



**CONFLICT AND NEGOTIATION:
A GAME THEORETICAL APPROACH**

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SERIE DOCUMENTOS DE TRABAJO

**No. 54
Noviembre 2008**

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Abstract

We study economic conflicts using a game theoretical approach. We model a conflict between two agents where each one has two possible strategies: cease-fire or neglect the truce. Under this setting, we use the concept of pre-donations, namely, a redefinition of the game where agents commit to transfer a share of their output to the other agent (Sertel, 1992), and explain under which conditions a system of pre-donations can facilitate a truce. We find that for conflicts involving high costs there is a distributive mechanism, acceptable for both parties, such that, the best strategy for both parties is Cease-Fire. However, in many cases there are no sufficient conditions for the scheme or pre-donations to be effective. We also analyze some limitations of this framework and extend the model in order to deal with some of these flaws. Finally, in order to illustrate the relevance of the theoretical results we briefly describe some of the circumstances that characterized the negotiation processes between the Colombian government and different illegal groups.

JEL Codes: D31, D74, H29, H39

Keywords: Conflict, Distribution, Cease-Fire, Colombia.

I. Introduction

Why do some internal conflicts succeed in reaching a truce, demobilization or a negotiated settlement while in others the combatants withdraw from the negotiating table and return to war or do not even consider the possibility of a truce? Why, do some processes fail, even after having managed to get opposing parties to sit down at a negotiation table? Those questions are posed in a growing body of literature on internal conflict and peace processes that point out several reasons for the failures and successes of conflict resolution efforts. Among those (explanatory factors?), we may find the type and terms of the settlement, the lack of third party support, the significance of ethnic and religious identities, and the economic and political incentives. In addition, a number of sensitive points of the peace process have been suggested as ones that may difficult or threaten the progress of the process: strategies and objectives of each party, violence during the peace process and the design of the negotiation agenda.

The literature on internal war (civil war) termination and conflict resolution can be categorized into two main groups: The first one, the *rational choice* approach, considers negotiated settlement as a function of economic, institutional or military conditions that may encourage combatants to initiate dialogues. Under this perspective, the success of negotiation will be closely related to the presence of specific conditions. The second set of theories, *conflict resolution techniques*¹, underlines the ability of parties to solve their conflicts. In other words, once dialogue is initiated, the success of the process will rely on the ability to put an end to the inner reasons of war. In this paper, we will focus on the first approach: rational choice as it follows.

We study a conflict between two agents, a guerrilla group and the government. We assume that the conflict is triggered by distributive issues, namely, guerrillas fight in order to expropriate legal agents' income and, by these means, increase their own income. Legal agents are represented by the government and they can invest in defence in order to reduce the appropriated share. Each agent has two possible strategies: cease-fire or neglect the truce. For the guerrilla group, the cease-fire implies a resignation of the appropriated income but also a reduction in

¹ This category was developed by Kornprobst (2002).

confrontation-related costs. For the government, the cease-fire strategy implies a reduction in defence expenditure but also a higher appropriated share if the guerrilla group chooses the no-truce strategy.

Now, the problem of civil conflict is related to economic and non economic issues and, consequently, any attempt to solve a conflict should observe the different dimensions of the problem. When we talk about redistribution of wealth as a way to make a cease fire possible we refer to a broad concept of wealth which includes political power.²

Under this setting, we use the concept of pre-donations, namely, a redefinition of the game where an agent may commit to transfer a share of their output to the other agent (Sertel, 1992), and explain under which conditions a system of pre-donations can facilitate a truce. We find that for conflicts involving high costs there is a pre-donations scheme, acceptable for both parties, such that, the best strategy for both parties is Cease-Fire. However, in many cases there are no sufficient conditions for the scheme or pre-donations to be effective. Recall that we refer to a broad concept of wealth which includes political power. Therefore, a pre-donations scheme, which always implies a transfer of wealth, may also imply a transfer of political power.

We also analyze some limitations of this framework and extend the model in order to deal with some of these flaws. Finally, in order to illustrate the relevance of the theoretical results we briefly describe some of the circumstances that characterized the negotiation processes between the Colombian government and different illegal groups. In particular, we refer to the negotiation attempts with the Revolutionary Armed Forces of Colombia (known by the acronym FARC) between 1991 and 1998, the successful negotiation with and eventual demobilisation of the M-19 guerrillas at the end of the 1980's, and the negotiation process between the Colombian government and the right-wing paramilitary group United Self-Defence Forces of Colombia (known by the acronym AUC) in 2003.

The rest of the paper is organized as follows: In section two, we review the related literature. In section three we present the basic games and its results. In section

² Admittedly, many of the non economic issues cannot be analyzed with the tools we use here.

four, we present the extensions of the model and, finally, we conclude in section five.

II. Literature Review

Jack Hirshleifer made one of the first attempts to model economic conflicts. The economic theory of conflict follows, in general terms the framework built by Hirshleifer (1987, 1988, and 1989) and rests upon the assumption that agents involved in conflicts optimally split their resources between productive activities and conflict.³

Following this approach, some authors study the effectiveness of income redistribution as a way to solve conflicts. Azam, (1995), Rodríguez (1997), Roemer (1998), Diaz (2000) and Zuleta (2004), among others, have shown that land reforms, changes in fiscal policy and other ways to redistribute income or wealth can be in the interest of the agents who are giving up a share of their wealth. However, one of the main problems regarding civil conflict is that agents in conflict are often not willing to settle. Therefore, in order to understand the real possibilities of a settlement, the issue of negotiation must be addressed. On the one hand, there is no complete information so the perceptions about the probability of victory differ among agents and, for this reason the likelihood of a settlement is reduced. On the other hand, the demands of the rebels often go beyond income re-distribution as they demand political power. The paper by Manson and Fett (1995) addresses the first issue. Assuming a simple model of rational calculation over the utility and cost of war and settlement, they introduce uncertainty to the analysis. In this setting, the likelihood that both parties agree to a settlement depends to a great extent on each party's estimate of its probability of victory.

The rational choice theory advances in the second direction. Based on the idea that the decision to negotiate or not is determined by the relative costs and benefits of a unilateral victory or a negotiated settlement, Shugart (1992), considers the rational calculation of ending a conflict by democratic means: "institutional change may

³ Recently, several studies extended Hirshleifer's basic model. See among others: Grossman (1991), Skaperdas (1992), Neary (1997), Anderton et al. (1999), Garfinkel and Skaperdas (2000), Dixit (2004), Spolaore (2004), Zuleta (2004), Caruso (2006) and Zuleta (2008).

lower barriers to entry for new participants in the political market, therefore, negotiations over the institutional rules of the game are usually crucial components of any electoral settlement". Shugart (1992, 122)

In that sense, beyond income redistribution, the greater the chances of electoral incorporation the higher the cost of continuing war. Here, the calculations made by the parties interact and, together, determine the outcome⁴. The step from war to settlement occurs if the cost of competition becomes lower than the cost of conflict creating a situation of stalemate that may lead to political and electoral reforms and ultimately the settlement. If government's costs of suppression are greater than costs of toleration, then the reform will be one that guarantees electoral security and lower barriers to rebel participation. If for the rebels the cost of participation is lower than the cost of resistance, there will be an institutional reform that provides guarantees to the governing parties that their interest will be protected in the new electoral competition.

Zartman (2001) introduces a new element into the analysis. He argues that in long conflicts, warring parties can present pain, fatigue and boredom from being at war and lower their benefits from the conflict. However, they may also have new incentives that increase their war-benefits. According to Zartman, incentives can come in two forms, as current or as contingent modifiers of present values. Contingent incentives must be credible, "both as to their own feasibility and as to the willingness of the other party to implement them".

Political reform and hurting stalemate are two main components that change behaviour and incentives of parties. The prospect of an inclusive political reform, accommodation and devolution reduce the benefits of war, that is, increases the chances of negotiation. On the other side, mutually hurting stalemate can get the process started by pushing parties to listen to incentives and negotiate. In addition, both types of incentives require being credible. Mediation of a third party may provide credibility to the incentives.

⁴ According to Shugart (1992), institutional reforms decrease the cost of resistance of rebels in exchange of participation and decrease the cost of suppression of the regime in exchange of toleration.

Collier and Hoeffler (1998) and Collier (2000) bring new elements to the discussion. They state that civil wars occur where rebel organizations are financially viable, mostly in countries with low income, low growth and economies based principally on the export of commodities⁵. In that sense, the way to end a civil war depends on how public policies reduce the economic risk factors: change the pattern of economy, diversify the production and international cooperation to reduce the incidence of illegal trades: sanctions making the economic and military circumstances of rebellion more difficult. In addition, Berdal and Malone (2000) expose the political economy of civil war (the rebels` economic system and the opportunities generated by war) and they suggest that one of the way to end war is to “deactivate the belligerents’ financial spigot” (Berdal and Malone 2000, 14). The greater the benefits of the war economy, the less chances to initiate a negotiated settlement.

Finally, Sanchez-Pages (2008) argues that, in an environment of incomplete information, the conflict can open the door to agreement if the uninformed agent is optimistic but confrontation persists if the uninformed agent is pessimistic.

We introduce a simple framework that allows us to consider the majority of the elements discussed above. As stated before, we follow the rational choice perspective. We are aware of the limitations of the analytical tools we use but we are also convinced that they help to model economic conditions, definition of strategies and incentives faced by the agents.

III. Understanding the case of Colombia

Traditionally, the academic discussion about the internal conflict of Colombia has primarily focused on the social and political meaning of Colombian violence. One of the pioneer studies was published in 1983 by a multidisciplinary group of social scientist known as the *violentólogos*. Among other hypotheses, *violentólogos* related Colombia`s growing record of violence to a number of causes, including economic deprivation. In the absence of alternative explanations, they became part of the conventional wisdom.

⁵ He suggests that political agendas have been replaced by economic agendas.

A decade later, three quantitative studies by Gaitán (1995), Rubio (1995), and Montenegro and Posada (1995) presented a different approach and challenged the *violentólogo* theory. Since then, scholars and social scientist have approached the issue from different perspectives.⁶

In the following paragraphs we review the literature produced during the last two decades. For presentation purposes we divide the review in two subsections. In the first one, we discuss the papers where the main problem is the identification of the causes of the conflict and, in the second, we discuss the papers where the main problem is the identification of the costs of the conflict.

1. Causes

Several scholars have studied the causes of the Colombian conflict from a theoretical perspective. In general, identification of the causes is the first step in order to provide elements for the solution of the conflict. Castillo and Salazar (1999), argue that rebels have abandoned their ideological and social dimension, moving to an emerging economic and military dimension. Gorbaneff and Jacome (2000), following Grossman (1991 and 1994) model rational decisions of three agents: peasant, government and insurgent. Decisions are based on gains of participating with competing groups, represented by wage. Cante (2003) present a sequential game theoretical approach. The first step is given by armed actor and the decision is to assault or not. The second player, civil society, chooses among giving up or resisting. Cante, following Elster (2001), argues that civil society decisions are affected by personal and social compromises that can be more complex than simple economic gains. Finally, Zuleta and Andonova (2006) use a general equilibrium model ala Grossman (1991). They find a low-wage equilibrium with guerrilla activity and one peaceful, high-wage equilibrium and argue that, through their compensation policies, entrepreneurs and not the government might be able to protect their assets against expropriation.⁷

⁶ See Castillo and Salazar (1999), Mejía (2000), Posada and González (2001), Cante (2003), Zuleta (2004) Isaza and Campo (2005), Zuleta (2008), among others.

⁷ Andonova and Zuleta (2008) present a case study that supports this hypothesis.

Isaza and Campo (2005), calibrated a dynamic model of war trying to match the Colombian data. They pay special attention to the population that may choose to enrol in illegal armed groups and find that it is more efficient to undertake programs focusing on population deemed at risk, than to focus exclusively on military strategy as a way to solve conflicts.

Recently, some authors have made efforts in order to identify the causes of the conflict using empirical methods. Angrist and Kugler (2005) find that, in the early 1990s when coca production shifted from other nations to Colombia, violent deaths increased substantially in coca-growing regions deaths.⁸ Dube, O. and Vargas, J. F. (2006) show that negative price shocks in the international coffee market exacerbated civil conflict in Colombia. They present evidence supporting the idea that municipal expenditure reduced the effects that the crisis had on guerrilla attacks. Finally, they show that poverty is associated with greater violence. This evidence is consistent with the findings of Miguel et al. (2004) and Zuleta (2008).

Although the literature about the causes of the conflict seems disperse, from the previous review it is possible to identify three factors: unease produced by income inequality and institutional arrangements, poverty and the existence of easy sources of income.

2. Costs

According to Collier (1999) there are three main channels through which civil wars affect the economy: destruction of resources, disruption caused by the suppression of civil liberties and diversion of expenditure from productive activities. In Colombia, Rubio (1995), Trujillo and Badel (1998), Guerrero and Londoño (1999) and Mejia and Posada (2003) among others, provide calculations of these costs.

Trujillo and Badel (1998) build on Rubio (1995) and make a quantification of the gross costs of the conflict. According to them, terrorist actions by the guerrilla groups have been concentrated against the electrical infrastructure. They estimate the repair costs at US\$ 18 million during 1999 and 2000. However, these replacement costs may be small compared to the costs of the suspension of

⁸ Deininger (2003), Barron, Kaiser and Pradhan (2004) and Do and Iyer (2006) provide empirical studies for other countries.

transmission and generation. Mejia and Posada (2003) argue that the total valuation of damages from attacks to the Caño Limon – Coveñas oil pipeline during 2000 reached U\$ 12,3 million.

Levitt and Rubio (2000), present a summary of the literature concerning the costs of violence in Colombia. Costs are divided, as in Collier (1999), in three different groups: (i) Costs of repression and deterrence of criminal activities; (ii) costs of destruction and damages on the physical and human capital, and (iii) the negative impact that violence has on investment decisions. The estimated public costs of security and justice represent 5% of the GDP.

The second group of costs brings together loss of physical capital and costs of human life lost as a result of the murders, kidnappings and forced displacement of people. Guerrero and Londoño (1999) calculated that the direct material losses in Colombia are 6,4% of the GDP and the costs of violence determined by the losses of productivity and investment are 2% of GDP.

Although there are no calculations about the investments forgone due to violence and uncertainty in Colombia, the Cross-Country empirical evidence is significant about the negative effect that violence has on investment decisions (Alesina et al., 1996).

Summarizing, there exists enough empirical evidence indicating that the costs of the Colombian conflict are immense for the society. However, to the best of our knowledge there is no evidence at all regarding the costs faced by guerrilla and paramilitary groups. This type of evidence would be useful in order to determine the real incentives of these groups.

IV. The basic game

From the previous section it seems clear that an important factor explaining the conflict in Colombia is the distribution of income. Additionally, it is clear that the costs of the conflict, at least for the government and civil society, are significant. Therefore, the modelling strategy must take into account these two facts.

We use a game theoretical approach. There are two agents: government and rebels, and each agent choose between two possible strategies. One strategy is confrontation or war and the other is truce. If both agents choose a truce then both total income and income distribution are given. Now, if the rebels choose confrontation, they have to pay a cost but they may get a bigger share of total income; that is, there can be a redistribution of total income in favour of them. If the government chooses a truce while the rebels choose confrontation, then the individuals who behave according to the laws lose a share of their income in favour of the rebels. Finally, if both agents choose confrontation, then both agents pay costs, net income is reduced and income distribution depends on the relative military power of the agents.

In the following lines we define the variables, the strategies, the basic game and some of the results.

Definitions:

IL: Legal agents initial income.

IG: Illegal armed group initial income.

C: Illegal armed group operational costs

T: Defence costs.

P0: Share of income appropriated by guerrilla groups when the government does not invest in defence.

P₁: Share of income appropriated by guerrilla groups when the government invests in defence.

No Truce: Strategy in which the agent invest in

Assumption 1: There is only one guerrilla group and it behaves like one agent.

Assumption 2: The government represents the interests of legal agents.

Assumptions 1 and 2 allow us to model the problem with only two agents.

The basic game is described as follows,

Game 1.

		Illegal Armed Group	
		Cease-Fire	No Truce
Government	Cease-Fire	I_L I_G	$I_L(1-P_0)$ $(I_G-C)+P_0.I_L$
	No Truce	(I_L-T) I_G	$(I_L-T)(1-P_1)$ $(I_G-C)+P_1.(I_L-T)$

Results

1. If $P_0 \cdot I_L > C$ then Cease-Fire, Cease-Fire (CF,CF) is not a Nash equilibrium.

The proof is straightforward: If $P_0 \cdot I_L > C$ then $(I_G-C)+P_0.I_L > I_G$ so when the government chooses to Cease Fire the best strategy for the rebels is No Truce.

2. No Truce- No Truce (N,N) is a Nash equilibrium if:

$$P_1 \cdot (I_L - T) > C \text{ and } I_L (P_0 - P_1) > T(1 - P_1)$$

The proof is straightforward: If $P_1 \cdot (I_L - T) > C$ then $I_G - C + P_1 \cdot (I_L - T) > I_G$ so when the rebels choose No Truce the best strategy for the government is No Truce and if $I_L (P_0 - P_1) > T(1 - P_1)$ then $(I_L - T)(1 - P_1) > I_L (1 - P_0)$ when the government chooses No Truce the best strategy for the rebels is No Truce.

Under this setting the possibility of a truce depends on:

- How productive is the guerrilla group in appropriation. Parameters C and P_0
- How productive is the government in defence. Parameters T and (P_0-P_1)
- How wealthy is the representative legal agent. I_L .

These results are similar to those obtained by Hirshleifer (1991, 1994), Skaperdas (1992) y Skaperdas y Syropoulos (1997). However, in our framework the strategy of the guerrilla group depends on the income of legal agents and on the appropriated share and not directly on the income distribution. Therefore, the equilibrium N, N is possible even if $I_G > I_L$.

From now on, we assume that under the initial conditions, and in the absence of additional mechanisms, N,N is a Nash Equilibrium and it is unique, formally,

Assumption 3: $P_0 \cdot I_L > C$

Assumption 4: $P_1 \cdot (I_L - T) > C$

Assumption 5: $I_L(P_0 - P_1) > T(1 - P_1)$

The continuing climate of no-truce, no-negotiation by Armed Revolutionary Forces of Colombia–FARC between 1992 and 1998 fits into the logic of the basic game and is consistent with assumptions 1 to 5.

At that time, the end of the talks of Tlaxcala, 1992), pushed this group into strengthening their armed forces and implementing a violent escalation against the government, the army and civil society. Neither FARC nor the government made suggestions to reinstate talks or a ceasefire.

Following the basic game, FARC was in a situation where the share of income appropriated by them was greater than their operational costs. Basically, FARC managed to increase the number of combatants in their ranks due to the linkage between the guerrillas and the illicit drugs industry, which boosted their resources and made a strategy to withdraw from their illegal and illicit activities increasingly difficult to undertake.

In the same way, the government, passing through a troubled institutional situation, did not suggest peace talks. Taking into account their current defence costs and share of income appropriated by the guerrilla group, they had no possibility to change their strategy and got stuck in a no truce strategy.

1. Sertel-Azam-Roemer solution

Assume that a third party, accepted by both players, proposes a re-definition of the game where legal agents can choose to pre-donate a share λ of their income (see Sertel, 1992).⁹ Under this new setting, the game is described as follows,

⁹ Sertel proves that, in many games, pre-donations are a useful mechanism in order to induce the optimum.

Game 2.

		Illegal Armed Group	
		CF	N
Government	CF	$I_L(1-\lambda)$ $I_G + \lambda I_L$	$I_L(1-P_0)(1-\lambda)$ $(I_G-C) + P_0 \cdot I_L + \lambda I_L(1-P_0)$
	N	$(I_L-T)(1-\lambda)$ $I_G + \lambda(I_L-T)$	$(I_L-T)(1-P_1)(1-\lambda)$ $(I_G-C) + P_1 \cdot (I_L-T) + \lambda (I_L-T)(1-P_1)$

PROPOSITION 1: A system of pre-donations induces guerrilla groups to cease fire if

the pre-donated amount is such that $\lambda > \left(1 - \frac{C}{P_0 I_L}\right)$.

The guerrilla group is willing to cease fire if the pre-donated amount in the scenario CF,CF is bigger than the appropriated amount plus the pre-donated amount in the scenario CF,N minus the cost of belligerence, in other words the illegal armed group

is willing to cease fire if $\lambda I_L > P_0 I_L + \lambda I_L(1 - P_0) - C$, rearranging, $\lambda > \left(1 - \frac{C}{P_0 I_L}\right)$.

Similarly, if $\lambda > \left(1 - \frac{C}{P_1(I_L - T)}\right)$ then when the strategy of the government is CF then the best strategy for the guerrilla group is CF.

Assumption 5 implies that $\frac{C}{I_L P_0} < \frac{C}{(I_L - T)P_1}$. Therefore, pre-donations are an

efficient mechanism if $\lambda > \left(1 - \frac{C}{P_0 I_L}\right)$.

PROPOSITION 2: A system of pre-donations is acceptable by legal agents if the pre-

donated amount λ is such that $\frac{T + P_1(I_L - T)}{I_L} > \lambda$.

Legal agents are willing to pre-donate if their equilibrium payoff in the redefined game is better than the equilibrium payoff in the initial game. Formally, if

$I_L(1 - \lambda > (I_L - T)(1 - P_1)$ then legal agents are willing to pre-donate. Rearranging, the condition can be written as follows,

$$T + P_1(I_L - T) > \lambda L.$$

Therefore, the pre-donations mechanisms is convenient for both players if the equilibrium pre-donated amount is lower than the defence costs, T, plus the appropriated amount , $P_1(I_L - T)$.

PROPOSITION 3: $\frac{P_1}{1 - P_1} > P_0(I_L - T)$ is necessary condition for the pre-donation

mechanism to be feasible and effective and $\frac{C}{(1 - P_1)P_0} + T > I_L$ is sufficient condition for the pre-donation mechanism to be feasible and effective.

From propositions 1 and 2 it follows that both players are willing to accept the pre-donations mechanism and choose the strategy CF if the following condition holds

$$T + P_1(I_L - T) > \left(I_L - \frac{C}{P_0} \right)$$

Rearranging,

$$(8) C > (1 - P_1)P_0(I_L - T)$$

Note that if in game 1 the income of illegal armed group in scenario CF,CF is bigger than their income in scenario N,N then condition 8 always hold. Indeed,

$$1. \text{ If } (I_G - C) + P_1(I_L - T) < I_G \text{ then } P_1(I_L - T) < C$$

$$2. P_1 < P_0 \text{ implies } P_0(I_L - T) < C$$

From 1 and 2 it follows that if $(I_G - C) + P_1(I_L - T) < I_G$ then $C > (1 - P_1)P_0(I_L - T)$

Now, if in game 1 the income of illegal armed group in scenario CF,CF is lower than their income in scenario N,N the condition 8 holds if

$$P_1(I_L - T) > C > (1 - P_1)P_0(I_L - T)$$

Therefore, $\frac{P_1}{1 - P_1} > P_0(I_L - T)$ is necessary condition for the pre-donation mechanism to be feasible and effective and $\frac{C}{(1 - P_1)P_0} + T > I_L$ is sufficient condition for the pre-donation mechanism to be feasible and effective.

Summarizing, the success of a pre-donations system depends on the costs of the conflict, C and T, compared to the income of legal agents, I_L .

In other words, for any conflict involving high costs there is a distributive mechanism, acceptable for both parties, such that, the best strategy for both parties is Cease-Fire. This result is similar to those obtained by Azam (1995) and Roemer (1998), under different settings.

Now, the Sertel-Azam-Roemer solution is a change in the bargaining problem, where the agents have the possibility to make transfers before the bargain is reached. Following Sertel (1992), we will assume that the pre-donations are not only monetary but can also be non-monetary.

The case of government negotiation with the –United Self Defence Forces of Colombia- AUC- in 2003, shows a pre-donation that reshaped the bargaining among groups and clearly presented a transfer between them. There were two types of pre-donations:

- a. Pre-donation that increases the share of income appropriated by the illegal armed group –AUC- through an income (salary) if they demobilize. This income is given individually to ex AUC members replacing cost of operation.
- b. Pre-donation that increases the share of income appropriated by leaders of the illegal armed group – AUC – through judicial benefits coming from the promise and credibility of the future peace negotiation.

Both pre-donations fit into the model as they happen before the negotiation and are a condition to the cease fire and initiate peace talks.

With Uribe's election in 2002, the AUC began to reshape their armed strategy. They reduced the scale of violence, going from massacres to selective assassinations. On December 1, about 4 months after president Uribe took office, the leader of AUC declared a ceasefire and the government announced the initiation of contacts to negotiate demobilization.

The pre-donation was the share of income product of a specific judiciary framework. On the one hand, the government, as part of the legal group, offered a framework that relaxed the existing laws and sentences to major crimes¹⁰. The AUC was expecting to obtain a blanket pardon for major drug traffickers inside the AUC, to secure amnesty for past massacres and violence, and to legalize their growing economic involvement in the agricultural sector.

As a result of a pre-donation scheme, demobilization was reached and almost 15 thousand combatants have been demobilized since 2003.

Another case that fits in this framework is the successful negotiation with three illegal armed groups during the late eighties. At that time, president Barco (1986-1990), offered a specific unilateral peace proposal in exchange for the demobilization of guerrilla groups. The M-19 entered negotiation with two aims: amnesty and political inclusion. In 1989, the M-19 demobilized and gave birth to a new political party, the Democratic Alliance M-19, with reasonable popular support.

As a result of the negotiated settlement with M-19, President Gaviria (1990-1994), initiated talks with other small groups that subsequently demobilized: the People's Liberation Army (EPL), the Quintín Lame, and the Revolutionary Workers' Party (PRT). During this time two events set the stage for demobilization: a successful peace accord with the M-19, and elections for the National Constituent Assembly (in order to write the new political constitution). The M-19 accord was a unique peace agreement signed in Colombia because it opened a new perspective for combatants, realizing the possibilities of amnesty and reincorporation into civil

¹⁰ Law of Peace and Justice in June 2005. This law has been deeply criticized (Amnesty International, Human Right Watch, domestic human rights NGOs scholars and civil society among others) because it significantly reduces criminal sentences associated with massacres, human rights violations, kidnappings and terrorist activities (from twenty years to around five to eight years of prison terms). In addition, the law does not include the obligation to reveal the truth associated with past illegal actions: there is no requirement for combatants to confess their war crimes or reveal any existing connection with civilians or politicians.

society. The election for a National Constituent Assembly election provided former combatants with the opportunity to be co-authors of an inclusive constitution, and fight for their interests in the democratic arena.

V. Extending the game

The results presented in the previous section suggest a first step in order to solve conflicts. However, some times reality can be more complex for a number of reasons: first, perceptions about relative military power, P_1 and P_0 , can be different for illegal armed groups and legal agents; second, military expenditure and appropriated share; and third, agents within groups are very often heterogeneous. In this section we extend our framework in order to deal with some of these limitations.

1. Different perceptions

In order to model different perceptions we need to introduce some new concepts. These concepts are defined as follows.

Definitions:

P_{0G} : Illegal armed group perception about the share of income appropriated by illegal armed groups when the government does not invest in defence.

P_{1G} : Illegal armed group perception about the share of income appropriated by illegal armed groups when the government invests in defence.

P_{0L} : Government perception about the share of income appropriated by illegal armed group groups when the government does not invest in defence.

P_{1L} : Government perception about the share of income appropriated by illegal armed groups when the government invests in defence.

Given that, perceptions are different the game played by illegal armed group is different from the game played by the government:

Game3A.

		Illegal armed group	
		CF	N
	CF	$I_L(1-\lambda)$	$I_L(1-P_{0G})(1-\lambda)$
		$I_G+\lambda I_L$	$(I_G-C)+P_{0G}.I_L+\lambda I_L(1-P_0)$

Government	N	$(I_L - T)(1 - \lambda)$ $I_G + \lambda(I_L - T)$	$(I_L - T)(1 - P_{1G})(1 - \lambda)$ $(I_G - C) + P_{1G} \cdot (I_L - T) + \lambda(I_L - T)(1 - P_{1L})$
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Game 3B.

		Illegal armed group	
		CF	N
Government	CF	$I_L(1 - \lambda)$ $I_G + \lambda I_L$	$I_L(1 - P_{0L})(1 - \lambda)$ $(I_G - C) + P_{0L} \cdot I_L + \lambda I_L(1 - P_{0L})$
	N	$(I_L - T)(1 - \lambda)$ $I_G + \lambda(I_L - T)$	$(I_L - T)(1 - P_{1L})(1 - \lambda)$ $(I_G - C) + P_{1L} \cdot (I_L - T) + \lambda(I_L - T)(1 - P_{1L})$

Even though illegal armed group and government are the parties in conflict, they are playing different games. Illegal armed group plays Game 3A while the government plays Game 3B. The only difference between these two games is the perception about the share of income appropriated by guerrilla groups.

The different perception about the strength of the two parties reduces the possibilities of an agreement because the set of acceptable pre-donations schemes is reduced. This result is formally presented in propositions 4 and 5.

PROPOSITION 4: $C > (1 - P_{L1})P_{0G}(I_L - T)$ is sufficient condition for the pre-donation mechanism to be feasible and effective.

Following the same reasoning we use in section 1, we find the conditions for CF, CF to be an equilibrium.

Illegal armed groups are willing to Cease Fire if $\lambda > \left(1 - \frac{C}{P_{0G}I_L}\right)$ and legal agents are willing to pre-donate if $T + P_{1L}(I_L - T) > \lambda I_L$. Therefore, it is possible to find a pre-donations system acceptable for both parties if,

$$(9) C > (1 - P_{L1})P_{0G}(I_L - T)$$

Condition 9 is more restrictive than condition 8 because $P_{0G} > P_{0L}$ and $P_{1G} < P_{1L}$. Thus, even if there are “objective conditions” for a pre-donations system to

generate the equilibrium CF,CF, different perceptions can tear down the usefulness of the mechanism.

The situation described above, shows that opponent groups have no incentives to stop the conflict unilaterally unless they receive an enormous pre-donation not acceptable for the rival group. This can be the case of Armed Revolutionary Forces of Colombia – FARC and the army in the late nineties and early 2000, during the peace negotiation process.

At that time, the government was very confident about the possibility of reaching an accord. They offered a non-monetary pre-donation to the FARC of territorial control (a demilitarized zone), a negotiation scheme in the midst of war and legal guarantees. By contrast, the FARC offered to free 350 kidnapped policemen and to discuss and analyse their proposed political agenda.

Contacts between FARC and then candidate Andres Pastrana took place in 1998 during the presidential campaign¹¹. Once the Pastrana government was in office, the parties established the conditions to initiate negotiations. During the negotiation process, there was a perception that the government conceded too much without demanding anything. The FARC demanded the demilitarisation of a region of Colombia [a 42,000 square kilometre area¹²], known as *Zona de Distension* (demilitarised zone), to remove some officers from the military, to crack down on the paramilitaries, all in the midst of war, that is to say they did not agree to a ceasefire during the negotiation period.

On 9 January 1999 the peace dialogues were officially inaugurated. However, since the beginning, Manuel Marulanda, the top leader of FARC, made clear that his movement had more to demand than to offer. On the day the talks were inaugurated he was absent from the official ceremony, leaving the president sitting next to an empty chair.

¹¹ The candidate Andrés Pastrana had several secret meetings with the guerrilla leader, Manuel Marulanda after which he showed his willingness to negotiate with FARC.

¹² 3.67% of the Colombian territory, an area almost the size of Switzerland and the largest area in hands of FARC ever since.

The negotiation agenda¹³ shows the parties interest on the talks. Talks started after defining this agenda and the bargaining began with the fifth point (economic and social structure), specifically economic reforms concerning unemployment. During the following three years, the negotiation stuck on the same point without obtaining an agreement or moving to another point.

The talk has severe problems from the beginning. FARC showed their unwillingness to bargain and presented them in a too strong way so that the government had to fulfil their demands if seeking to negotiate. They suspended the talks three times and pushed the government to maintain and extend the deadline of the demilitarised zone without a counterpart commitment. Pastrana's government tried to keep the talks going at any price, satisfying almost all guerrilla demands without achieving any agreement.

In addition, the approval of the *Plan Colombia*¹⁴ opened the gap between parties and further diminished the weak confidence-building among them. According to FARC, the *Plan Colombia* contradicted the government position. They suggested that on the one hand, government had a willingness for peace while, on the other hand, it followed a "peace diplomacy" aimed at strengthening the armed forces and the fight against drug traffickers.

In terms of the agenda, there was no achievement. By contrast, an implicit outcome of this fruitless peace negotiation was the shared belief of the unfeasibility of negotiating in the midst of war. Public opinion saw guerrilla attacks and violence as cynical behaviour of FARC toward the talks. AUC took advantage of the failed peace process and learned from it.

¹³ The agenda "A Common Agenda for Change Toward a New Colombia" contained the following points: 1. Negotiated Political Solutions; 2. Protection of Human Rights Is a Responsibility of the State; 3. Integral Agrarian Policies; 4. Exploitation and Conservation of Natural Resources; 5. Economic and Social Structure; 6. Justice Reforms the Fight Against Corruption and Drug-Trafficking; 7. Political Reform and the Expansion of Democracy; 8. Reform of the State Agreements on International Humanitarian Law; Armed Forces International Relations Formalizing Agreements Signed 6 May 1999 in La Machaca, (Demilitarised Zone).

¹⁴ In 2000, after several meeting the U.S Congress approved \$1.3 billion to support of Plan Colombia. Of that, \$911 million was to reinforce the war against the drug (aerial fumigation, destruction of coca labs and military training and strengthening), \$106 million to support alternative programs and the remaining \$302 million to human rights and justice. Behind the logic of the Plan Colombia, there is an idea that guerrilla are major drug trafficking dealers, so by eliminating the drug trafficking Colombia will achieve two goals, end of illicit traffic and a victory over the guerrilla.

Neither FARC nor AUC presented a hurting stalemate with the Armed Force. During the negotiation with FARC, there was a fluctuating stalemate or negotiation deadlock where the state could not defeat the guerrillas and the guerrillas could not achieve victory.

According to Zartman, the failure of negotiation highlights his hypothesis that incentives can only be “effective when parties are sufficient dissatisfied with their present costs” (Zartman 2001, 301). Talks with FARC showed that they were not damaged enough and were not sufficiently pessimistic about the future to attend to incentives from the dialogue process. In the same direction, Rangel (2003) suggests that FARC has greater incentives for staying at war than for signing an accord because they do not feel militarily powerless. This view, matches Zartman`s idea: FARC saw their negotiation position as a way to strengthen their military power instead of listening to offers of incentives.

In that sense, the situation described above fits into the logic of the extending game with different perceptions. Neither FARC nor the army reach a truce and a negotiation, because, on the one hand, FARC was demanding too much and was unwilling to give and on the other hand, the government had a wrong perception about the willingness of the FARC and was expecting an agreement.

2. Military Expenditure and Appropriated Share.

Until now, we have assumed that military expenditures, C and T, do not affect military power P_0 : and P_1 . However, this assumption is not realistic and it is reasonable to assume that the appropriated share positively depends on the expenditure made by illegal armed group and negatively on the expenditure made by the government, that is,

$$P_0 = F(C) \text{ where } F_C(.) \geq 0$$

$$P_1 = G(C,T) \text{ where } G_C(.) \geq 0, G_T(.) \leq 0$$

In other words the strength of the parties depends on the money invested in weapons, military organization, etc.

Under these circumstances, condition 8 reads,

$$C > (1 - G(C,T))F(C)(I_L - T)$$

Rearranging,

$$(10) C - (1 - G(C, T))F(C)(I_L - T) > 0$$

The relation between the left hand side of equation 10 and the expenditure made by the parties is not evident. Moreover, the relation can be characterized by non-linearities. In order to explore this possibility, in the following lines we characterize the behavior of the left hand side of equation 10.

Define: $\Omega(C, T) = C - (1 - G(C, T))F(C)(I_L - T)$

Now, derive with respect to T,

$$(11) \Omega_T(C, T) = G_T(.)F(C)(I_L - T) < 0$$

Therefore, any increase in the military expenditure made by the government T increases the LFS of equation 10. In other words, by increasing T, the government may generate the conditions for a pre-donations scheme to be acceptable for both parties. On the one hand by investing more the government increases the costs of the conflict and, on the other hand, the increase in military expenditures reduces the appropriated share and, for this reason, increases the incentives to negotiate for guerrilla groups.

Guerrilla groups may also invest some money in order to get a better deal. To see effect of an increase in the military expenditure made by the rebels derive the function $\Omega(C, T)$ with respect to C,

$$(12) \Omega_C(C, T) = 1 + (G_C(.)F(.) - (1 - G(.))F_C(.))(I_L - T)$$

Note that $\Omega_C(C, T)$ can be positive or negative:

If $\frac{F(.)}{1 - G(.)} \geq \frac{F_C(.)}{G_C(.)}$ or $I_L - T < \frac{1}{(1 - G(.))F_C(.) - G_C(.)F(.)}$ then $\Omega_C(C, T) > 0$ and any

increase in the military expenditure made by illegal armed group increases the LFS of equation 10.

If $\frac{F(.)}{1-G(.)} < \frac{F_c(.)}{G_c(.)}$ and $I_L - T > \frac{1}{(1-G(.))F_c(.) - G_c(.)F(.)}$ then $\Omega_c(C,T) < 0$ and any

increase in the military expenditure made by illegal armed group decreases the LFS of equation 10.

In this case, an increase in C generates an augment in the costs of conflict disbursed by the legal agents and, for this reason, the incentive to negotiate become bigger for legal agents. Now, for the illegal armed groups the effect can be ambiguous. On one hand, the cost that they pay grows so they have more incentives to negotiate. However, as the appropriated share increases the illegal armed group's income grows, so the incentive to negotiate decreases.

What is the dominant effect? It depends on the shape of the functions $F(.)$ and $G(.)$, and on the initial conditions.

Consider the case where $F_{cc}(.), G_{cc}(.), < 0$ and $F_c(.) \geq G_c(.)$

If under the initial conditions C is small as well as the appropriated

then $\frac{F(.)}{1-G(.)} \geq \frac{F_c(.)}{G_c(.)}$ so by increasing C the guerillas may generate conditions for a pre-donations scheme to be acceptable for both parties.

Now, if under the initial conditions C is big as well as the appropriated then

$\frac{F(.)}{1-G(.)} < \frac{F_c(.)}{G_c(.)}$. If additionally the income of legal agents is big, that is

$I_L - T > \frac{1}{(1-G(.))F_c(.) - G_c(.)F(.)}$, then by increasing C the guerillas reduce the

possibility for a pre-donations scheme to be acceptable for both parties.

In other words, if the costs of conflict are consuming a big share of the income of legal agents, then by increasing their military power, illegal armed groups may force the government to accept a pre-donations scheme and cease fire.

We summarize these results in proposition 5, 6 and 7:

PROPOSITION 5: If $F_c(.) \geq 0$, $G_c(.) \geq 0$ and $G_T(.) \leq 0$ then by increasing T, the government may generate the conditions for a pre-donations scheme to be acceptable for both parties.

PROPOSITION 6: If $F_c(.) \geq 0$, $G_c(.) \geq 0$ and $G_T(.) \leq 0$ and under the initial conditions

$$\frac{F(.)}{1-G(.)} \geq \frac{F_c(.)}{G_c(.)} \text{ or } I_L - T < \frac{1}{(1-G(.))F_c(.) - G_c(.)F(.)} \text{ then:}$$

(a) By increasing T, the government may generate the conditions for a pre-donations scheme to be acceptable for both parties.

(b) By increasing C, the guerillas may generate the conditions for a pre-donations scheme to be acceptable for both parties.

These results suggest that a war escalation can be an optimal strategy, for the parties, in order to increase the chances of a pre-donations scheme acceptable for both parties.

3. Military Expenditure Appropriated Share and Asymmetric information in repeated games.

Until now, we have modeled the problem as a one shot game and we treated separately the information problems and the link between military expenditures and appropriated shares. However, it can be argued that both the military conflict and the negotiation process are characterized by consecutive movements, actions and reactions. Additionally, in a repeated game, the strategy of both players gives information about their actual perceptions and, for this reason, the strategies of both parties may change with time as well as the equilibrium of the game.

Admittedly, in order to approach these problems in a formal way we would need a broader theoretical framework. However, using the tools we have, we can provide an example that illustrates the importance of the interactions between time and information.

Suppose that the government observes the initial level of C (C_0) and has a perception about the share of income appropriated by guerrilla groups when the government does not invest in defence P_{0L} . Suppose also that, given the priors of

the government, there exists a pre-donations scheme, λ , such that when the government does not invest in defence, the pre-donation scheme is acceptable for both parties, that is,

$$(14) C_0 - (1 - G(C_0, 0))P_{0L} (I_L - T) > 0$$

In such circumstances, the best strategy for the government is Cease-Fire. However, if $P_{0G} > P_{0L}$, it can be the case that

$$(15) C_0 - (1 - G(C_0, 0))P_{0G} (I_L - T) < 0$$

If inequality 15 holds as well as the conditions in proposition 6 then illegal armed group respond increasing military expenditure and, as a result, illegal armed group become stronger, the appropriated share bigger and there is no room for negotiation.

The following period, both players can revise their priors and change their strategy. From proposition 5 it follows that the government chooses to increase T . Finally, from proposition 6 it follows that the increase in T increases the likelihood of a negotiation.

The breakup of negotiations with FARC in 2001, added to an atmosphere of insecurity, while the urgency of military actions against guerrillas groups was the main theme of discussion during the 2002 presidential electoral campaign. President Uribe won the 2002 elections defending a military and security agenda against illegal armed groups. His agenda of so-called “democratic security” includes an important growth of military expenditure financed through a tax on wealth (democratic security tax). This tax allowed the government to finance the “plan de choque”, that is, the increase in troop numbers, special rapid deployment units, mountain-warfare battalions and urban special forces. The Democratic Security strategy increased military expenditure in 1.3 additional points, reaching 5.7% of GDP in 2008. In addition, the number of troops increased by 28% (these included anti-guerrilla troops as well as policemen sent to police outposts in isolated regions, to complete the territorial presence of the armed forces all over the country.

This military expenditure has been followed by significant changes in statistics for kidnappings, from 3.572 in 2000 to 521 in 2007; massacres (from 236 to 26 in 2007); attacks against pipelines and terrorist assaults against towns (from 1549 to 387 in 2007). In addition, armed forces operational results show an increase in ammunition, weaponry and communication equipment seized; rebels captured and killed. In the same perspective, demobilization of FARC rebels has risen by 460% since 2002.¹⁵

Following the theoretical framework it will be expected that increasing military expenditures have an effect on FARC's armed strategy. FARC has been significantly affected, moving from mostly offensive actions to a movement back into its strategic rear guard. If the situation continues along this path, it may be expected that in the near future the FARC decides to negotiate instead of seeking their goals as an armed force.

4. Heterogeneity within groups

Guerrilla groups are often heterogeneous. In particular, income distribution can be unequal in such groups. In this is the case, a successful pre-donations system must take into account the differences among members. However, if income is the only source of heterogeneity then a successful pre-donations scheme can be easily adapted in such a way that it is acceptable for every single rebel.

Define the set of illegal armed group $I = 1,2,3...N$ and call β_i the share the groups' income that goes to guerrilla i .

PROPOSITION 8: If within the guerrilla group each agent i receives a share β_i of the total income of the group and there exists a pre-donations scheme λ acceptable for the group, then a pre-donations scheme where each and every illegal armed group received a share $\lambda \beta_i$ of the income of legal agents, is acceptable for each and every single rebel.

¹⁵ Source: Ministerio de Defensa (2008) Estadísticas de Resultados de operaciones de la fuerza pública contra terrorismo, violencia y criminalidad. In: http://www.mindefensa.gov.co/descargas2/anexos/2644_Avance_de_la_Politica_de_Defensa_y_Seguridad_ingles.pdf

The proof is straight forward. The game each guerrilla faces is just a lineal transformation of game 2.

Now, if there are more sources of Heterogeneity the problem becomes more complicated. For instance, if the hierarchies and the distribution of power within groups are based on military skills then, after a peace agreement, some of the current leaders would lose power. In this case the incentives to negotiate are also heterogeneous and any effective pre-donations scheme would be so complicated that it wouldn't be implementable. Admittedly, this is an important issue and the framework we develop in this paper is not adequate to analyze this problem.

VI Conclusions

We study economic conflicts using a game theoretical approach. We model a conflict between two parties where each one has two possible strategies: cease-fire or neglect the truce. Under this setting, we use the concept of pre-donations, namely, a redefinition of the game where agents commit to transfer a share of their output to the other agent (Sertel, 1992), and explain under which conditions a system of pre-donations can facilitate a truce. We find that for conflicts involving high costs there is a distributive mechanism, acceptable for both parties, such that, the best strategy for both parties is Cease-Fire.

We also find that the different perception about the strength of the two parties reduces the possibilities of an agreement because the set of acceptable pre-donations scheme is reduced. However, if the costs of conflict are consuming a big share of the income of legal agents, then by increasing their military power illegal armed groups may force the government to accept a pre-donations scheme and cease fire. Similarly, by increasing defense expenditures the government may change the conditions of the game and increase the possibility of a cease-fire. Of course, the conditions of the post conflict arrangement would depend on the relative strength of the parties, that is, by increasing military power the parties increase bargaining power.

These results suggest that a war escalation can be an optimal strategy, for the parties, in order to increase the chances of a pre-donations scheme acceptable for both parties.

Finally, we illustrate the relevance of the described results with historical episodes of the Colombian conflict. In particular, we refer to the attempts at negotiation between the government and FARC, as well as talks and peace processes with M-19, EPL and AUC.

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