious fractionalisation index plus the ethno-linguistic or the religious fractionalization index, whichever is the greater. By adding either index we avoid classifying a country as homogenous (a value of zero) if the country is ethnically homogenous but religiously divers, or vice versa. This data was obtained from Collier and Hoeffler (2000.a).

Primary Com. Exports

Denotes the ratio of primary commodity exports to GDP. This proxies the abundance of natural resources. The data on primary commodity exports as well as GDP was obtained from the World Bank. Export and GDP data are measured in current US dollars.

1 We would like to thank Robert Barro for the use of his data set (Barro 1997). For some countries which were not listed in his data set we used the data from the original source (Barrett 1982).

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