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A MICRO LEVEL ANALYSIS OF VIOLENT CONFLICT

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Incentives and Survival in Violent Conflicts[1]

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Abstract: This paper analytically investigates the incentive scheme of perpetrators of violent conflicts. It provides a rational equilibrium framework to elicit how monetary incentives and survival considerations shape a combatant's decision to participate in a conflict. In the model, a leader decides to award soldiers monetary incentives. Civilians finance the militia via donations and soldiers decide on the actual fighting and indulge in looting. We explore the scheduled decision-making that takes place on the path toward a violent conflict and study the principal–agent relationship that exists between the leader and the militia. In addition, we analyze the effect of several internal factors (productivity and survival risk) and external factors (relative economic resources, opponents' military strength) on the intensity of the conflict. The model shows that soldiers fighting decisions are set by personal mortality risk and the level of identification with the cause of war. In addition, our results link between monetary incentives and participation in fighting and demonstrate a substitution effect of looting and donations as monetary incentives.

Keywords: economics of conflict, contract theory, civil war, looting

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Introduction

Throughout history, monarchs, warlords and rebels have faced the same problem: how to encourage soldiers to fight for them on the battlefield. From the notorious motivational quote of Frederick the Great during the battle of Kolin ("Rogues, do you wish to live forever?")[1] to the pocketsful of oil money that Colonel Gaddafi is using at this writing to hire mercenaries to kill Libyan protesters, the question always remains: how does one make a combatant fight to engage in combat? The problem becomes even more acute when the warring parties are non-governmental militant organizations. This paper presents a stylized explanation of the individual fighting decision among militant groups in conflict areas. It provides a rational equilibrium framework using logical interactions to elicit how the decision on participation in violence is made. We explore the scheduled decision-making that takes place on the path to violent conflict and the interrelations of leader, militia, and supportive peasants.

The underlying assumption is that the outcomes of violent conflicts are shaped by a combination of economic incentives and other social dimensions. In the presence of an ethnic, political, or religious discrepancy, the structure of incentives may make the difference between a peaceful outcome and a violent one. In addition, the study focuses on individuals as the natural unit of analysis. Rather than assuming group cohesion or shared values, we deconstruct the components of individual agents' decision-making in regard to warfare. Recent micro-level evidence suggests that the decision to participate in a rebel is different from the decision to participate in violence – fighting and killing (Humphreys and Weinstein, 2008). In line of this distinction, we focus on militia members' decision on actual fighting. [2]

The results of the theoretical model allow us to study the mechanism that prompts militia members to fight and kill at their leader's behest. The model illuminates two channels through which the leader affects soldiers' fighting decisions: ideological and monetary.

[1] Quoted from Christopher Duffy, "*Frederick the Great, A Military Life* (USA: "Routledge, 1985).

[2] At this point, it is important to point out that in some case recruitment and fighting are not a question of decision. Several militias in conflict zones use force to recruit fighters. For example, according to Minter (1995) almost 90% of the Renamo soldiers in Mozambique were forced to join: children were abducted on their way to school; young men were taken away from their homes. The current paper does not address such cases.

Basing ourselves on these channels, we introduce several identifiable triggers that generate the final fighting decision: (a) the cause that the war is supposed to serve, (b) the leader's announcement of future allocation of booty among the soldiers, and (c) transfers of money (donations) from peasants who support the soldiers in return for supplemental defense services. Later, we analyze the effect of internal factors (productivity shocks and aggregate and individual mortality risk) and external factors (relative economic resources, opponents' military strength) on the intensity of the conflict.

Monetary Incentives and Looting

While somewhat neglected in the theoretical literature, the issue of monetary incentivization of collective violent action is the subject of a growing empirical literature.[3] Blattman and Miguel (2010) review a large body of evidence from case studies of twentieth-century rebellions. Several of them offer evidence consistent with selfish actors seeking to maximize material payoffs. For example, Lichbach (1994; 1995) shows that social movements offer selective material incentives to young men who join them. Popkin (1988) finds that political leaders developed mechanisms to directly reward peasant rebellion in Vietnam. Weinstein (2007) shows how rebel fighters in Mozambique, Sierra Leone, and Peru were compensated in the coin of looted civilian property and drug sales. Still, to be able to offer incentives, the leader needs resources. In a recent empirical paper, Collier et al. (2009) used a global panel data set to examine different determinants of civil wars during the past 45 years. They report evidence of a feasibility hypothesis: where a rebellion is financially and militarily feasible, it will occur. In other words, the ability of local leaders to initiate a war or a rebellion is linked with their ability to provide the soldiers with sufficient economic resources. Large enough resource endowments may enable leaders to offer short-term reward to soldiers, but in some cases lack of resources force leaders to commit on future payments for recruitment (Weinstein, 2005). Collier and Hoeffler (1998) suggest that net costs during a conflict may be compensated for by future expected earnings. More specifically, militias widely

[3] A parallel trend in the theoretical literature studies resource allocation between military and non-military uses during a conflict. In Skaperdas (1992), agents decide to allocate financial resources to production or arms, while in Grossman (1991) peasants decide how to divide their labor time among production, soldiering, and insurrection.

finance themselves through organized external looting (looting of the opposite civilian population). Based on a review of 14 cross national econometric studies, Ross (2004) reports that 'lootable' commodities like gemstones and drugs are correlated with the duration of conflict. Similarly, evidence suggests that both government and opposition in many lands of conflict get involved in illegal business and organized crime (Cairns, 1997). Looting, as well as other forms of violence against civilians, has therefore become the main activity of soldiers in poor countries, where civil wars take place predominantly (Azam, 2002). Notably, this pattern of warfare results in a humanitarian disaster: "suffering of millions of mutilated children, of raped women, of destroyed homes and stolen property, of damaged crops, and of millions of refugees displaced by the anticipation of massacres and looting" (Azam, 2002. p.3).

Following the evidence, in the model looting is part of fighting. Based on their aggregate relative strength, soldiers loot a share of their opponents' income. The booty allocation rule is credibly declared by the leader in advance, so that soldiers base their fighting decision on the share of the booty that they personally expect. Higher expected personal booty is related to higher probability of participation irrespective of other personal characteristics.

An additional channel of financing is based on the usage of internal material resources. Such resource may include the incomes and wealth of local civilians, the presence of natural resources and external transfers (foreign aid by countries, global organizations or private supporters). While the existence of natural resources and availability of external transfers may be considered as an initial endowment (mainly since the leader is well informed about their expected size) the magnitude of donations is subject to the supportiveness of the local community of the rebel groups as well as to the ability of peasants to produce during the violent conflict. Clearly, the composition of internal resources varies: for example, Weinstein (2005) reports that the National Resistance Army in Uganda lacked money for soldiers' salaries. Therefore, money and supply had to be donated by the local population. In contrast, the Renamo in Mozambique enjoyed generous funding by its external Rhodesian patron.

This paper focuses on the interaction between soldiers, peasants and the leader – therefore we single out the channel of monetary transfers between the supportive civilians

and the soldiers. All other forms of possible internal funding are considered to be part of the aggregate income of the leader. Hence, the second monetary incentive mechanism in the model is direct donations from the supportive peasants. In the model, peasants produce goods and finance the warfare sector by means of donations (or transfers). The initial reason for the peasant support is social and ethnical cohesion but intuition has it that peasants also give individual donations to promote better defense of their life and property.[4] Either way, the transfers from peasants to soldiers incentivize soldiers to fight. However, we would expect to find a tradeoff between donations and booty, i.e., when the leader expects generous donations, he may allocate less booty to his soldiers'.

Patriotism and Identification with the War

On top of the economic incentive, social and political factors play an important role in the decision to fight (Sambanis, 2001). While in the classic crime-economics literature (Becker, 1968) agents are motivated by pure greed, several recent political economy studies emphasize the social and psychological motivation of agents in the warfare sector. Using data gathered from newspaper reports, Chen (2005) finds that areas of high baseline religiosity experienced more social violence in the aftermath of the Indonesian financial crisis. Krueger and Maleckova (2003) claim that terrorists' primary motive is passionate support for their cause and feelings of indignity or frustration, rather than poverty and education that play a minor role.

We assume soldiers have an emotional leaning toward political and military action that the leader takes. At another level, soldiers' solidarity and mutual commitment may also play a crucial role in fighting. Since we focus on economic incentives but do not wish to exclude the effect of social, religious, and political factors, the model includes a parameter that reflects the per-mission identification level of the militia with the leader. Based on patriotism, social cohesion, and values, we assume that soldiers as a collective develop a certain sentiment toward any specific mission or war. When patriotism is high, soldiers are expected to earn a positive psychological reward by joining the army and

[4] A less naive terminology would suggest that the local militia terrorizes the peasants and collects a share of their income as protection money.

fighting. When soldiers do not identify with the mission, resent it, and express less patriotism, they experience a psychological cost of fighting.

Mortality and Survival

Another key element that influences agents' decisions in wartime is risk to life (Weinstein, 2005). Although it is almost impossible to mingle survival concerns with more material or psychological motivations, we still believe that in the immediate decision-making that occurs during wars, soldiers take into account changes in risk to life alongside less cardinal concerns. In the model, we differentiate between two survival effects: group and personal. The survival probability of all agents in the model is affected by the war. The mortality probability is a direct function of the relative strength of the fighting army. Once the local militia becomes stronger (e.g., when more soldiers choose to fight), the relative probability of survival increases as well. In addition, soldiers are assumed to be at more risk than civilians. Later in the model, we relax this assumption. Finally, we introduce heterogeneity in the individual's survival probability. Hence, each soldier has a private value that captures his subjective perception regarding the excess risk that he assumes by fighting as a soldier as against quitting and reverting to his peasant life. Naturally, the individual survival value would be a major factor in the individual's decision to fight or desert.

The Model

We consider a society in conflict. Individuals are assumed to be grouped into two pre-existing ethnic groups, A and B. We focus on the decisions taken by a unit mass of agents Group A) and consider all the parameterization of Group B as exogenously given. Group A, i.e., the rebels, is headed by a leader who first initiates the violent phase of the conflict and then sets the allocation rule for the booty. Individuals care for income, survival, and patriotism.[5] Soldiers decide on whether to join the fighting (i.e., actually to kill people and to loot) while peasants decide on donating to combatants. The model includes an

[5] For the sake of simplicity, all individuals are assumed to have the same utility function and to be risk-neutral, so that their utility function in income is linear, broadly defined.

aggregate-level production shock. The following paragraphs present the building blocks of the model and explain the equilibrium concept that we use.

Agents: Agents are *ex ante* identical.

Agents may belong to the civilian sector (as peasants) or the warfare sector (as militia members/soldiers). The mechanism that civilians use to self-select into the warfare sector and the role of ideology are the center of a parallel and more theoretical project (Lavie & Muller, 2010). Here, in contrast, our point of departure is a society that has a predetermined fixed proportion of soldiers and peasants. S_A denotes the share of soldiers in Society A and P_A denotes the share of peasants. By construction, $P_A = 1 - S_A$. In the civilian (agriculture) sector, peasants produce a single good and donate money to the fighting militia. In the warfare sector, soldiers decide whether to fight or to desert.

The utility function: the utility of agents is additively decomposable into three components: income, survival, and patriotism: $U_i = I_i + \log(H_i)$. Where I_i is agent i's disposable income, H_i is his survival rate during the war (see below).

The leader: The sole leader of group A declares war and decides how the booty is to be allocated within the group. The leader is selfish and gains utility only from his/her own revenues:[6] $U_L = I_L$. where I_L denotes the leader's income.

War: When the leader declares war on the incumbent group (B), a war breaks out. We analyze the outcomes of the war using a "contest success function" that reflects the relative power of the fighting sides. The strength of Group A relative to Group B is given by: $\omega(S_B, S_A^F) = e\left(\frac{p_k S_A}{S_B}\right)$, with $e' > 0,\ e'' \leq 0$ (implying that the return to military strength is positive but not increasing). Let $S_A^F \equiv p_k S_A$ denote the number of soldiers in Group A who actually participate in fighting.[7] The probability of participation in fighting is denoted by p_k. When all soldiers. fight, $p_k = 1$. Let S_B denote the number of fighting soldiers in Group B (assuming that all fight). The aforementioned fighting technology (i.e., the contest success function) directly reflects the relative fighting strength of the two armies and is a simpler transformation of the common successes function in the conflict literature.[8]

[6] For brevity, hereinafter we use the masculine form for the leader.
[7] Note: the indexation of S using A is omitted below for brevity.
[8] See, for example: Azam 2002, and Grossman and Kim, 1995.

War affects the economy in three ways: (i) looting, (ii) increased mortality, and (iii) and identification effect.

i. Conditional on war, the looting value extracted from the opposite side (Group B) is given by: $L^B = L(\pi_B, \omega) = \pi_B \omega$, where π_B is the total wealth of Group B. For simplicity, we disregard looting of Group A by Group B because it does not 'the soldiers'' fighting decision directly.

ii. Mortality: war reduces the survival probability of both soldiers and peasants. Without war, the survival probability is set at 1. Survival is a decreasing function of ω and depends on the agent's position. We let h_P, h_S denote the respective survival parameter of peasants and soldiers during a war. Then, the respective survival probabilities are given by: ωh_P and ωh_S. Assume: $h_S = (1 - \mu)h_P$ with $\mu > 0$, reflecting the excess mortality among soldiers. For objective and subjective reasons, soldiers are heterogeneous in their evaluation of the extra risk. Thus an individual soldier experiences $h_{S,i} = (1 - \mu_i)h_P$ when μ_i is drawn from a cdf F_μ.

iii. Identification effect: commensurate with their level of commitment to and identification with the cause of the war, soldiers who participate in fighting experience a psychological effect of size z. This parameter reflects a wide spectrum of feelings and emotions that soldiers might entertain in respect to their declared mission. A possible intuition may be "patriotism", but other terms such as "values", "morals" or "commitment" and "solidarity" may also be in mind. In a nutshell, "z" captures the aggregate militia's sentiment toward fighting. We allow z to be negative or positive. When z is positive, soldiers favor the war and get a psychological reward from fighting; when z is negative, the effect is the opposite.

Peasants (production and donation): peasants produce using a constant-return-to-scale technology: $F_i = \lambda\theta_{t,i}$. Productivity is subject to an aggregate shock. The aggregate shock is $\theta_t \geq 0$,drawn from distribution F_θ. Peasants may transfer (donate) money to the militia. Donation affects the peasant probability of survival by incentivizing the soldiers to

provide better local protection.[9] Let D_i denote the per-peasant donation level and let d_i denote the per-soldier donation level ($D_i = \frac{p_k S_A}{P_A} d_i$). For the sake of brevity, peasants' actions are simplified into a reduced form that captures the link between the aggregate productivity level and the monetary transfers to soldiers. Individual donations are a positive function of the peasants' income: $d_i = D(\theta_t)$ with $D'(\theta_t) > 0$. The intuition is that due to budget constraints and/or liquidity constraints, peasants donate sub-optimally and, as a result, the collective level of donations is a positive increasing function of the aggregate productivity shock.[10] Finally, the enhanced survival effect is given by $\beta_i\left(D_i(\theta_{t,i})\right)$,which increases with $\theta_{t,i}$.

Revenues: besides production, the other primary source of income in the economy is looting. Looting is a war-related activity; as such, it is organized and controlled by the leader. The leader decides and announces the rule to be used in dividing the booty between the soldiers and him. The proportions are denoted by vector $\mathrm{A} = \{a_L, a_S\}$, where $a_L + a_S = 1$, and a_L, a_S are those of the leader and the soldiers, respectively. However, soldiers' revenues depend on their fighting participation: Soldiers who do not fight (by deserting the army and returning to be peasants) are not entitled to either form of financial benefit, donations or booty. Finally, the leader's income is constructed by his share of the booty. The incomes of the leader (I_L), the soldiers (I_S), and the peasants (I_P) are summarized by:

$$(1) \qquad \left\{ \begin{array}{c} I_L = (1 - a_S) L^B \\ I_{S,i} \big| (k_i = 1) = \frac{a_S L^B}{S_A^F} + d_i \\ I_{S,i} \big| (k_i = 0) = 0 \\ I_{P,i} = \lambda \theta_{t,i} - D_i \end{array} \right\}$$

where '$|(k_i = 1)$' represents 'conditional on fighting'.

Schedule**:** The model is scheduled as follows: (1) productivity shock (θ_t) takes place; 2) the leader declares war and discovers if the militia supports him (identification); 3) the leader announces the sharing rule of the looting (a_L, a_S); 4) peasants transfer their

[9] Note that this kind of argumentation is true whether the local militia protects the local civilians or represses and brutalizes them.

[10] For an extended description and full structure of such a system, see Lavie and Muller, 2010.

donations; 5) soldiers decide to fight (k=1/0); 6) war breaks out and the booty is distributed.

Information structure: agents and leader are familiar with all the model parameters and structure. The aggregate productivity shock becomes public knowledge instantaneously after it occurs. Also, after the declaration of war, the leader immediately discovers the reaction of the militia (the realization of z) so he can optimally respond to both the local productivity level and the militia support level when he sets the booty allocation rule. The individual-risk parameter (μ_i) is private information but the distribution of the survival probabilities is known. Finally, all decisions made are also common knowledge.

Equilibrium: the equilibrium results from the players' optimal sequential decisions. The model is solved backward: we start with the final decision of the model—to fight, our main decision of interest—and move backward to previous decisions that make it possible: donations and booty allocation. At each stage, agents choose actions that maximize their utility based on the anticipated response of other players. The equilibrium is characterized by three decision vectors: $\{\mathrm{A}, \Delta, \mathrm{K}\}$. $\mathrm{A}\{a_L, a_S\}$ as the vector of the booty allocation, $\Delta\{\mathrm{D_j},\ \mathrm{j} = 1, \dots, \mathrm{n}\}$ as the vector of donations from peasants, and $\mathrm{K}\{\mathrm{k_l} = \{0 \text{ or } 1\}, \mathrm{l} = 1, \dots, \mathrm{n}\}$ as the vector of the soldiers' fighting intensity.

We now proceed to analyze the model.

Analysis

The model is solved by solving the three decision equations sequentially. Note that since the aggregate productivity shock precedes the making of any decision, we consider productivity as fixed ($\theta_{t,i} = \theta$). Consequently, the donation level is also fixed ($d_i = d$) and does not attract direct special interest. To solve the rest of the model, we first explicitly express the utility functions. The leader's utility is given by his revenues[11]:

$$U_L = (1 - a_S)L^B \qquad (2)$$

The soldiers' utility function contains revenues (from their share of the looting and received donations) and, upon fighting, the individual probability of death and the identification parameter:

[11] Still, it must satisfy the liquidity constraint; thus, $D \leq \lambda\theta_t$.

$$(3) \qquad U_{S,i} = k_i \left(\frac{a_S L^B}{S_A^F} + d \right) + \log\left(h_{S,i}\right) + k_i z$$

where: $h_{S,i} = \omega(1 - k_i \mu_i) h_P$.

The peasants' utility function accommodates net revenues and the survival probability:

$$(4) \qquad U_{P,i} = \lambda \theta_{t,i} - D_i + \log(h_P)$$

where: $H_P = \omega h_P$.

The following paragraphs provide formalization for the agents' three decision equations in reverse order:

Fighting decision: soldier i fights if $E(U_S|k=1) \geq E(U_S|k=0)$. Plugging in the utility expression (Equation 3), we get[12]: $a_S{}^* \frac{L^{B^*}}{p_k{}^* S} + d + \log\left(\omega^*(1-\mu_i)h_P\right) + z \geq \log(\omega^* h_P)$. Recall that $L^{B^*} = \frac{\pi_B}{S_B} p_k{}^* S$,. Then, using the notation $\chi_i \equiv \log\left(\frac{1}{1-\mu_i}\right)$, we can rewrite the fighting condition into:

$$(5) \qquad \chi_i \leq a_S \frac{\pi_B}{S_B} + d + z$$

Parameter χ_i is a monotone transformation of μ_i with a cdf F_χ. Similarly, χ_i represents the extra threat of death to a soldier. The higher χ_i gets, the more dangerous the fighting that soldier I experiences. Let $\chi_i^F \equiv a_S \frac{\pi_B}{S_B} + d + z$ denote the reservation survival level. Then, any soldier who is more fearful of survival than this level will not fight. Therefore, the fighting rate among the soldiers, p_k, is:

$$(6) \qquad p_k = prob.(\chi_i \leq \chi_i^F) = F_\chi \left[a_S \frac{\pi_B}{S_B} + d + z \right]$$

Leader's decision: The leader chooses to allocate the booty in a way that maximizes his revenues:

$$(7) \qquad \max_{a_S} E[(1 - a_S)\, L^B]$$

The corresponding F.O.C. is:

[12] The asterisks represent the equilibrium values of the variables. Note that at the moment of decision all previous information is already known; hence the only asterisk (denoting an optimal choice to calculate) left is for $p_k{}^*$ and we may delete the asterisks from all other variables.

(8) $\frac{\partial I_L}{\partial a_s} = \frac{\pi_B}{S_B} S \left((1 - a_S) \frac{\partial p_k{}^*}{\partial a_s} - p_k{}^* \right) = 0$

Equations (6) and (8) provide us with the structural characteristics of the model. To complete the analytical analysis, we now use a specific functional form for the distribution of the survival parameters. Let the distribution of the survival parameter be uniform: $\chi_i \sim \mathrm{U}[0, \chi_0]$. Then: $p_k = \frac{a_S \frac{\pi_B}{S_B} + d + z}{\chi_0}$.

Using the above functional form, we can analytically solve the model and present the equilibrium results. We summarize the result in the following proposition:

Proposition 1: Booty allocation

- $a_S = 0$ *if* $d + z \geq \frac{\pi_B}{S_B}$
- $a_S = \frac{1}{2} - \frac{d+z}{2\frac{\pi_B}{S_B}}$ *if* $\frac{\pi_B}{S_B} \geq d + z \geq -\frac{\pi_B}{S_B}$
- $a_S = 1$ *if* $-\frac{\pi_B}{S_B} \geq d + z$

Proof:

Using $p_k = \frac{a_S \frac{\pi_B}{S_B} + d + z}{\chi_0}$*, we calculate:* $\frac{\partial p_k}{\partial a_S} = \frac{\frac{\pi_B}{S_B}}{\chi_0}$*. Plugging into (8,) we can solve for* a_S *and get the interior solution:* $a_S{}^* = \frac{1}{2} - \frac{d+z}{2\frac{\pi_B}{S_B}}$*. Also, the soc is satisfied:* $\frac{\partial^2 I_L}{\partial^2 a_s} = -\frac{2\left(\frac{\pi_B}{S_B}\right)^2 S}{\chi_0} < 0$*.*

Re-inserting $a_S{}^*$ *into* p_k *we get:* $p_k{}^* = \frac{\frac{\pi_B}{S_B} + d + z}{2\chi_0}$*.* ∎

The soldiers' share of the booty decreases in inverse proportion to donation size; i.e., the higher the donation, the smaller the share in the booty. In addition, a_S compensates for the size of z. Higher support in the war leads to smaller monetary incentives; when support is little or negative, the soldiers' share increases. Interestingly, the effect of the opponent's wealth and strength is not monotonous in the interior solution segment: $\frac{\partial a_S}{\partial \frac{\pi_B}{S_B}} < 0$ for $d >$z and $\frac{\partial a_S}{\partial \frac{\pi_B}{S_B}} > 0$ for $d <$ z. By implication, when the militia supports the war (or at least does not oppose it vigorously), the higher opportunity value (greater opponent wealth combined with less military power) reduces the soldiers' share. When the militia is strongly against the war, its share of the booty increases when the opponent\s income increases or when the opponent\s military strength decreases. Note that for $d < z$, soldiers

will not fight unless they are offered a share of the booty. In this case, higher opportunity value allows the leader to increase the incentives.

At the corner ($d + z < -\frac{\pi_B}{s_B}$), soldiers sit out the war even if they are offered the entire looting surplus ($a_S = 1$, but $p_k{}^* = 0$). Finally, when donations are high enough ($d + z \geq \frac{\pi_B}{s_B}$), the soldiers are so keen to fight that the leader can retain all the booty. Note that this result may be achieved either by high donations or by strong support of the war; in both cases, additional monetary incentives become unnecessary.

A possible intuition for donation is taxation. In this sense, we may interpret the last result as in the case of a regular army: the government pays its soldiers enough (in salaries financed by the tax system) to avoid the need to incentivize them with a performance bonus (i.e., booty). In a less organized group, such as that of rebels, donations (given willingly or taken by force) are important but often are not enough to make soldiers fight. In the extreme case where soldiers are non-patriotic, the promised share becomes maximal.

Proposition 2: Fighting decision

- $p_k{}^* = 0 \qquad if -\frac{\pi_B}{s_B} \geq z + d$
- $p_k{}^* = \frac{\frac{\pi_B}{s_B} + d + z}{2\chi_0} \qquad if \quad 2\chi_0 - \frac{\pi_B}{s_B} > z + d > -\frac{\pi_B}{s_B}$
- $p_k{}^* = 1 \qquad if \; z + d > 2\chi_0 - \frac{\pi_B}{s_B}$

Soldiers do not fight ($p_k = 0$) when the individual risk of fighting is so severe as to make all possible levels of compensation inadequate. Alternatively, soldiers do not fight if the militia is strongly against a war (very negative z). In the interior solution segment, fighting participation rises in tandem with opportunity value, peasants' donations, and support of the militia. Fighting participation decreases as the opponent's army grows or when the distribution of χ widens; in these cases, soldiers fear that the risk of mortality is very high. In the extreme case of very generous donations and/or very strong patriotism, all soldiers fight; at some point in this segment, the promised share of the booty drops to zero.

Relaxing the Excess Threat Assumption

Previously we assumed that the survival probability of soldiers is lower than that of civilians ($\chi_i > 0$). However, some evidence suggests that this is not always the case. Azam (2002) quote an aid-agency official who estimated the share of nonsoldiers in casualties at 84% and suggest that deliberate targeting of civilians by militias is part of a well defined military tactic. In the analytical terms of the model, this would suggest a negative value of χ. Such a change gives a peasant a lower survival probability than a soldier. Clearly it would tend to increase $p_k{}^*$ but in parallel it also decreases the soldiers' share of the booty.

Consider a new functional form for the distribution of the individual risk parameter: $\chi_i \sim U[-\chi_0, \chi_0]$. Then: $a_S = \frac{1}{2} - \frac{d+z+\chi_0}{2\frac{\pi_B}{S_B}}$, $p_k{}^* = \frac{\frac{\pi_B}{S_B}+d+z+\chi_0}{4\chi_0}$. Indeed, fighting participation is higher and the share of the booty is lower. We also see that contrary to the previous model, the parameter of the risk distribution (χ_0) enters directly into the a_S equation. The intuition is clear: when soldiering is safer than remaining a civilian, the practical result is forced recruitment with no exit option. This type of story is common in territories where the local militia terrorizes its own people and inducts men by force.

Declaration of War and Occurrence of Shocks

We now observe possible trigger factors for an armed conflict. We consider three main channels through which war becomes more likely (from the point of view of the leader who declares the war). Although this model does not explicitly define how the decision to go to war is made, our results suggest that a leader would tend to declare war when the expected probability of fighting crosses a certain threshold. The following paragraphs suggest such possible scenarios:

- A positive local productivity shock: when the society experiences a positive productivity shock ($\theta_{t,i}$), peasants can make larger donations (alternatively, the leader can more easily collect taxes or protection money, depending on the interpretation). Those transfers serve as a fixed-incentive device for soldiers. The outcome is higher expected probability of compliance among soldiers, resulting in higher expected profits for the leader. To conclude, the model suggests that a

jump in productivity (e.g., due to an international increase in the price of a local natural resource) may transform a peaceful leader into a violent one.

- Changes in the opportunity value of looting: when the opponent becomes richer (creating more income to loot) or weaker (fewer soldiers or weaker tendency of soldiers to fight), the effect on the local leader and the militia is similar: an increase in opportunity value that may lead to a war.
- Patriotism and charisma: the support of the militia (i.e., strong identification with the cause of the war) is a major factor in the participation equation. Patriotism and charisma may serve as substitutes for monetary incentives. A leader who cannot pay soldiers properly may compensate for this by effective manipulation of public opinion. Since different leaders tend to differ in charisma and communication skills, the model suggests that the leader's personal attributes would play a crucial rule, especially in low-income economies where alternative ways of financing the army are limited.

Concluding Remarks

In essence, this paper takes a closer look at the decision-making process that eventually induces people to become perpetrators of violent conflict. Our model suggests a possible mapping of the effect of incentives on conflicts. We showed the substitutability of looting and donations as monetary incentives for fighting. Also, we studied the effect of perceived survival heterogeneity as an explanatory variable for the sorting of soldiers. Finally, we explored the possibility of leaders using charisma alongside monetary incentives to promote participation.

A lot of attention in academic, donor and nongovernmental organization circles is given to the role of financial foreign aid in fueling violent civil wars. A parallel concern is focused at the effect of local resources (and especially on variation of global prices of such resources) as the funding sources of militia forces and rebels (for a recent examples see Janus 2011 and Humphreys 2005). While we acknowledge the role of foreign aid and natural resources as funding sources we don't specify them directly in the model. The total resources of the opponent side are captured via the parameter π_B. In that sense, if the opponents enjoy large scale external transfers or payments it would affect the 'lootable' wealth and by that it should yield a positive motivational effect on soldiers' decision to

fight (due to the higher rent from fighting). Alternatively, if the opponent gets supply of weapons and arms it may be captured via an increase in the opponent relative strength (via the S_B parameter). As for the funding of the rebel group, the effect of production and production shocks (i.e., changes in global prices of local resources) is well captured via the donation mechanism. Any additional enclave production (with little connection to the productivity of most citizens) would enter directly into the possession of the group leader. The current model does not allow the leader to use the additional funding to incentivize soldiers. However, under some minor adjustments (which were omitted for the sake of shortness) we can show that given that the leader optimally incentives the soldiers using the booty allocation rule, an increase in the total endowment of the leader would only affect the wealth of the leader.

While it is clear that economic incentives play an important role in the decision to fight, the initial motivation for joining the militia remains survival. Joining a militia in a conflict zone is never simple: in many cases, the dilemma is as plain as kill or get killed. While economic models tend to flatten the world into a set of elementary equations, reality is more complex.[13] Even so, the careful use of modeling to examine non-trivial circumstances may be productive, mainly in better understanding the dilemmas that young people face and the possible equilibriums to which they lead. Still, understanding does not necessarily mean condoning.

Finally, the study may offer an interesting policy-oriented contribution toward the debate over re-legitimizing a former terrorist or militant. When a conflict comes to its end, it is crucial to be able to differentiate and understand the reasoning process that made people fight and kill. U.S. Secretary of State Hillary Clinton referred to Afghanistan when she said (March 31, 2009), "*The Taliban consists of hard-core committed extremists with whom there is not likely to be any chance of any kind of reconciliation or reintegration. But it is our best estimate that the vast majority […] are people who are not committed to a cause so much as acting out of desperation.*"[14] Assuming that agents differ in their level of extremism (or, in our terms: patriotism), our model provides mapping of the

[13] In a provocative paper, Cramer (2002) suggests that orthodox economic theories of war are reductionist, speculative, and misleading.

[14] CBC news report (March 31, 2009), www.cbc.ca/news/world/story/2009/03/31/hague-conference.html

motivational background of different soldiers in the same army. Such a structure may be used after a war to develop criteria for the clearing of some former combatants and the prosecution of others.

References

Azam, Jean-Paul, (2002). "Looting and Conflict between Ethnoregional Groups: Lessons For State Formation in Africa". Journal of Conflict Resolution. February 46: 131-153

Becker, Gary (1968). Crime and Punishment: An Economic Approach. The Journal of Political Economy 76: pp. 169–217

Blattman, Christopher, and Edward Miguel. (2010). "Civil War." Journal of Economic Literature, 48(1): 3–57.

Cairns, E. (1997). " A Safer Future : Reducing the Human Cost of War". Oxford: Oxfam Publications.

Chen, Daniel L. 2005. "Islamic Resurgence and Social Violence During the Indonesian Financial Crisis." Unpublished working paper, University of Chicago.

Collier, P., A. Hoeffler, and D. Rohner (2009). "Beyond greed and grievance: feasibility and civil war." Oxf. Econ. Pap., January 1, 2009; 61(1): 1– 27.

Collier, P., and A. Hoeffler (1998). On economic causes of civil war. Oxford Economic Papers 50:563–73

Cramer, Christopher. 2002. "Homo Economicus Goes to War: Methodological Individualism, Rational Choice and the Political Economy of War." World Development, 30:11, pp. 1845-64.

Grossman, Herschel I & Kim, Minseong, (1995). "Swords or Plowshares? A Theory of the Security of Claims to Property," Journal of Political Economy, University of Chicago Press, vol. 103(6), pages 1275-88, December

Grossman, Herschell I. (1991). A General Equilibrium Model of Insurrections. The American Economic Review, Vol. 81, No. 4 (Sept. 1991), pp. 912–921.

Humphreys Macartan and Jermy M. Weinstein (2008). Who Fights? The Determinants of Participation in Civil War. *American Journal of Political Science* Vol. 52, No. 2 (Apr., 2008), pp. 436-45

Humphreys, Macartan, 2005. Natural resources, conflict and conflict resolution uncovering the mechanisms. Journal of Conflict Resolution 49 (4), 508–537.

Krueger, Alan B. and Jitka Maleckova (2003). "Education, Poverty and Terrorism: Is There a Causal Connection?" The Journal of Economic Perspectives, 17:4, pp. 119–144.

Lavie, M & Christophe Muller (2010)."Incentives and Self-Selection in Violent Conflicts", mimeo, University of Aix-Marseille.

Lichbach, Mark I. (1994). "What Makes Rational Peasants Revolutionary?: Dilemma, Paradox, and Irony in Peasant Collective Action." World Politics, 46:3, pp. 383–418.

Lichbach, Mark I. (1995). The Rebel's Dilemma. Ann Arbor, MI: University of Michigan Press

Minter, William. 1995. Apartheid's Contras: An inquiry into the roots of war in Angola and Mozambique. London: Zed Books.

Popkin, Samuel L. (1988). "Political Entrepreneurs and Peasant Movements in Vietnam," in Michael Taylor, ed., Rationality and Revolution. Cambridge: Cambridge University Press, pp. 9–62.

Ross, Michael, 2004. What do we know about natural resources and civil war? Journal of Peace Research 41 (3), 337–356.

Sambanis, Nicholas (2001). Do Ethnic and Non ethnic Civil Wars Have the Same Causes?: A Theoretical and Empirical Inquiry *The Journal of Conflict Resolution*, Vol. 45, No. 3 (Jun., 2001), pp. 259-282

Skaperdas, Stergios (1992). "Cooperation, Conflict, and Power in the Absence of Property Rights," American Economic Review, American Economic Association, vol. 82(4), pp. 720–739, September.

Thorsten Janus (2011). Natural resource extraction and civil conflict. *Journal of Development Economics*, Forthcoming.

Weinstein, Jeremy M (2005). Resources and the information problem in Rebel Recruitment. The Journal of conflict Resolution, Vol: 49 N. 4, pp. 598-624

Weinstein, Jeremy M. (2007). Inside Rebellion. Cambridge: Cambridge University Press.