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Armed Conflicts in Africa and War of Attrition

By Cossi Gilles Tobossi

Université de Franche-Comté, France

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ARMED CONFLICTS IN AFRICA AND WAR OF ATTRITION

Strictly as per the compliance and regulations of:

Armed Conflicts in Africa and War of Attrition

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I. Introduction

It is generally found in Africa, as countries in sub-soil rich in valuable natural resources (oil, diamonds, gold, etc...) are most often run by dictatorial governments that implement mechanisms for systematic plunder of the national wealth. These dictatorships usually sign contracts for the exploitation of natural resources of their countries with powerful multinationals. These contracts are often negotiated in disfavor of the general interest of people. The share of profits that contribute to national development remains very low. Such practices often lead to armed conflicts on the African continent. *The paradox arising from such conflicts is at the level of their financing. Thus, the unique natural resources of those countries experiencing armed conflict, instead of contributing to the daily well-being of peoples, are used to impoverish them while they contribute at the same time an intense accumulation of wealth among dictatorships and multinationals.* Indeed, multinationals to protect their interests will support dictatorships in particular by providing the logistics of war and the cash (Money) in armed conflicts which oppose these dictatorships to civilian population or political opponents.

Multinationals, not only contribute to the complexity of conflicts on the African continent but are often the instigator and the main brain of these conflicts, where the main victim is the civilian population of people in war. The civilian population suffered all the atrocities of war such as famine, the enormous loss of life, rape of women, migration, etc.. Speaking of the role played by multinationals in armed conflict, *Châtaigner J. M. (2004)* states: *It is "a new triangular trade", where Africa illegally exports to western countries unprocessed, where Eastern Europe countries export to Africa weapons and mercenaries and which is established between the countries of Western and Eastern Europe financial relationships more or less hidden. Such facilities rents induced by the abuse of natural resources complicate the rapid unwinding of armed conflicts on the African continent.*

Armed conflicts, cause enormous human costs immediately, but also costs related to: The collapse of the education system and health service, the weakening of the device support and psychological trauma that impact negatively on human development. Collier P. (2007) believes that armed conflict is one of the four traps that lock the poorest countries in economies stagnant or declining.

According to a *UNDP report (2005),* during the armed conflict in Sierra Leone, more than half of women have been victims of some form of sexual violence.

The NGO International Rescue Committee (2001) estimated that between 1998 and 2001 the armed conflict in the Democratic Republic of Congo (DRC), killed three and a half million people.

The Commission For Africa (2005), estimated in his report that between 1945 and 1995, the armed conflicts in Africa have killed more than six million people in nine countries totalling hundred and sixty million people (Sudan, Ethiopia, Mozambique Angola, Somalia, Burundi, Rwanda, Uganda, Sierra Leone).

Pidika D. and Tchouassi G. (2005), referring to the armed con.ict in the Democratic Republic of Congo (DRC) said: The lust aroused by the natural and mineral wealth of the DRC plunged the country into a war of resources where the aggressor countries, criminal networks smuggling involving large local players, everyone in the area it occupies is using the wealth with impunity. In doing so, these actors systematically plundered the country's wealth to fund the war along the lines: Looting finance the war and it allows the looting.

In most armed conflicts in Africa, abundance of natural resources has been central to the conflict. These natural resources instead of helping to develop human were used to finance civil wars. Thus diamonds in. Angola and Sierra Leone, gold and Cobalt in Democratic Republic of Congo have been at the heart of conflicts in these countries. *Bannon I. and Collier P. (2003),* argue that the natural resources of the subsoil, mainly oil, are more the cause of armed con.ict. As for *Maillard J. (1998)*, he believes that most African conflicts are linked to international criminal networks and the regulation of a "world without law" is central to the prevention and control of conflicts.

Collier P. and Hoeffler A. (2000), reasoning in a utilitarian contest as H. Grossman I. (1991), analyze the

Author : Docteur en Economie-Université de Franche-Comté Laboratoire: CRESE. E-mail : gtobossi@yahoo.fr

conflict as a war between a legitimate government and a rebellion which they define as a criminal organization characterized by greed. In this context, conflict is more likely that the level of income per capita is low and the share of raw materials is important in exports.

This article focuses on the armed conflicts in which civilian population fighting the dictatorship (supported by the multinationals) in power in order to compel him to grant the people a greater share of wealth from the exploitation of country's natural resources. During such competitions, the civilian population cannot drop the weapon if it has at least a certain minimum share in sharing the national cake. While the dictatorship, that controls the wealth realized will want to confiscate at least some minimum share. *In this context it is in the case of a game of sharing wealth, where the dictatorship in power loses part of his wealth confiscated, whenever he grants an additional share of wealth realized to the civilian population.*

The outcome of such competition will depend, above the minimum share of wealth which the civilian population wishes to benefit, and below which it will not lay down their arms.

This game of sharing in which the dictatorship in power extracted from the national wealth, private benefits can be approximated in corporate finance for the extraction of private benefits by executives and some controlling shareholders who exercise control activity within the company. The dictatorship in power and multinationals can be assimilated to executives and shareholders while the civilian population can be assimilated to minority shareholders. The concept of private benefits in corporate finance has been deepened by *La Porta R. et al. (2000),* under the concept of tunnelling which they define as the transfer of assets or profits of a firm to executives and shareholders (insiders) who exercise control within the company. This transfer is to detriment of minority shareholders (outsiders) who do not control the activities of the company.

As corporate finance, it arises in this game a threshold problem of extracting private benefits tolerable by the civilian population. Given that the minimum share of wealth expected by each protagonist is private information: *How the conflict resolves itself in a position where the dictatorship in power ignore the minimum share expected by the civilian population and below which it cannot disarm.*

To solve the problem of ending such a conflict, I analyze it as a war of attrition based on a specific auction mechanism in which:

- The civilian population earns at least its minimum share expected whatever the period of abandonment;
- The dictatorship in power wins a share of wealth than the minimum share that she hopes to be confiscated, if only his opponent gives up first in the competition. While she gains nothing by giving up first, the competition.

This type of game war of attrition differs from the approach traditionally developed in the literature. *In fact, in a standard war of attrition, a player who leaves the competition in the first gain nothing, whereas in our game sharing, the civilian population earns a minimum share renouncing first in the competition.*

In the rest of my article, I present in the first part, the terms of my model and in the second part, I present the different outcomes induced by a war of attrition in which *the civilian population earns at least its minimum share expected whatever the time she leaves the competition.*

II. The Model

To analyse situations of armed conflict between a dictatorship in power and the civil population during the sharing of national wealth, I suppose that these conflicts involve:

- The couple, dictatorial government - foreign powers (the dictatorial government manages the natural resources of the country);
- The civil population, which demands a larger share of national wealth.

To protect the economic interests of their multinational corporations, foreign powers support the dictatorship in power. The civil population disadvantaged in the sharing of national wealth declares war to dictatorial government. The civil population in its struggle will claim a share more and more important in the sharing of wealth. In such a conflict, each protagonist hopes to receive a minimum percentage (threshold) of the wealth realized by period of time. To simplify my analysis, I distinguish two main agents who pursue conflicting interests. They are:

- The civil population that I designate as "Agent oppressed" or player 1;
- The couple, dictatorial government - foreign powers that I designate as "selfish agent" or player 2.

I suppose that the endowment in natural resources (net of all operating expenses) of the country in the beginning of competition and in each period of game has a constant monetary value noted ω which is common knowledge. So ω is at every game period, the wealth produced by the country.

On the wealth realized ω at every game period j, the player 2 (selfish agent) transfer a portion to player 1 (oppressed agent) through the expenditures of public utility in the areas such as the infrastructures, the health, the education, etc...

The objective of player 1 is to force the player 2 to transfer him at each new game period, a larger share in the distribution of wealth realized ω.

I suppose that in the beginning of competition ($j=0$), both players are in the following situations:

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- Player 2 (selfish agent) has a part λ_2^* (common knowledge) of the wealth realized ω;
-Player 1 (oppressed agent) has a part λ_1^* (common knowledge) of the wealth realized ω; - $\lambda_2^* > \lambda_1^* > 0$.

Being in an environment of asymmetric information where the dictatorship cannot observe the minimum share that the civilian population demands in the national wealth achieved by time period, there is no possibility of negotiation between both parties. In this case, to know the outcome of such a conflict, I propose a game in which a player (civilian population) wins at least the minimum share that he hopes to benefit in the wealth produced by time period regardless of the player who leaves first, the competition. While the other player (dictatorship - foreign powers) earns the minimum share that he hopes, if only he does not give up first, and gains nothing if he gives up first, the competition.

I suppose that war of attrition between the two parties begins at the moment (j=0) where the oppressed agent enter into armed con.ict against the dictatorship to force him to transfer in his favour, a larger share of national wealth.

Let λ_1, the minimum share of the wealth achieved ω, which player 1 (oppressed agent) hopes to benefit in each game period and from which he give up the competition. λ_1 is for him private information.

Let λ_2, the minimum share of wealth achieved ω that player 2 (selfish agent) hope confiscate and below which he give up the competition because it is not more profitable for him to continue the war.$\lambda_2$is for him private information.

I suppose that early in the competition ($j = 0$):

-The part λ_2^* that holds the player 2 (sel.sh agent) is such: $\lambda_2^* > \lambda_2$ (private information);
- The part λ_1^* that holds the player 1 (oppresed agent) is such: $\lambda_1^* < \lambda_1$ (private information).

I assume that in each game period (j=1; 2; ...), player 2 under the pressure of player 1 increases in proportion α, the share of player 1. The share confiscated by player 2, decreases in the same proportion in each new game period.

On the thresholdλ_2, player 2 receives a share of wealth less important than the player 1 and that before reaching this threshold, it benefits, a larger share than player 1.

I suppose that below the accumulation of wealth equal to $\lambda_2\omega$, player 2will incur by playing period, costs of competition (to finance the conflict) above$\lambda_2\omega$. This forced him to abandon the competition when he is on the threshold λ_2. So if player 2 leaves first, the competition, according to the above hypothesis, we have $\lambda_2 < \lambda_1$.

Player 1, being aware that before player 2 reaches the threshold λ_2, civilians bear huge losses, will abandon the competition once it reaches its threshold λ_1, because he is aware that if he continues to fight beyond this threshold to get the power, the new team that will steer the country will always capture private benefits. Player 1 in abandoning the competition at threshold λ_1, reveals that there is a tolerable level of expropriation (1 -λ_1), and even a democracy can be induced to fly beyond this threshold. So player 1 leaves first, the competition, when it reaches its threshold λ_1 and it comes: $\lambda_2 > \lambda_1$.

I suppose that $\lambda_1$and λ_2 are random variables independently distributed on [0; 1] by the same probability distribution *F* with density function f positive, continuous and twice differentiable on [0; 1].

The equilibrium strategy β (payment) of each player i ($i = 1; 2$) is an increasing function of its signal λ_i. Indeed, each player invests more in competition when it expects a higher share of wealth realized (ω).

Let:
$$\beta : [0;1] \to [0;\infty[$$
$$\lambda_i \to \beta(\lambda_i).$$

When player 1 reaches its threshold λ_1 and leaves first, the competition($\lambda_2 > \lambda_1$), it collects per time period, a gain $\lambda_1\omega$ while player 2 receives a gain (1- λ_1)ω such that: (1 -λ_1) $>\lambda_1$and therefore $\lambda_1 < \frac{1}{2}$.

When player 2 reaches his threshold λ_2 and leaves first, the competition ($\lambda_2 < \lambda_1$), it sees no gain because it is not interesting for him to stay in power and in this case player 1 takes power and enjoys all the wealth realized by time period ω. Player 1 then receives a gain equal to ω when player 2 leaves first, competition.

Both players are risk-neutral.

I suppose that both players support per unit of time, the same cost of competition which is equal to unity.

We are in a game of attrition where player 2 (selfish agent) being the force that controls the wealth realized ω, will be forced under pressure from the player 1 to allocate to the latter, at least his minimum share λ_1 in the wealth-sharing.

Gradually, as the competition continues, the conflict becomes more intense. This leads "selfish agent" to gradually increase the share of wealth realized ω allocate to the "oppressed agent".

The player, who receives a signal equal to zero, invests in the competition, an equilibrium payment equal to zero. Indeed it is a passive player who expects nothing in sharing of the wealth realized ω. Such a player will not participate in armed conflict.

At simultaneous abandonment, both players share equally the wealth realize ω.

a) Equilibrium strategy of player 1

Given that player 1 (civilian population) still hopes a win at the end of the competition regardless of the player who leaves first, and then he plays an

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asymmetric equilibrium strategy to that of player 2.

The expected utility of player 1 when he announces at equilibrium, $\lambda_1 = t$ is:

$\pi_{11} = (1 - F(t))[t\omega - \beta(t)]$, if player 1 leaves first, competition ($\lambda_2 > \lambda_1$),

$\pi_{12} = \omega F(t) - \int_0^t \beta(\lambda_2 = s) f(s) ds$, if player 2 leaves first, competition($\lambda_2 < \lambda_1$).

With:

$F(t) = \Pr[\lambda_2 \leq \lambda_1]$,

$\beta(t)$, the equilibrium payment of player 1 when he gives up first, competition;

$\int_0^t \beta(\lambda_2 = s) f(s) ds$ the equilibrium payment of player 1 when player 2, leaves first, competition.

The total expected utility of player 1 is:

$$\pi = t\omega(1 - F(t)) + \omega F(t) - (1 - F(t))\beta(t) - \int_0^t \beta(s) f(s) ds. \tag{1}$$

By maximizing the total expected utility of player 1 with respect to t, the first order condition gives:

$$\beta'(t) = \omega[1 + \frac{f(t)}{1 - F(t)}(1 - t)] \quad \forall t \in [0; 1]\,. \tag{2}$$

The equilibrium strategy of player 1 is then:

$$\beta(t) = \int_0^t \omega[1 + \frac{f(t)}{1 - F(t)}(1 - t)]dt \quad \text{car } \beta(0) = 0 \tag{3}$$

Proposition 1 *The equilibrium utility expected by player 1 in the armed conflict is equal to zero.*

Proof. $\pi = t\omega(1 - F(t)) + \omega F(t) - (1 - F(t))\beta(t) - \int_0^t \beta(s) f(s) ds.$

By integrating by part, the amount $\int_0^t \beta(s) f(s) ds$, I get:

$$\int_0^t \beta(s) f(s) ds = [\beta(s)F(t)]_0^t - \int_0^t \beta'(s) F(s) ds = \beta(t)F(t) - \int_0^t \beta'(s) F(s) ds.$$

Substituting $\int_0^t \beta(s) f(s) ds$ by its value in π, I get:

$$\pi = t\omega(1 - F(t)) + \omega F(t) - (1 - F(t))\beta(t) - \beta(t)F(t) + \int_0^t \beta'(s) F(s) ds,$$

$$\pi = t\omega(1 - F(t)) + \omega F(t) - \beta(t) + \int_0^t \beta'(s) F(s) ds.$$

Using the relations (2) et (3), I get:

$$\pi = t\omega(1 - F(t)) + \omega F(t) - \int_0^t \omega[1 + \tfrac{f(t)}{1 - F(t)}(1 - t)]dt + \int_0^t \omega[1 + \tfrac{f(s)}{1 - F(s)}(1 - s)]F(s) ds$$

$$\pi = t\omega(1 - F(t)) + \omega F(t) - \int_0^t \omega[1 + \tfrac{f(s)}{1 - F(s)}(1 - s)][1 - F(s)] ds$$

$$\pi = t\omega(1 - F(t)) + \omega F(t) - \int_0^t \omega[(1 - F(s)) + f(s)(1 - s)] ds$$

$$\pi = \omega[t(1 - F(t)) + F(t) - \int_0^t [(1 - F(s)) + f(s)(1 - s)] ds]$$

$$\pi = \omega[\int_0^t \{(1 - F(s)) + f(s)(1 - s)\} dt - \int_0^t [(1 - F(s)) + f(s)(1 - s)] ds] = 0$$

This result shows that the strategy played by player 1 in the armed conflict is an efficient equilibrium. This implies that in equilibrium, player 1 commits as payment in the armed conflict, all its expected payoff in case of victory.

Proposition 2 When player 1, hopes to capture by time period all the wealth realized ω by announcing at equilibrium a signal $t = 1$, it spends in the competition, an equilibrium payment equal to the wealth realized ω.

Proof. $$\beta(t) = \int_0^t \omega[1 + \frac{f(t)}{1 - F(t)}(1 - t)]dt,$$

For $t = 1$; we have: $\beta(t = 1) = \int_0^1 \omega dt = [\omega t]_0^1 = \omega.$

This result shows that when the civilian population (player 1) is greedy and wants to monopolize the entire wealth realized by time period, it will never give up first, the competition. This is true insofar as it is ready to invest (by time period) in the armed conflict, an equilibrium payment equal to the wealth realized ω.

b) Equilibrium strategy of player 2

The expected utility of player 2, when he announces at equilibrium $\lambda_2 = t$ is:

$\pi_{21} = -(1 - F(t))\beta(t)$ if player 2 leaves first, competition $(\lambda_1 > \lambda_2)$

$\pi_{22} = F(t)\omega - \int_0^t s\omega f(s)ds - \int_0^t \beta(\lambda_1 = s)f(s)ds$ if player 1 leaves first, competition ($\lambda_1 < \lambda_2$).

With:

$F(t) = \Pr[\lambda_1 \leq \lambda_2]$,

$\beta(t)$, the equilibrium payment of player 2 when he gives up first, competition; $\int_0^t \beta(\lambda_1 = s)f(s)ds$, the equilibrium payment of player 2 when player 1 gives up first, competition.

The total expected utility of player 2 is:

$$\pi = F(t)\omega - \int_0^t s\omega f(s)ds - \int_0^t \beta(\lambda_1 = s)f(s)ds - (1 - F(t))\beta(t). \tag{4}$$

By maximizing the total expected utility of player 2 with respect to t, the first order condition gives:

$$\beta'(t) = (1 - t)\omega\frac{f(t)}{1 - F(t)} \qquad \forall t \in [0; 1]. \tag{5}$$

The equilibrium strategy of player 2 is then:

$$\beta(t) = \int_0^t (1 - t)\omega\frac{f(t)}{1 - F(t)}dt \qquad \text{car } \beta(0) = 0. \tag{6}$$

Proposition 3 The equilibrium strategy of player 2 is such that he can never claim to any period of time, all the wealth realized ω by announcing at equilibrium, $t = 1$.

Proof. When player 2 decides to monopolize all wealth realized ω, he supports at equilibrium, a marginal payment such as:

$$\beta'(t = 1) = (1 - 1)\omega\frac{f(1)}{1 - F(1)} = 0.$$

This result implies that if player 2 announces $t = 1$, he supports a payment equal to zero. He cannot then come into armed conflict with player 1 when he attacks him. Given that player 2 cannot keep the smallest share of the wealth realized ω without fighting the player 1, he will never announce at equilibrium, $t = 1$.

Proposition 4 At a simultaneous abandonment ($\lambda_1 = \lambda_2 = t$), the marginal equilibrium payment supported by player 1 (civilian population) in the armed conflict, is higher than the marginal equilibrium payment supported by player 2.

Proof. See appendix.

This result shows the determination of the civilian population to make significant sacrifices to get a better share of national wealth. Indeed in such a conflict, the human cost increases considerably the payment of the civilian population.

III. Discussion

The sharing of wealth from the exploitation of natural resources, which is at the root of armed conflicts (between dictatorship in power and civilian population) in Africa, can be analyzed as a game of attrition. This is a game of incomplete information, insofar as: The minimum share of wealth expected by each protagonist is private information. The dictatorship, which controls the wealth realized, wants to confiscate a minimum share, while the outcome of the competition will depend on the minimum share of wealth that the civilian population, wants to benefit and below which she does not disarm. In this context, the dictatorship in power decreases his wealth confiscated, whenever she grants an additional share to the civilian population.

To specify the outcome of such a war of attrition, I analyze it as a particular auction mechanism in which: A player (civilian population) wins at least the minimum share that he hopes to benefit in the wealth produced by time period, whatever the player who gives up first, the competition. While the other player (dictatorship) earns the minimum share that he hopes if only he does not give up first, competition and gains nothing if he gives up first.

The civilian population, leaving first, the competition when She gets its minimum share of wealth expected, shows that there is no public power completely honest, which realizes zero private benefits. The difference between the wealth realized, and the minimum share of wealth expected by the civilian population, can be considered as the share of private benefits socially acceptable that a governement (democratic or dictatorial) may be confiscated. Such private benefits are for governments, a premium for good governance, insofar as the share of national wealth allocated to public interest is deemed socially adequate. In fact, the civilian population supposed rational, cannot remain in the logic to capture the entire wealth realized because it is aware that even by installing in power a democratic government, the system will always produce private benefits that may even exceed of a small value ", the private benefits socially acceptable.

Such an assessment of the situation from the civilian population is well illustrated by his equilibrium strategy $\beta(t) = \int_0^t \omega[1 + \frac{f(t)}{1 \square F(t)}(1 \square t)]dt$ insofar as: If his equilibrium signal is $t = 1$ (she wants all the wealth realized), she supports in the competition, an equilibrium payment equal to the wealth realized ω, while she is aware that no government in power can not realize zero private benefits.

However, armed conflicts that occur between civilian population and dictatorship in power for the sharing of the national wealth do not necessarily lead to an outcome in favour of the civilian population which is most often in a position of weakness.

Indeed dictatorships in power, which controls national wealth, invest in such conflicts, significant financial and material resources. These conflicts cause massive civilian casualties, which constrain the most frequently civilians to disarm and continue to suffer the atrocities of the dictatorship in place. In this context, the civilian population, to be successful, must be determined to make enormous sacrifices.

IV. Numerical Application

I suppose that λ_1 and λ_2 are random variables independently distributed on $[0;1]$ by a same uniform law F with a density function f positive, continuous and and twice differentiable on $[0; 1]$.

The marginal equilibrium payment of the civilian population (player 1) is:

$$\beta'(t) = \omega[1 + \frac{f(t)}{1 \square F(t)}(1 \square t)] = \omega[1 + \frac{1}{1 \square t}(1 \square t)] \quad \forall t \in [0; 1],$$

we get:

$$\beta'(t) = 2\omega.$$

The marginal equilibrium payment of the dictatorship (player 2) is:

$$\beta'(t) = (1 \square t)\omega \frac{f(t)}{1 \square F(t)} = (1 \square t)\omega \frac{1}{1 \square t} \quad \forall t \in [0; 1],$$

we get:

$$\beta'(t) = \omega.$$

We note that the marginal equilibrium payment of the civilian population is twice the one of the dictatorship (player 2).

V. Conclusion

In an armed conflict between a dictatorship and the civilian population, where the minimum shares expected by both in the sharing of the national wealth are private information, a game of attrition solves the problem of sharing. The outcome of such a competition leads to an equilibrium in which the civilian population supports the highest equilibrium payment. This result confirms the will of the civilian population to fight the dictatorship at the cost of enormous sacrifices to receive at least its minimum share of wealth expected. Another interesting result is that the equilibrium strategy of the dictatorship is such that it can never monopolize the entire wealth realized when the civilian population declares him a war.

VI. Appendix: Proof of Proposition 4

The marginal equilibrium payment supported by player 1 is:

$$\beta_1^{'}(t) = \omega[1 + \frac{f(t)}{1 \square F(t)}(1 \square t)].$$

The marginal equilibrium payment supported by player 2 is:

$$\beta_2^{'}(t) = (1 \square t)\omega\frac{f(t)}{1 \square F(t)}.$$

$$\beta_1^{'}(t) \square \beta_2^{'}(t) = \omega[1 + \frac{f(t)}{1 \square F(t)}(1 \square t)] \square (1 \square t)\omega\frac{f(t)}{1 \square F(t)} = \omega$$

It comes:

$$\beta_1^{'}(t) = \beta_2^{'}(t) + \omega.$$

References Références Referencias

1. *Bannon I. et Collier P. (2003),* "Natural ressources and violent conflict: Options and Actions", Washington DC, Banque mondiale.
2. *Châtaigner J. M. (2004),* "Aide publique au développement et réformes des systèmes de sécurité: L"improbable rencontre du Dr Jekyll et de Mr Hyde", Afrique contemporaine, n_ 209, p.205-222.
3. *Collier P. (2007),* "The Bottom Billion: Why the poorest countries are failing and what can be dohe about it", Oxford University Press.
4. *Collier P. et Hoeffler A. (2000),* "Greed and Grievance in Civil War", Working Paper.
5. *COMMISSION POUR L"AFRIQUE (2005),* Notre intérêt commun, Rapport de la commission pour l' Afrique, Londres.
6. *Grossman H. I. (1991),* "A General Equilibrium Model of insurrections", American Economic Review, n_ 81, pp.912-921.
7. *International Rescue Comittee (Mai 2001),* "Mortality in Eastern Democratic Republic of Congo".
8. *La porta R., Lopez-de-Silanes F., Shleifer A. et Vishny R. (2000a),* "Investor protection and corporate governance", Journal of Finance Economics, vol.58, pp.3-27.
9. *La porta R., Lopez-de-Silanes F., Shleifer A. et Vishny R. (2000b),* "Agency problem and dividend policies", Journal of Finance, vol. 55, pp.1-33.
10. *Maillard J. (1998),* "Un monde sans loi", Stock, Paris
11. *Pidika D., Tchouassi G. (2005),* "Afrique centrale: Crises économiques et mécanismes de survie", CODESRIA, Dakar.
12. *PNUD (2005),* "Human Development Report", p.160.