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# The Role of Mediation in Peacemaking and Peacekeeping Negotiations

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# The Role of Mediation in Peacemaking and Peacekeeping Negotiations*

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**Abstract**

We develop a model of bargaining that provides a rationale for the difference in the method of negotiation, depending on the nature of the conflict. We distinguish those negotiations that take place previous to a potential conflict (peacekeeping), and negotiations inside the conflict (peacemaking). In these contexts, we study the role of a mediator that tries to achieve a certain balance between the efficiency of the agreement and the equality of the sharing. We show that the credibility of the mediator comes from her willingness to impose delays in the negotiation, even if that implies costs. We also find how the "weak" player in the conflict can strategically profit from the mediator's quest for equality. Finally, we show how the capacity of the mediator to induce a higher equality in the sharing is always higher in a peacemaking situation than in a peacekeeping one.

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# 1 Introduction

There is a crucial feature in many real-life economic negotiations that is still poorly understood by the literature on bargaining and conflict resolution: the role played by arbitrators and mediators in negotiation processes. The importance of these professional negotiators is clear. In most international negotiations, the United Nations (UN) sends a group of diplomats (supervised by a main negotiator) whose aim is to help the parties involved in the conflict to achieve a successful agreement. In other domains, such as domestic conflicts caused by damaging strikes, the legislation usually allows governments to impose an arbitrator to the parties.[1]

The purpose of this paper is to provide a first step in the analysis of mediators in conflicts using a game-theoretical approach. We focus on mediators that have the capacity to strategically intervene in a conflict or negotiation, contrary to arbitrators that impose an agreement to the parties involved in the negotiation.[2] In our framework, the mediator does not benefit from transfers of the parties involved in the conflict, and her intervention is driven by her interest in achieving a certain balance between the efficiency and the equality of the final agreement. Moreover, her mediation activity is not conducted through the promise of monetary transfers to the parties, but through her capacity to alter the way in which negotiations are conducted by threatening the parties with the blockage of proposals that she considers as "unacceptable". Behaving in this way, the mediator is able to alter the strategic incentives in the negotiation. In particular, the mediator can choose between allowing the agents involved in the (potential) conflict to conduct direct (face-to-face) negotiations, or forcing them to undertake indirect (mediated) negotiations. In face-to-face negotiations, the two parties confront each other in a typical Rubinstein way (see Rubinstein (1982)). In mediated negotiations, the offers of the parties go through the mediator, who decides whether to convey them to the other party, or not.

In spite of its importance, and as far as we are aware, the literature on Bargaining has seldom approached the role of these negotiators, and has essentially done it by treating them as passive agents with an exogenously predetermined role. On the one hand, the approach followed by Compte and Jehiel (1995) and Manzini and Mariotti (2001), analyzes the role of arbitrators as pre-fixed outside options of the bargaining process. On the other hand, Jarque, et al. (2003) and Copic and Ponsatí (2003) study mediators as information filters in a context of two-sided asymmetric information. In these cases, the role of the mediators is to make the agreement public as soon as the parties have made mutually acceptable offers. An exception to these approaches are the works by Ponsatí (2001) and Manzini and Ponsatí (2002), in which third-parties take strategic decisions that may affect the negotiation process. In their models, these parties are stake-holders (agents indirectly affected by the outcome of the bargaining process), and they

[1] For an example of this arbitration, see the strike in the Spanish Airline IBERIA in July 2001, that was ended after a compulsory arbitration process imposed by the Spanish Government.

[2] See Muthoo (1999) for an explanation of the difference between arbitrators and mediators

intervene in the negotiation through the promise of monetary transfers to the contenders in order to ease the termination of the conflict.

Another important issue of this paper is that it allows us to analyze and compare the role of the mediators in situations of different nature, where the two parties negotiate to share a fixed surplus. Often, a distinction is made between *peacekeeping* negotiations (pre-conflict) and *peacemaking* negotiations (in-conflict). This distinction is common in war conflicts (*peacekeeping* versus *peacemaking*), but also in labor conflicts (*before strike* versus *in-strike*). The former, corresponds to situations in which the negotiation tries to achieve an agreement that avoids the declaration of a potential conflict. In the latter, the conflict has already started, and the aim of the negotiation process is to find a way to stop it. In this case, each player suffers a cost of conflict each period until an agreement is reached.[3]

The following quotation from an interview with Françesc Vendrell (former UN-Secretary General's Personal Representative for Afghanistan, a UN negotiator with more than 30 years of experience in international conflicts) can help us to illustrate the important link between the way in which negotiations are conducted, and the nature of the conflict and, therefore, to highlight the relevance of the approach proposed in this article:[4]

> "I would rather negotiate pendularly with each party, than with both sides face-to-face. (.....) I am talking about negotiation processes to conquer the peace, *peace-making*, (.....) in which there is a primacy of rounds of contacts over multilateral meetings. This is different to what happens with *peacekeeping* negotiations."

The aim of the paper is, in short, to propose a model of bargaining under complete information that is able to provide insights about the effects that a mediator can have on the outcome of a negotiation, distinguishing *peacemaking* from *peacekeeping* negotiations.

We obtain interesting results showing that, even in a perfect information setting, the introduction of the mediator can alter substantially the outcome of the negotiation. We find important differences in the mediator's intervention depending on the environment of the negotiation. In a peacemaking scenario we show that, even if the mediator is willing to completely sacrifice efficiency in order to achieve a higher equality, she is not able to induce a fully egalitarian sharing. The reason for this is that the mediator's capacity to influence the players is undermined by the existence of a conflict, that generates a flow of damages for the players in an uneven way. We also prove that, in this case, more equality can be achieved by giving the initiative in the negotiation process to the ex-ante strong player (in contrast with what happens

[3] For an analysis of mechanism design problem that explicitly distinguishes among these two alternative environments see Porteiro (2007).

[4] This inteview appeared in the magazine "El País Semanal" (number 1.318, $30^{th}$ December 2001).

in unmediated bargaining processes). If the mediator gives the first mover's advantage to the weak player, this agent will strategically use in his favor the higher costs that the continuation of the conflict implies for him.

When moving to a peacekeeping scenario, the position of the mediator, rather than improving, worsens. In these situations, the conflict is only a potential outcome of the process, and the agents will strategically threaten the mediator with the option of declaring the conflict, and moving to a peacemaking scenario. At equilibrium, the players link the non-acceptance of their offers to the start of the conflict, and this severely undermines the mediator's capacity to increase the egalitarianism of the final agreement. In particular, we show that, in peacekeeping negotiations, the intervention of the mediator is unable to induce a more egalitarian sharing than in face-to-face negotiations. As a conclusion from the analysis of the two different scenarios, we observe that the capacity of the mediator to induce more egalitarian agreements is always higher in peacemaking negotiations.

The paper is organized as follows: in Section 2 we introduce the economic environment and the model. Section 3 analyzes the *peacemaking* situation, that is, the mediation activity when the conflict has already started, and in Section 4 we study the *peacekeeping* scenario, which corresponds to a situation prior to a potential conflict. Section 5 concludes and comments on possible extensions. We provide an Appendix in Section 6.

## 2 The Economic Environment

We model negotiations between two parties in the presence of a potential conflict. The players bargain *à la Rubinstein,* under complete information, over the division of a fixed surplus with value $s \in \mathbb{R}_+$ and with homogeneous discount factor $\delta \in (0,1)$. Time runs in discrete periods of equal length, numbered by the natural numbers.

There are two types of negotiations that differ in the timing of the bargaining process with respect to the conflict: *peacemaking* and *peacekeeping* negotiations. In peacemaking processes, the conflict has already started. The negotiation takes place inside the conflict and the players bargain to try to stop it. In this case, the agents suffer a cost of conflict each period. The cost suffered by player $i$ each period of conflict is $(1-\delta)c_i$. This cost is normalized so that the discounted cost of being in continuous conflict is $c_i > 0$ $(i = 1, 2)$. To simplify, we suppose that $c_1 = c > c_2 = 0$. Hereinafter we will denote the agent who suffer the cost of conflict (i.e., agent 1) as the "weak" player and agent 2 as the "strong" player.

We also assume that $s > c$. This means that the conflict does not destroy the whole surplus that can be divided among the two players.[5]

[5]Note that this assumption is stronger than the necessary condition to reach an agreement, that, in this case, is $s > -c$.

In peacekeeping negotiations, the objective of the bargaining process is to divide the surplus $s$ between the parties, and to avoid the declaration of the conflict. Since the conflict has not already started, neither player suffers a cost of conflict each period. In the bargaining process, each player has the option of breaking up the negotiations and move to the conflict. In case of opting out, negotiations will continue in a peacemaking environment.

The objective of this paper is to analyze the role of mediation in these negotiations processes. We study mediators that have the capacity to strategically intervene in the conflict in the following sense: the mediator can choose between allowing the agents involved in the conflict to conduct *direct negotiations*, or forcing them to undertake *indirect negotiations*. In direct (face-to-face) negotiations, the players bargain *à la Rubinstein* and the only role of the mediator is to choose who is the player that has the right to start the negotiation process. In indirect (mediated) negotiations, the mediator takes an active role in the process, by deciding whether to submit an offer to the other party or not. The game is as follows: at any stage, the mediator meets with the party that has the right to make a proposal. This player makes a proposal to the mediator, who decides whether or not to submit this proposal to the other player. If the player receives the proposal, he can either accept it or reject it. If he accepts, the game ends. If he rejects, or if he does not receive the proposal, he has the right to make a counter-proposal to the mediator at the following stage, and so on. In this game, if the mediator can credibly commit not to submit a proposal (that, if submitted, would be accepted), then she will be able to alter the outcome of the bargaining process. The credibility of the threats depends crucially on the preferences of the mediator. Her main trade-off is equality versus efficiency. In terms of efficiency, the best the mediator can do is not to block any proposal that, if submitted, would be accepted. If the mediator wants to affect the final sharing, that is, to increase the equality by reducing the first mover advantage of the initial proposer, she has to credibly threaten with "blocking" proposals, even if this implies (out of equilibrium) a delay in the agreement.

In this work we propose to represent the solution of the equality-efficiency trade-off of the mediator through a parameter $\alpha \in \mathbb{R}_+$. This value measures the mediator's willingness to sacrifice joint surplus in order to achieve a greater equality. Formally, we define the preferences of the mediator as follows.

**Definition 1** *Consider two vectors of payoffs for players $i$ and $j$, $(P_i, P_j)$ and $(P'_i, P'_j)$. A type-$\alpha$ mediator, $m(\alpha)$, (weakly) prefers the first vector of payoffs to the second one, if and only if:*

$$\left|P'_i - P'_j\right| - \left|P_i - P_j\right| \geq \frac{1}{\alpha}\left[(P'_i + P'_j) - (P_i + P_j)\right], \text{ with } \alpha \in \mathbb{R}_+.$$

The left-hand side of this expression denotes how much more egalitarian is $(P_i, P_j)$ with respect to $(P'_i, P'_j)$, and the right-hand side expresses how much more efficient is $(P'_i, P'_j)$ with respect to $(P_i, P_j)$. This construction allows for two extreme cases:

- $\alpha \to +\infty$ : Equality-seeking mediator. A sharing is preferred whenever is more egalitarian.
- $\alpha \to 0$ : Efficiency-seeking mediator. She selects the most egalitarian sharing, but only among those that are equally efficient.

  Moreover, it allows for intermediate situations where the mediator is willing to sacrifice *some* efficiency, in order to achieve a higher equality.

To understand better the role of the mediator, take the following example from an international conflict:

*Consider a conflict between two countries. One of the countries has a very poor army and its civilian population is likely to suffer greatly if the conflict is triggered (to be consistent with notation, we denote it as country 1). The other country, on the contrary, has a very powerful army and will bear much less the consequences of the conflict (country 2). In this setting, in the absence of a mediator, it is clear that the position of country 1 is very weak and that this weakness will be reflected in the eventual solution of the conflict.*

*Consider now what happens when a mediator (i.e., an international arbitrator) steps in. If it is common knowledge that this mediator will search for an balanced solution, does this alter the strategic behaviour of the parties in conflict?*

In the following sections, we answer this question by analyzing independently the two different scenarios: *peacemaking* and *peacekeeping*.

# 3 In-conflict Negotiations (*Peacemaking*)

The players are in a **peacemaking** setting, that is, the negotiation takes place inside the conflict. This implies that each player suffers a stream of costs while the negotiation takes place.

## 3.1 Direct (face-to-face) Negotiations

The role of the mediator is to choose, in an initial stage of the negotiation, which of the two players has the right to start the negotiation.

Denote the player who starts the negotiation as player $i$. In even (odd) periods player $i$ (player $j$) makes an offer. The other party may accept, thus terminating the game with agreement at the proposed shares. If he rejects, bargaining goes on to the next round. Each period until an agreement is reached, agent 1 suffers a cost $(1-\delta)c$ and agent 2 a cost of 0.

**Proposition 1** *For any $c \in \mathbb{R}_+$ and $\delta \in (0,1)$, there exists a unique subgame perfect equilibrium (SPE) of the game where agent* 1 *starts the negotiation. The payoffs, $P_1^*$ and $P_2^*$, for agent* 1 *and* 2 *at equilibrium are:*

$$P_1^* = \frac{s - \delta c}{1+\delta},\ P_2^* = \frac{\delta(s+c)}{1+\delta}.$$

*For the game where agent* 2 *starts the negotiation, the unique subgame perfect equilibrium payoffs,* $P_1'$ *and* $P_2'$*, are:*

$$P_1' = \frac{\delta s - c}{1+\delta},\ P_2' = \frac{s+c}{1+\delta}.$$

**Proof.** See Fudenberg and Tirole (1996). ■

Now we come to analyze the difference in payoffs between the two players and the decision of the mediator of choosing who starts the negotiation. The following corollary follows directly from the previous proposition:

**Corollary 1** *The SPE sharing has the following distributional properties:*

- *If the "strong" player (agent* 2*) starts the negotiation, then he receives a bigger share than the "weak" player (agent* 1*).*
- *If the "weak" player (agent* 1*) starts the negotiation, then he receives a bigger share than the "strong" player (agent* 2*) if and only if*

$$\frac{s}{c} > \frac{2\delta}{1-\delta}.$$

This Corollary highlights the trade-off faced by the "weak" player. The fact that he bears higher conflict costs ($c > 0$) gives him a worse bargaining position with respect to the "strong" player, but the first-mover advantage is beneficial for him. The effect that dominates is determined by the value of the parameters of the model. If the overall size of the surplus to share is relatively high with respect to the conflict cost, then the positive effect associated with having the initiative in the negotiation dominates, and gives agent 1 a higher payoff in the final sharing.

**Proposition 2** *In direct negotiations under peacemaking, the mediator will always choose the "weak" player (agent* 1*) to start the negotiation. Formally,*

$$\left(P_1^{Dpm}, P_2^{Dpm}\right) = \left(P_1^*, P_2^*\right).$$

**Proof.** Direct from Proposition 1. ■

### 3.2 Indirect (mediated) Negotiations

The main difference of this scenario in comparison with the direct (face-to-face) case is the role of the mediator. She meets independently with each party and decides whether or not to submit each player's proposal to the other party.

The process is as follows: at any stage $t$ the mediator meets with the party that has the right to make a proposal (player $i$). This player makes a proposal. Then the mediator decides whether or not to submit this proposal to player $j$. If player $j$ receives the proposal, he can either accept it or reject it. If he accepts, the game ends. If he rejects, or if he does not receive $i's$ proposal, he has the right to make a counter-proposal to the mediator at stage $t+1$, and the process is repeated.

**Characterization of the Equilibrium with Mediator** We first solve the equilibrium for all possible types of mediators, that is, for all the possible values of $\alpha$. Then, we comment on the two extreme cases. We restrict the analysis to stationary strategies.

The following Proposition describes the equilibria of this game. The different equilibrium payoffs for each of the cases are described in the proof of the Proposition that is provided in the Appendix (in the main text we provide a sketch of this proof). We use the following notation:

$$\begin{aligned}\alpha_1 &= \frac{(1+\delta)^2(s+c)}{s(1-\delta^2)-c(1-\delta)^2},\ \alpha_2 = \frac{(1-\delta^2+2\delta)(s+c)}{s(1+\delta^2)-c(1-\delta^2+2\delta)},\\ \alpha_3 &= \frac{\delta^2(s+c)}{\delta s-c},\ \alpha_4 = \frac{(1-\delta^2)(s+c)}{(1-\delta)^2 s+(3+\delta^2)c}.\end{aligned}$$

**Proposition 3** *In indirect negotiations the Stationary Subgame Perfect Equilibrium (SSPE) is characterized as follows:*

- *If* $\alpha \leq \min\{1, \alpha_3\}$, *then the* ***equilibrium is unmediated****.*
- *If* $\alpha \geq \max\{\alpha_1, \alpha_2\}$ *and* $\frac{s}{c} > \frac{1+2\delta-\delta^2}{1+\delta^2}$, *then* ***the equilibrium is fully mediated****.*
- *If* $\alpha \geq 1$ *and* $\frac{s}{c} < \frac{1+2\delta-\delta^2}{1+\delta^2}$, *or* $\max\{1, \alpha_4\} \leq \alpha \leq \max\{\alpha_1, \alpha_2\}$ *and* $\frac{s}{c} > \frac{1+2\delta-\delta^2}{1+\delta^2}$, *then* ***the equilibrium is partially mediated****.*
- *If* $\alpha_3 \leq \alpha \leq \alpha_4$ *and* $\frac{s}{c} > \frac{1+2\delta-\delta^2}{1+\delta^2}$, *then the* ***equilibrium is unmediated*** *or* ***partially mediated.***

The intuition of the proof is the following: Note that the only stationary strategies that can be optimal for each agent are the following: agent 1 always offers $(x, s-x)$ and rejects anything less than $w$. Agent 2 always offers $(y, s-y)$ and rejects anything less than $z$. The reason is that if any of the players decides to reject an offer, then he must reject any other offer that is strictly worse for him. Moreover, at equilibrium, each player will offer the minimum amount that the other agent will accept and that the mediator still submits. This implies that $w = y$ and $z = s-x$. The necessary conditions for these strategies to be a stationary subgame perfect equilibrium (SSPE) are the following:

(1) $y \geq \delta x - (1-\delta)c$.

(2) $s - x \geq \delta(s - y)$.
(3) $x \geq \delta y - (1-\delta)c$.
(4) $s - y \geq \delta(s - x)$.
(M1) $\frac{(1-\delta)}{\alpha}(s+c) \geq |2x - s| - |\delta(2y - s) - (1-\delta)c|$.
(M2) $\frac{(1-\delta)}{\alpha}(s+c) \geq |2y - s| - |\delta(2x - s) - (1-\delta)c|$.

Conditions (1) to (4) are the usual acceptance/rejection restrictions of the two players. The optimal strategy of the mediator is determined by conditions (M1) and (M2). The mediator, when a player makes an offer, will submit the proposal whenever the proposed sharing is preferred to the one induced by the continuation of the game, taking into account, both efficiency and equality. Condition (M1) ensures that the offer made by agent 1 will not be blocked by the mediator, that is, the mediator prefers $(P_i, P_j) = (x, s-x)$ to $(P_i', P_j') = (\delta y - (1-\delta)c, \delta(s-y))$. Condition (M2) is the analogous condition for the offer of agent 2. We do not need to specify the mediator's strategy because the equilibrium payoffs that arise from these conditions are unique.

Note that the left-hand side of the mediator's condition is the cost in efficiency terms of blocking a proposal and delaying the agreement one period (parametrized by the mediator's type $\alpha$). The right-hand side is the difference in the equality of the proposals.

We obtain the equilibria of this game analyzing the binding conditions in each case.

We represent in Figure 1 this equilibrium configuration.

[Insert Figure 1]

In this figure, we represent the mediator's willingness to sacrifice efficiency in terms of equality (parametrized in the model by $\alpha$) as a function of $\frac{s}{c}$. Note that the equilibrium of this game has the following properties: the SSPE payoffs can be divided in three cases. First, if $\alpha$ is sufficiently low, the mediator is, at equilibrium, *completely passive and submits any proposal she receives.* The negotiation is conducted as if there was no filter to the agents' proposals. As a result, the equilibrium sharing coincides with the obtained in the direct negotiation case, since the binding conditions are (1) and (2).

On the other extreme, if $\alpha$ is sufficiently high and, at the same time, the damage caused by the conflict is relatively low (i.e. $\frac{s}{c}$ is sufficiently large), the equilibrium is *fully mediated.* This means that the threat of blocking proposals is binding for both agents (conditions (M1) and (M2)). This way, neither party can fully benefit from his position as a proposer.

For intermediate cases, the equilibrium is *partially mediated.* In this range of parameter values, the mediator's position is not strong enough to drive completely the negotiation but it still has some influence over the outcome. At equilibrium, the mediator threats the strong player in order to reduce his advantage as a proposer, but allows the weak player to completely profit from his position when he has the right to propose (the binding conditions are (2) and (M2)).

Some insights can be extracted from this general characterization. First, note that the mediator's willingness to sacrifice efficiency on the grounds of a higher equality crucially determines the outcome of the negotiations. This commitment to achieve equality, even at the cost of destroying resources if necessary, gives credibility to the mediator's threat to block proposals and, hence, alters the equilibrium sharing. Second, an important element that affects the mediator's capacity to influence the negotiation is how costly the conflict is. The relative damage of continuing the conflict with respect to the total amount of resources to share (i.e., $\frac{s}{c}$) measures how costly it is for the mediator to actually intervene in the negotiation.

In order to extract more insights on the implications of an active mediator, we consider now the prediction that Proposition 3 makes for the two extreme cases of the preferences of the mediator, that is, *efficiency-seeking mediator* ($\alpha \to 0$), and *equality-seeking mediator* ($\alpha \to +\infty$).

**Proposition 4** *If $\alpha = 0$ (efficiency-seeking mediator), the two negotiation processes, that is, direct and indirect, are equivalent.*

**Proof.** Direct from Proposition 3. ■

This Proposition confirms our previous claim that only mediators that can credibly commit to delay the negotiations (and, hence, destroy resources), do have an impact on the final sharing. Otherwise, they become simple passive witnesses of the negotiation.

Let us move now to the opposite, and more interesting, case.

**Proposition 5** *In indirect negotiations with an equality-seeking mediator ($\alpha \longrightarrow +\infty$), there exists a unique SSPE in which the offers made by the players are the following:*

- *If $\frac{s}{c} \geq \frac{1+2\delta-\delta^2}{1+\delta^2}$ then,*

$$x = \frac{s}{2} + \frac{\left(1-\delta^2\right)}{2\left(1+\delta^2\right)}c,$$
$$y = \frac{s}{2} - \frac{\left(1-\delta\right)^2}{2\left(1+\delta^2\right)}c.$$

- *If $\frac{s}{c} \leq \frac{1+2\delta-\delta^2}{1+\delta^2}$ then,*

$$x = \frac{s}{2} + \frac{s-\delta c}{2\left(1+\delta\right)},$$
$$y = \frac{s}{2} - \frac{c-\delta s}{2\left(1+\delta\right)}.$$

**Proof.** Direct from the Proof of Proposition 3 in Appendix. ■

Several insights emerge from this Proposition. The first, and most obvious one is that, even if the mediator is willing to completely sacrifice efficiency in order to achieve a higher equality, she is not able to induce a fully egalitarian sharing. The reason is that the existence of conflict costs that affects more one player than the other, is a source of inequality that undermines the capacity of the mediator. The tool the mediator has to increase the egalitarianism of the sharing is to threaten the proposer with blocking his offer (implying a delay in the resolution of the conflict). The larger asymmetry of conflict costs, the more inequality this blocking will generate and, therefore, the weaker the position of the mediator (the less credible her threat). This implies that, even in the extreme case in which the mediator would postpone indefinitely the agreement if needed, she is not capable of forcing any of the players to make a fully egalitarian offer.

Second, the structure of the equilibrium is different, depending on the values of the parameters. When $\frac{s}{c} \geq \frac{(1+2\delta-\delta^2)}{1+\delta^2}$, the equilibrium offers are completely determined by the mediator's threats to block their proposals (the equilibrium is *fully mediated*). In this case, neither player can, at equilibrium, fully benefit from his position as a proposer. However, if $s$ is relatively low with respect to the conflict cost ($c$) (that is, when $\frac{s}{c} < \frac{(1+2\delta-\delta^2)}{1+\delta^2}$), the equilibrium configuration is different. In this case, the position of agent 1 is very weak with respect to agent 2 and, hence, the mediator allows the former to fully use his advantage when he is the proposer (agent 1's offer is determined by the acceptance-rejection decision of agent 2). At the same time, the mediator restricts the first-mover-advantage of agent 2 (the strongest) using her power to block proposals. As a result, the equilibrium is only *partially mediated.*

Focusing on the first case, we can see the most striking and, at first sight, most counter-intuitive result of the mediator's intervention. *When the weak player is the proposer, his share of the surplus is increasing in his own conflict costs.* In the direct negotiation case, the result was completely the opposite. The reasoning was simple: the larger the conflict cost of one player, the weaker his bargaining position and, hence, the smaller share of the surplus he gets. However, this reasoning fails here, because the player's equilibrium offers are not determined by the other player's reaction, but by the mediator's blocking threat.

In a sense, the "competitor" of agent 1 is not directly agent 2, but rather the mediator. The stronger the position of the mediator, the less capacity will have agent 1 to exploit his advantage as a proposer, and vice versa. The higher $c$, the less credible will be the mediator's threat to block proposals, as this would imply an important source of inequality in the final sharing. As a result, the larger $c$, the bigger the share that agent 1 can ask for himself, without triggering a block from the mediator. This paradoxical result can also be restated in other terms: the quest for equality makes the mediator become an agent for the weak player.

The example of the international conflict we referred to in Section 2 may help to clarify this point: as we have already argued, in the absence of a mediator, the position of country 1 (with a weak army and civilians being more exposed to the conflict) is much weaker. Hence, any eventual solution of the conflict will favour the strong country. When a mediator steps in, if it is common knowledge that this mediator will search for an equitable solution, things change substantially. Now, the weak country has a new strategic device. The massive suffering of its population if the conflict continues, becomes a strategic threat for the mediator. Country 1 knows that the mediator will not be willing to let the conflict continue, as this would imply enlarging the flow of damages for the population of country 1. This "preference for equity" of the mediator gives the weak country a very strong position at the expense of country 2.

As a consequence of this effect, we have the following result.

**Corollary 2** *When $\alpha \to \infty$, the mediator achieves a* ***higher equality*** *by giving the* ***initiative to the strongest player*** *in the conflict. Formally,*

$$\left(P_1^{Ipm}, P_2^{Ipm}\right) = (y, s-y)\,.$$

**Proof.** See Appendix. ■

Once again, we see how the presence of an active mediator has very important implications. The fact that the mediator's intervention reinforces the negotiation position of the weak player implies that, contrary to the direct negotiation case, more equality can be achieved by giving the initiative in the negotiation to the ex-ante strong player, as he has a weaker position with respect to the mediator.

Finally, one can see how the mediator's activity, instead of improving over the direct negotiations in terms of equality, can turn out to be detrimental. To show it, we compare the payoffs achieved with **direct** and **indirect** negotiations.

From the Proposition above, we know that the payoffs of the **indirect** (mediated) negotiation (with the strongest player (player 2) proposing first) are:

- If $\frac{s}{c} \geq \frac{1+2\delta-\delta^2}{1+\delta^2}$ then,

$$P_1^{Ipm} = \frac{s}{2} - \frac{(1-\delta)^2}{2\left(1+\delta^2\right)}c,$$
$$P_2^{Ipm} = \frac{s}{2} + \frac{(1-\delta)^2}{2\left(1+\delta^2\right)}c.$$

- If $\frac{s}{c} \leq \frac{1+2\delta-\delta^2}{1+\delta^2}$ then,

$$P_1^{Ipm} = \frac{s}{2} - \frac{c-\delta s}{2\,(1+\delta)},$$
$$P_2^{Ipm} = \frac{s}{2} + \frac{c-\delta s}{2\,(1+\delta)}.$$

From the analysis already performed, we know that the payoffs of the **direct** (face-to-face) negotiations are:

$$P_1^{Dpm} = \frac{s-\delta c}{1+\delta},\; P_2^{Dpm} = \frac{\delta\,(s+c)}{1+\delta}.$$

In Corollary 3 below, we compare the degree of inequality in the presence and in the absence of the mediator:

**Corollary 3** *There exist two thresholds in the discount factor,* $(\delta_1, \delta_2)$, $0 < \delta_1 < \delta_2 < 1$ *such that:*

- *If* $\delta \leq \delta_1$ *the* ***equality*** *achieved is* ***higher*** *when conducting* ***mediated*** *negotiations.*
- *If* $\delta \in (\delta_1, \delta_2)$ *the* ***equality*** *achieved is* ***lower*** *when conducting* ***mediated*** *negotiations.*
- *If* $\delta \geq \delta_2$ *the* ***equality*** *achieved is* ***higher*** *when conducting* ***mediated*** *negotiations.*

**Proof.** See Appendix. ■

We represent this result in Figure 2.

[Insert Figure 2]

In this figure, we represent the difference in agents' payoffs (under direct and indirect negotiations) as functions of the discount factor. The result obtained can be, at first sight, counterintuitive: the presence of an active mediator that threatens the parties with blocking "unequal" proposals, may imply, ex-post, a higher degree of inequality. The explanation for this has to do with the nature of the mediator's intervention. The presence of conflict costs reduces the effective capacity of the mediator to equalize payoffs, and this weakness will be strategically used by the players in their own benefit.

For extreme cases of $\delta$, the intervention of the mediator always improves over the face-to-face situation. When the value of $\delta$ is very low, then the first-mover advantage of the initial proposer is very important, and the "blocking" capacity of the mediator effectively reduces its impact on the final sharing. On the other extreme, when $\delta$ is sufficiently high the mediator's intervention is very successful, since the higher the degree of patience of the players, the higher the capacity of the mediator to induce an egalitarian sharing.

However, for intermediate values of $\delta$, the inequality of the face-to-face negotiation is relatively low: the first-mover-advantage of the "weak" player allows him to compensate for his higher conflict costs in such a way that the final sharing is relatively balanced. The intervention of the mediator in this case does not improve the equality achieved in a direct negotiation, since the players use strategically the "weakness" of the mediation activity, that comes from the presence of conflict costs, in their own benefit.

## 4 Preconflict Negotiations (*Peacekeeping*)

The players are in a **peacekeeping** setting, where negotiations take place prior to a potential conflict. These games correspond to situations with no-cooperation as an outside option. The players that bargain over the division of the surplus have the option of breaking up negotiations and go to the conflict. If this happens, they receive their outside option payoffs, that will be denoted by $(P_i^*, P_j^*)$. These payoffs will be determined by the outcome of the peacemaking negotiations. We state the general results in the following Lemma and Proposition, for any outside payoffs that satisfy $s \geq P_i^* + P_j^*$. In a posterior analysis, we concentrate on a particular case of payoffs to be able to extract more interesting implications of the mediator's activity.

## 4.1 Direct (face-to-face) Negotiations

Agents 1 and 2 bargain over the division of $s$. Denote the player who starts the negotiation as player $i$. Each player has the option of breaking up the negotiations and move to the conflict. In even (odds) periods player $i$ (player $j$) makes an offer. The other party may accept and the game ends with agreement at the proposed shares. Alternatively, if he rejects, either of the two parties may decide to start the conflict, in which case both receive their outside payoffs, $(P_i^*, P_j^*)$. If the offer is rejected but neither player opts out, then bargaining goes on to the following round.

The framework and solution is the one used in Ponsatí and Sákovics (1998), but we restrict attention to stationary strategies (independent of $t$) and we allow the outside payoffs of the players to be negative. We first prove the following Lemma.

**Lemma 1** *In a direct negotiation under a peacekeeping scenario, for any outside payoffs $(P_i^*, P_j^*) \in \mathbb{R}^2$, such that $s \geq P_i^* + P_j^*$, immediate agreement at $(s - P_j^*, P_j^*)$ is an outcome that can be supported by a SSPE, when player $i$ is the first to propose. Moreover, it is the unique SSPE when $P_i^* > \delta^2 \left(s - \frac{P_j^*}{\delta}\right)$ and $P_j^* > \delta^2 \left(s - \frac{P_i^*}{\delta}\right)$. Otherwise, the outcomes that can be supported by a SSPE are immediate efficient agreements that give player $i$ a payoff in $\left[s(1-\delta) + P_i^*, s - P_j^*\right]$. At equilibrium each agent links the rejection of his proposal to the start of the conflict.*

**Proof.** Consider the following strategies: if player $i$ is the proposer he always asks for $s - P_j^*$; the responder accepts any proposal that is not worse than the (candidate) equilibrium proposal; if the proposer asks for more, then the responder rejects and takes his outside option; if the responder does not accept a proposal, the proposer opts out. It is straightforward to verify that these strategies constitute a SSPE.

To prove the second part of the Lemma, note that for the lowest possible share for player $i$ to get at equilibrium we need the following: player $i$ should (weakly) prefer continuing to opting out when player $j$ rejects his proposal. Otherwise, the only candidate equilibrium offer will be for player $i$ to ask for $s - P_j^*$, because player $j's$ threat to reject would not be credible. From this, we know that the continuation value of player $i$ from the next period must be at least $\frac{P_i^*}{\delta}$. Since player $j$ should be indifferent between accepting and waiting for next period, his maximum possible share is $\delta\left(s - \frac{P_i^*}{\delta}\right)$. By symmetry, the maximum possible share for player $i$ is $\delta\left(s - \frac{P_j^*}{\delta}\right)$, and therefore, $\frac{P_i^*}{\delta} \leq \delta\left(s - \frac{P_j^*}{\delta}\right)$ and $\frac{P_j^*}{\delta} \leq \delta\left(s - \frac{P_i^*}{\delta}\right)$. Given these conditions, both players (weakly) prefer this agreement to their option. It is straightforward to see that these conditions are also sufficient. ■

Note that a necessary condition for having multiplicity of equilibria is that $\delta s > P_i^* + P_j^*$. In the posterior analysis, we concentrate on a particular vector of outside payoffs from the peacemaking negotiation to extract more meaningful implications of the mediator's activity. Since these payoffs do not satisfy this condition, we study in what follows the case where the unique SSPE payoffs are $(s - P_j^*, P_j^*)$.

From the Lemma above, we observe that, at equilibrium, the proposer threatens with opting out if his offer is rejected, and this behavior is always credible. This has a direct implication for the relationship between **peacemaking** and **peacekeeping**: *in a peacekeeping setting, where the agents face a direct negotiation with the outside option of moving to a peacemaking situation, the outcome is completely determined by the outcome of the peacemaking process.*

This implies that the equilibrium sharing with peacekeeping is, in fact, the same as with peacemaking. In the absence of an active mediator, therefore, even if the players are not actually in conflict, the sharing is as if they were in it.

### 4.2 Indirect (mediated) Negotiations

The game that we analyze is as follows: at any stage $t$, the mediator meets with the party that has the right to make a proposal (player $i$). This player makes a proposal. The mediator meets with player $j$ and decides whether or not to submit to him the proposal of player $i$. If player $j$ receives the proposal and accepts, the game ends. If $j$ rejects (or does not receive the offer), either of the two parties may decide to start the conflict. If the offer is rejected (or not submitted) but neither player opts out, bargaining goes on to the following round.

There are interesting effects that may arise when we allow the mediator to intervene in a peacekeeping scenario, that is, before any of the players opts out and moves to a peacemaking situation. First, the lack of conflict costs per-period of delay in peacekeeping negotiations, makes the mediator be less constrained about efficiency considerations, which may ease her intervention in terms of achieving a higher equality, for a given level of $\alpha$. Second, this effect can be outweighed, since the player that loses by this increased equality may have more incentives to opt out and start the conflict. The formal statement of the results is the subject of the following Proposition.

**Proposition 6** *For the mediated game in a peacekeeping situation with outside options, where the outside payoffs are such that $s \geq P_i^* + P_j^*$, the SSPE payoffs $(x_i^*, s - x_i^*)$ are:*

- *If* $P_i^* \leq P_j^* - \left|s - 2P_j^*\right|$*, and if not, whenever* $\alpha \leq \alpha_i^0 \equiv \frac{\left(s-\left(P_i^*+P_j^*\right)\right)}{\left|s-2P_j^*\right|-\left|P_i^*-P_j^*\right|}$*, then*
$$x_i^* = s - P_j^*.$$

- *Otherwise,*
$$x_i^* = \frac{s}{2} + \frac{1}{2}\left(\frac{1}{\alpha}\left(s - \left(P_i^* + P_j^*\right)\right) + \left|P_i^* - P_j^*\right|\right).$$

**Proof.** See Appendix. ■

From this general case, we can extract some preliminary insights on the role of a mediator in a peacekeeping negotiation. First, and fully consistent with our previous results, a necessary condition for the mediator to have an active role in the negotiation process is that she is actually willing to sacrifice efficiency in order to induce a higher equality. Otherwise, she becomes a purely passive observer. However, and contrary to the peacemaking case, this necessary condition is not sufficient. In this setting it can be the case that, even a fully equality-seeking mediator ($\alpha \to \infty$), is incapable of altering the equilibrium sharing. This occurs when the sharing that results from the outside options is very unbalanced against the proposer and, thus, the mediator loses her capacity to effectively threaten him.

In those cases in which the mediator actually alters the distribution, her intervention is of a different nature than in a peacemaking environment. In a peacekeeping negotiation, the threat of the mediator is not to reduce the proposer's first-mover advantage and give it to the responder, but rather to actually reinforce the implicit threat made by the proposer himself of moving to the conflict. This is the best the mediator can aim at achieving, since the outside option is a safe outcome for the players.

Let us now move to a more specific case in which we can extract more meaningful implications of the mediator's activity: the equality-seeking mediator ($\alpha \to \infty$). Moreover, when negotiations are broken, the outside option is, in fact, the beginning of the conflict. This means that the agents will suffer one round of damages (with costs $(1-\delta)\,c$ for player 1 and 0 for player 2) and will continue negotiating under a peacemaking environment.[6] Then, the actual value of the outside option is:[7]

$$\begin{aligned} P_1^* &= P_1^{Ipm} - (1-\delta)\,c, \\ P_2^* &= P_2^{Ipm}. \end{aligned}$$

[6] We assume that there is no delay in the start of the negotiations after the conflict breaks out. This allows us to eliminate a purely artificial source of equity given by discounting (that reduces the present value of the differences in payoffs across agents).

[7] The posterior analysis and results correspond to the main range of the parameter space. It only does not cover the case with $\delta \in [\delta_1, \widetilde{\delta}]$ and $\frac{s}{c} > \frac{1-\delta^2+2\delta}{2(1-\delta)}$. For the case where $\delta \in [\delta_1, \widetilde{\delta}]$ and $\frac{1-\delta^2+2\delta}{(1-\delta)} > \frac{s}{c} > \frac{1-\delta^2+2\delta}{2(1-\delta)}$, the result obtained in Corollary 4 is the opposite, but the results of Corollary 5 and Proposition 7 remain the same. When $\delta \in [\delta_1, \widetilde{\delta}]$ and $\frac{s}{c} > \frac{1-\delta^2+2\delta}{(1-\delta)}$, the results obtained in Corollaries 4 and 5 and Proposition 7 are the opposite. We disregard these last cases since the range of parameters that satisfy them is of small significance.

Note that this is the most natural case of study. The parties try to negotiate in the absence of a conflict and they know that if, eventually, one of the parties decides to start the conflict, this will imply a flow of damages (unevenly distributed among the players) and the continuation of the negotiations in a new scenario (peacemaking). Focusing on this case, we find the following corollaries:

**Corollary 4** *An equality-seeking mediator ($\alpha \to \infty$) will, at equilibrium:*

- *Always be able to affect the equality of the sharing when the "strong" player moves first.*
- *Never be able to affect the equality of the sharing when the "weak" player moves first.*

**Proof.** When $\alpha \to \infty$, the mediator can alter the equilibrium proposal of the player with the right to start the negotiation (player $i$) if and only if

$$P_i^* > P_j^* - \left|s - 2P_j^*\right|.$$

Consider first the case $i = 2$ (i.e., the strong player). Using the fact that $P_1^* < P_2^*$ it is straightforward to see that the above condition is always fulfilled for the equilibrium values.

Conversely, consider the case $i = 1$ (i.e., the weak player). Substituting the equilibrium values for $P_1^*$ and $P_2^*$, we rewrite the above condition as

$$P_1^{Ipm} - (1 - \delta)\, c > s - P_2^{Ipm}.$$

And this condition never holds, since $P_1^{Ipm} + P_2^{Ipm} = s$. ■

Again, and analogous to a peacemaking situation, we observe how giving the initiative to the weak player is a source of problems for the mediator. Recall that, in a peacemaking negotiation, the reason was that the weak player was able to make more demanding proposals, exploiting the fact that, if they were blocked by the mediator, this would imply high damages for him. In a peacekeeping setting, the result, although related, is of a different nature. Here, the effect is not quantitative (submitting more uneven proposals) but rather qualitative (when the mediator is really active). The quantitative aspect is lost, since the players always link their proposals to fixed quantities (the outside option). What the mediator loses by giving the initiative to the weak player is the capacity to effectively threaten the proposer with executing the outside option, as this sharing would be very unbalanced.

**Corollary 5** *In* ***peacekeeping,*** *when the mediator's intervention alters the behavior of the players, the equality achieved is always smaller than in* ***peacemaking.***

**Proof.** First, in peacekeeping, if the mediator is active, the payoff of the proposer is

$$x_i^* = \frac{s}{2} + \frac{1}{2}\left(\frac{1}{\alpha}\left(s - \left(P_i^* + P_j^*\right)\right) + \left|P_i^* - P_j^*\right|\right).$$

It is straightforward to see that the equality induced is higher, the higher is $\alpha$. For $\alpha \to \infty$ we have (substituting the equilibrium values for the outside option payoffs):

$$x_i^* = \frac{s}{2} + \frac{1}{2}\left|P_1^{Ipm} - (1-\delta)\,c - P_2^{Ipm}\right|.$$

Since $x_i^* > \frac{s}{2}$, then the inequality of the sharing is given by:

$$2x_i^* - s = \left|P_1^{Ipm} - (1-\delta)\,c - P_2^{Ipm}\right|.$$

As in peacemaking we have shown that $P_1^{Ipm} \leq P_2^{Ipm}$, then:

$$2x_i^* - s = P_2^{Ipm} - P_1^{Ipm} + (1-\delta)\,c > P_2^{Ipm} - P_1^{Ipm}.$$

This completes the proof. ■

Even if, in peacemaking negotiations, the fact of being in conflict was a source of weakness for the mediator, the situation in peacekeeping environments, instead of improving, turns out to be even worse. The reason is that, even if in peacekeeping negotiations when the mediator delays the agreement this does not imply a priori conflict costs for the parties, the agents link the rejection of their proposals to the beginning of the conflict. This severely undermines the capacity of the mediator to induce an egalitarian sharing.

It is direct to see that, if the mediator can actually affect the proposer's strategy and, hence, the sharing of the surplus, the distribution is completely determined by the value of the outside option of the players. This implies that the equilibrium level of inequality is the same independently of which player starts the negotiation.[8] This is in contrast with the result in peacemaking, where the mediator strictly preferred to give the initiative to the ex-ante "strong" player.

However, so far, we have not seen when the presence of an active mediator is really beneficial in terms of equality. That is, we have not compared the degree of inequality obtained with indirect (mediated) negotiations with that resulting from a direct (face-to-face) negotiation. By doing so, we find:

**Proposition 7** *In a peacekeeping environment, undertaking mediated negotiations never generates a higher equality than a direct negotiation in which the weak player is the first proposer.*

**Proof.** Follows directly from comparing the equilibrium sharing in Lemma 1 and Proposition 6. ■

This result shows the extent to which the position of the mediator is weakened in a peacekeeping scenario. Her intervention by threatening the parties with blocking their proposals, is

[8] Note that this does not mean that the equilibrium payoffs are the same; the initial proposer always gains more.

completely unable to induce a more egalitarian sharing than if she allowed the parties to negotiate directly (giving the initiative to the weak player). Moreover, it can be checked that, whenever the mediator is active at equilibrium, i.e., she actually alters the proposals of the players, then her presence is detrimental for equality.

The intuition for this result is the following: in the direct negotiation case (Ponsatí and Sákovics, 1998), even the weak player, when being the proposer, can credibly commit to opting out, which prevents the responder from using all his bargaining power. When the mediator intervenes (indirect negotiation case), the proposer has to credibly threaten, not only the responder, but also the mediator. Since the mediator has preferences over equality and efficiency, the proposers "lose" bargaining power with respect to the responders when $\alpha$ increases since, for a sufficiently high $\alpha$, the mediator may prefer not to submit a given offer and go to the outside option. The threat of the mediator to actually implement the outside option is, in this case, detrimental

# 5 Conclusion

We have proposed a simple model of bargaining that, nevertheless, has allowed us to analyze and compare the role of mediation in conflicts of different nature, where two parties negotiate to share a fixed surplus.

We have distinguished between *peacemaking* (in-conflict) negotiations and *peacekeeping* (pre-conflict) negotiations. The main difference is that in a peacemaking scenario, since the conflict has already started, the players bear costs per-period of conflict. Since these costs are different, the players are asymmetric.

We analyze the negotiations in a peacemaking scenario in order to study the role of a mediator that strategically intervenes in the bargaining process. We observe two important implications of this analysis: first, even if the mediator is willing to sacrifice completely efficiency in order to achieve a higher equality, she is not able to induce a fully egalitarian sharing. Second, we prove that more equality can be achieved by giving the initiative in the negotiation process to the ex-ante strong player (in contrast with unmediated bargaining processes). This can be explained by the fact that, in mediated negotiations, the weak player has a strong position with respect to the mediator, who becomes, in fact, the real "competitor" of the player.

In a peacekeeping scenario, the conflict is not active yet and it is only a potential outcome of the process. In this setting, the absence of conflict costs would, in principle, help the mediator in achieving a higher equality of the final agreement. But the result is completely the opposite. In peacekeeping negotiations, the agents use the threat of starting the conflict, and, as a result, the position of the mediator, and her capacity to induce an egalitarian sharing, is weakened with respect to peacemaking negotiations.

At this point we can bring back the interview with a UN international negotiator, quoted in the Introduction. The words by Françesc Vendrell seemed support a particular strategy of negotiation: The option of conducting indirect (mediated) negotiations is better in peacemaking environments, while direct (face-to-face) negotiations dominate in peacekeeping settings. Our results are consistent with Vendrell's choice. First, we have seen that, in many instances, a mediated negotiation can achieve more equality than a direct one in a peacemaking environment. In this situation, the capacity of the mediator to "filter" proposals between the parties can be a useful distributive tool. Second, we have shown that in peacekeeping negotiations, this is no longer the case. Using the mediator as a filter between the two parties can never increase the egalitarianism of the final sharing and, hence, never improves over a direct negotiation.

Finally, it is worth mentioning that this model has to be seen as a first step in a new line of research. We believe that studying the impact that a mediator (understood as a strategic player) can have over an ongoing negotiation process, is a potentially fruitful area of research. Despite their interest, these issues, however, remained unattended by the literature. In this model we have dealt with a simple, yet interesting case: mediation under complete information. The next natural step is to study these same issues in a richer framework, where the parties negotiate in a two-sided asymmetric information environment. This would allow to analyze the capacity of the mediator to affect, not only the equality of the final sharing, but also the efficiency achieved.

# 6 Appendix

**Proof. (Proposition 3)**

The following stationary strategies are the only stationary strategies that can be optimal for the two agents involved in the negotiation: agent 1 always offers $(x, s-x)$ and rejects anything less than $w$. Agent 2 always offers $(y, s-y)$ and rejects anything less than $z$. Moreover, at equilibrium it must be the case that $w = y$ and $z = s - x$.

The necessary conditions for the strategies above mentioned to be a stationary subgame perfect equilibrium (SSPE) are the following:

(1) $y \geq \delta x - (1-\delta)c$.

(2) $s - x \geq \delta(s - y)$.

(3) $x \geq \delta y - (1-\delta)c$.

(4) $s - y \geq \delta(s - x)$.

(M1) $\frac{(1-\delta)}{\alpha}(s + c) \geq |2x - s| - |\delta(2y - s) - (1-\delta)c|$.

(M2) $\frac{(1-\delta)}{\alpha}(s + c) \geq |2y - s| - |\delta(2x - s) - (1-\delta)c|$.

Now we prove the following intermediate result that will help us to characterize the equilibrium outcomes:

- If at equilibrium (1) is not binding, then $y \leq \frac{s}{2}$.
- If at equilibrium (2) is not binding, then $x \geq \frac{s}{2}$.

Consider, first, the case in which (1) is not binding and assume that the equilibrium is such that $y > \frac{s}{2}$. Consider the following deviation for player 2 when he is the proposer: $y' = y - \varepsilon$, with $\varepsilon > 0$ and sufficiently small. Since (1) was not binding, there exist values of $\varepsilon > 0$ for which this condition still holds and, therefore, player 1 still finds the offer acceptable. Moreover, since $y > \frac{s}{2}$, the condition M2 is still fulfilled for $y'$ and the new offer of player 2 is not blocked by the mediator. Therefore, player 2 has a profitable deviation since the new offer gives him a larger share of the surplus. An analogous argument allows to show that $x < \frac{s}{2}$ cannot be sustained as an equilibrium when (2) is not binding.

Now we prove that the equilibrium outcome cannot be such that conditions (1) and (M1) are binding. In this case, the only candidate equilibrium payoffs are the following (restricting to $y \leq \frac{s}{2}$ and $\delta(2x - s) \leq (1-\delta)c$, since the rest of the cases are eliminated because either condition (2) or (M2) are not satisfied):

$$\begin{aligned} x &= \frac{s(1-\delta+\alpha+\alpha\delta)}{2\alpha(1+\delta^2)} + \frac{c(1-\delta)(1+\alpha+2\alpha\delta)}{2\alpha(1+\delta^2)} \geq \frac{s}{2}, \\ y &= \delta x - (1-\delta)c \leq \frac{s}{2}. \end{aligned}$$

But in this case we can prove that these payoffs are not compatible with $\delta(2x - s) \leq (1-\delta)c$.

We are now in the position to fully characterize the outcome of the indirect (mediated) negotiations, in the presence of a type-$\alpha$ mediator. We use the following notation:

$$\begin{aligned} \alpha_1 &= \frac{(1+\delta)^2(s+c)}{s(1-\delta^2)-c(1-\delta)^2};\ \alpha_2 = \frac{(1-\delta^2+2\delta)(s+c)}{s(1+\delta^2)-c(1-\delta^2+2\delta)} \\ \alpha_3 &= \frac{\delta^2(s+c)}{\delta s - c};\ \alpha_4 = \frac{(1-\delta^2)(s+c)}{(1-\delta)^2 s + (3+\delta^2)c};\ \alpha_5 = \frac{\delta(1+\delta)(s+c)}{c(1-\delta)}; \end{aligned}$$

The offers made by the players in the SSPE are the following:

- For $\alpha \leq \min\{1, \alpha_3\}$,

$$x = \frac{s-\delta c}{1+\delta},\ y = \frac{\delta s - c}{1+\delta}. \tag{UM}$$

- For $\alpha_1 \leq \alpha \leq \alpha_5$,

$$\begin{aligned} x &= \frac{s}{2} + \frac{s+c(1+\alpha)}{2\alpha} - \frac{\delta c}{1+\delta}, \\ y &= \frac{s}{2} - \frac{s+c(1+\alpha)}{2\alpha} + \frac{c}{1+\delta}. \end{aligned} \tag{FM$_1$}$$

- For $\alpha_2 \leq \alpha \leq \alpha_1$,

$$\begin{aligned} x &= \frac{s(2\alpha-\delta-\alpha\delta+\alpha\delta^2+\delta^2)-\delta c(1-\alpha)(1-\delta)}{2\alpha(1+\delta^2)}, \\ y &= \frac{s(\alpha+\delta-\alpha\delta+2\alpha\delta^2-1)-c(1-\alpha)(1-\delta)}{2\alpha(1+\delta^2)}. \end{aligned} \tag{PM$_1$}$$

- If $\frac{s}{c} \geq \frac{1+2\delta-\delta^2}{1+\delta^2}$ and $\alpha \geq \max\{\alpha_2, \alpha_5\}$,

$$\begin{aligned} x &= \frac{s}{2} + \frac{(1-\delta^2)(s+c(1+\alpha))}{2\alpha(1+\delta^2)}, \\ y &= \frac{s}{2} - \frac{(1-\delta)^2(s+c(1+\alpha))}{2\alpha(1+\delta^2)}. \end{aligned} \tag{FM$_2$}$$

- If $\frac{s}{c} \geq \frac{1+2\delta-\delta^2}{1+\delta^2}$ and $1 \leq \alpha \leq \min\{\alpha_2, \alpha_3\}$, or if $\frac{s}{c} \leq \frac{1+2\delta-\delta^2}{\delta(1+\delta)}$ and $\alpha \geq 1$,

$$\begin{aligned} x &= \frac{s(2\alpha+\alpha\delta-\delta)-\delta c(1+\alpha)}{2\alpha(1+\delta)}, \\ y &= \frac{s(\alpha+2\alpha\delta-1)-c(1+\alpha)}{2\alpha(1+\delta)}. \end{aligned} \tag{PM$_2$}$$

- If $\alpha_3 \leq \alpha \leq \alpha_2$, there is multiplicity of equilibria:
  - If $\alpha \geq \alpha_4$, the equilibria are (PM$_1$) and (PM$_2$).
  - If $1 \leq \alpha \leq \alpha_4$, the equilibria are (PM$_1$) and (PM$_2$) and (UM).

– If $\alpha \leq 1$, the equilibria are (UM) and ($PM_1$).

**Case 1 (Unmediated Eq. - UM)**

Conditions (1) and (2) hold with equality. If this happens we obtain $(x, s-x)$ and $(y, s-y)$ from the direct negotiation case, that is,

$$x = \frac{s-\delta c}{1+\delta},\ y = \frac{\delta s - c}{1+\delta}.$$

We have to check if there exists some value of $\alpha$ that makes that these payoffs satisfy conditions (M1) and (M2):

(M1) $\frac{(1-\delta)}{\alpha}(s+c) \geq |2x-s| - |\delta(2y-s) - (1-\delta)c| \iff$

$\frac{(1-\delta)}{\alpha}(s+c) \geq \frac{1}{1+\delta}|s(1-\delta) - 2\delta c| - (1-\delta)c + \delta s - 2\delta\left(\frac{\delta s - c}{1+\delta}\right).$

(M2) $\frac{(1-\delta)}{\alpha}(s+c) \geq |2y-s| - |\delta(2x-s) - (1-\delta)c| \iff$

$\frac{(1-\delta)}{\alpha}(s+c) \geq \frac{2c}{1+\delta} + \frac{(1-\delta)s}{1+\delta} - \frac{1}{1+\delta}\left|\delta s(1-\delta) - c(1+\delta^2)\right|.$

**Case 1.1**

$x \leq \frac{s}{2}$, that is, $|2x-s| = s - 2x = \frac{1}{1+\delta}(2\delta c - s(1-\delta))$. Then, we also have:

$$|\delta(2x-s) - (1-\delta)c| = (1-\delta)c + \delta(s-2x) = \frac{1}{1+\delta}\left(c(1+\delta^2) - \delta s(1-\delta)\right).$$

In this case, we can prove that (M1) is always satisfied because

$$\frac{1}{1+\delta}(2\delta c - s(1-\delta)) - \frac{1}{1+\delta}\left(c(1+\delta^2) - \delta s(1-\delta)\right) < 0.$$

If we check for (M2), we get:

$$\begin{aligned}\frac{(1-\delta)}{\alpha}(s+c) &\geq |2y-s| - |\delta(2x-s) - (1-\delta)c| \Leftrightarrow \\ \frac{(1-\delta)}{\alpha}(s+c) &\geq \frac{2c}{1+\delta} + \frac{(1-\delta)s}{1+\delta} - \frac{1}{1+\delta}\left(c(1+\delta^2) - \delta s(1-\delta)\right) = (1-\delta)(s+c).\end{aligned}$$

And this is satisfied iff $\alpha \leq 1$.

**Case 1.2**

$x \geq \frac{s}{2}$, that is, $|2x-s| = 2x - s = \frac{1}{1+\delta}(s(1-\delta) - 2\delta c)$.

**Case (a):**

$|\delta(2x-s) - (1-\delta)c| = \delta(2x-s) - (1-\delta)c = \frac{1}{1+\delta}\left(\delta s(1-\delta) - c(1+\delta^2)\right).$

If we rewrite (M1):

$$\frac{(1-\delta)}{\alpha}(s+c) \geq s\left(\frac{1-2\delta+\delta^2}{1+\delta}\right) - c\left(\frac{1+4\delta-\delta^2}{1+\delta}\right) = z_1.$$

If we rewrite (M2):

$$\frac{(1-\delta)}{\alpha}(s+c) \geq s\left(\frac{1-2\delta+\delta^2}{1+\delta}\right) + c\left(\frac{3+\delta^2}{1+\delta}\right) = z_2 > z_1.$$

So the necessary condition is (M2), and therefore we need:

$$\alpha \leq \frac{(1-\delta^2)(s+c)}{(1-\delta)^2 s + (3+\delta^2)c},$$

(note that this value is higher than 1 iff $\frac{s}{c} > \frac{1+\delta}{\delta(1-\delta)}$).

**Case (b):**

$|\delta(2x-s)-(1-\delta)c| = (1-\delta)c - \delta(2x-s) = \frac{1}{1+\delta}\left(c(1+\delta^2) - \delta s(1-\delta)\right).$

Again, rewriting (M1) and (M2) we obtain,

$$\frac{(1-\delta)}{\alpha}(s+c) \geq z_1, \tag{M1}$$

$$\frac{(1-\delta)}{\alpha}(s+c) \geq (1-\delta)(s+c), \tag{M2}$$

and since $(1-\delta)(s+c) > z_1$, the necessary condition is again (M2), which, to be satisfied, implies $\alpha \leq 1$.

We can conclude that there exists a minimum value of $\alpha$, $\alpha_{\min} = \max\left\{1, \frac{(1-\delta^2)(s+c)}{(1-\delta)^2 s+(3+\delta^2)c}\right\}$, under which the candidate equilibrium payoffs are the ones obtained from the direct (face-to-face) negotiation.

**Case 2 (Fully mediated-FM)**

Conditions (M1) and (M2) hold with equality, that is,

$$\frac{(1-\delta)}{\alpha}(s+c) = |2x-s| - |\delta(2y-s)-(1-\delta)c|, \tag{M1}$$

$$\frac{(1-\delta)}{\alpha}(s+c) = |2y-s| - |\delta(2x-s)-(1-\delta)c|. \tag{M2}$$

Note first that, in this case, we must have $x \geq \frac{s}{2}$ and $y \leq \frac{s}{2}$. Otherwise, players 1 and 2, respectively, would have a beneficial deviation. Therefore, we can rewrite the conditions in the following way:

$$\frac{(1-\delta)}{\alpha}(s+c) = 2x-s-(1-\delta)c-\delta(s-2y), \tag{M1}$$

$$\frac{(1-\delta)}{\alpha}(s+c) = s-2y-|\delta(2x-s)-(1-\delta)c|. \tag{M2}$$

**Case 2.1**

$|\delta(2x-s)-(1-\delta)c| = (1-\delta)c - \delta(2x-s).$

In this case, we obtain,

$$x = \frac{s}{2} + \frac{(1-\delta^2)(s+c(1+\alpha))}{2\alpha(1+\delta^2)},$$

$$y = \frac{s}{2} - \frac{(1-\delta)^2(s+c(1+\alpha))}{2\alpha(1+\delta^2)}.$$

We have to check if conditions (1) and (2) of equilibrium are satisfied.

We get the following conditions:

Necessary condition for (1) to be satisfied: $\alpha \geq 1$.

Necessary condition for (2) to be satisfied:

$\alpha\left(s(1+\delta^2) - c(1+2\delta-\delta^2)\right) \geq (s+c)(1+2\delta-\delta^2)$.

-If $\frac{s}{c} < \frac{1+2\delta-\delta^2}{1+\delta^2}$, this condition is never satisfied.

-If $\frac{s}{c} \geq \frac{1+2\delta-\delta^2}{1+\delta^2}$, we need the following condition for existence of equilibrium:

$$\alpha \geq \frac{(s+c)(1+2\delta-\delta^2)}{s(1+\delta^2) - c(1+2\delta-\delta^2)}. \tag{ii}$$

We can easily prove that condition (ii) implies (i).

Since we are in the case where $(1-\delta)c \geq \delta(2x-s)$, we need the following condition for this to hold:

$$\alpha \geq \frac{\delta(1+\delta)(s+c)}{c(1-\delta)}. \tag{iii}$$

Therefore, if $\alpha > \max\left\{\frac{\delta(1+\delta)(s+c)}{c(1-\delta)}, \frac{(s+c)(1+2\delta-\delta^2)}{s(1+\delta^2)-c(1+2\delta-\delta^2)}\right\}$ and $\frac{s}{c} \geq \frac{1+2\delta-\delta^2}{1+\delta^2}$, the candidate equilibrium offers are the previous ones.

**Case 2.2**

$|\delta(2x-s) - (1-\delta)c| = \delta(2x-s) - (1-\delta)c$.

In this case, we obtain,

$$\begin{aligned} x &= \frac{s}{2} + \frac{s+c(1+\alpha)}{2\alpha} - \frac{\delta c}{1+\delta}, \\ y &= \frac{s}{2} - \frac{s+c(1+\alpha)}{2\alpha} + \frac{c}{1+\delta}. \end{aligned}$$

Note that we do not have always $y \leq \frac{s}{2}$ and $x \geq \frac{s}{2}$. If we had $y \leq \frac{s}{2}$, then we would also have $x \geq \frac{s}{2}$. The necessary condition for $y \leq \frac{s}{2}$ is:

$$\alpha \leq \frac{(1+\delta)(s+c)}{c(1-\delta)}. \tag{iv}$$

A sufficient condition for this to be satisfied is $\alpha < \frac{1+\delta}{1-\delta}$.

The necessary condition to be in the case $(1-\delta)c \leq \delta(2x-s)$ is

$$\alpha \leq \frac{\delta(1+\delta)(s+c)}{c(1-\delta)}. \tag{v}$$

We check the conditions for (1) and (2) to be satisfied.

Necessary condition for (1) to be satisfied is

$$\alpha \geq \frac{(s+c)(1+\delta)^2}{s(1-\delta^2) + c(3-2\delta-\delta^2)}. \tag{vi}$$

The necessary condition for (2) to be satisfied is

$$\alpha \geq \frac{(1+\delta)^2(s+c)}{s(1-\delta^2)-c(1-\delta)^2}.$$

Then, if $\frac{(1+\delta)^2(s+c)}{s(1-\delta^2)-c(1-\delta)^2} \leq \alpha \leq \frac{\delta(1+\delta)(s+c)}{c(1-\delta)}$, and $\frac{s}{c} \geq \frac{1+2\delta-\delta^2}{\delta(1+\delta)}$, the mentioned offers are a potential equilibrium.

**Case 3 (Partially mediated-PM)**

We study the case when conditions (2) and (M2) are binding, which again implies that, at equilibrium, $y \leq \frac{s}{2}$ :

$$\begin{aligned} s-x &= \delta(s-y), && (2) \\ \frac{(1-\delta)}{\alpha}(s+c) &= s-2y-\left|\delta(2x-s)-(1-\delta)c\right|. && (\mathrm{M2}) \end{aligned}$$

**Case 3.1**

We analyze first the case where $|\delta(2x-s)-(1-\delta)c| = (1-\delta)c-\delta(2x-s)$. In this case the candidate equilibrium offers are the following:

$$\begin{aligned} y &= \frac{s(\alpha+2\alpha\delta-1)-c(1+\alpha)}{2\alpha(1+\delta)}, \\ x &= s(1-\delta)+\delta y. \end{aligned}$$

For the case $2x \leq s$, we can prove that condition (M1) always holds. The necessary condition for (1) to hold is $y \geq \frac{\delta s-c}{1+\delta}$, and we also need $x \leq \frac{s}{2}$ (which implies $y \leq \frac{s}{2}$). This implies that $1 \leq \alpha \leq \frac{\delta(s+c)}{s-\delta c}$.

For the case $2x \geq s$, we have to add a necessary condition for (M1) to hold, which is $y \leq \frac{s(1-\delta-\alpha+3\alpha\delta)}{4\alpha\delta}$, and impose $x \geq \frac{s}{2}$ and $(1-\delta)c \geq \delta(2x-s)$. If we put all these necessary conditions together, we obtain the following:

If $\frac{s}{c} \leq \frac{1-\delta^2+2\delta}{1+\delta^2}$, we need $\alpha \geq 1$.

If $\frac{s}{c} \geq \frac{1-\delta^2+2\delta}{1+\delta^2}$, we need $1 \leq \alpha \leq \frac{(1-\delta^2+2\delta)(s+c)}{s(1+\delta^2)-c(1-\delta^2+2\delta)}$.

**Case 3.2.**

We analyze now the case where $|\delta(2x-s)-(1-\delta)c| = \delta(2x-s)-(1-\delta)c$. The candidate equilibrium offers are:

$$\begin{aligned} y &= \frac{s(\alpha+\delta-\alpha\delta+2\alpha\delta^2-1)-c(1-\alpha)(1-\delta)}{2\alpha(1+\delta^2)}, \\ x &= s(1-\delta)+\delta y. \end{aligned}$$

Checking for all the conditions required we get the following necessary conditions for the above offers to be an equilibrium:

$\frac{s}{c} > \frac{1}{\delta}$ and $\frac{\delta^2(s+c)}{\delta s-c} \leq \alpha \leq \frac{(1+\delta)^2}{s(1-\delta^2)-c(1-\delta)^2}$.

Given all these candidate equilibria, we can check that, for the cases 1 and 3, there exists an overlapping of equilibrium offers for some regions.

This completes the proof. ■

**Proof. (Corollary 2)**

Given the payoffs obtained for the case when $\alpha \to +\infty$, we can easily prove the following:

- For the case $\frac{s}{c} \geq \frac{(1-2\delta-\delta^2)}{1+\delta^2}$, the difference in payoffs if the weakest player (player 1) starts the negotiation is $\frac{(1-\delta^2)c}{(1+\delta^2)}$, while the difference if it is the strongest player the one who starts is $\frac{(1-\delta)^2 c}{(1+\delta^2)} < \frac{(1-\delta^2)c}{(1+\delta^2)}$.
- For the case $\frac{s}{c} \leq \frac{(1-2\delta-\delta^2)}{1+\delta^2}$, the difference in payoffs if the weakest player (player 1) starts the negotiation is $\frac{s-\delta c}{1+\delta}$, while the difference if it is the strongest player the one who starts is $\frac{c-\delta s}{1+\delta} < \frac{s-\delta c}{1+\delta}$.

This completes the proof. ■

**Proof. (Corollary 3)**

First we can compute $\Delta P^{Dpm}$ as follows:

$$\Delta P^{Dpm} \equiv \left| P_1^{Dpm} - P_2^{Dpm} \right| = \left| \frac{s(1-\delta) - 2\delta c}{1+\delta} \right| = \begin{cases} \frac{s(1-\delta)-2\delta c}{1+\delta}, & \text{if } \delta \leq \widetilde{\delta} \\ \frac{2\delta c - s(1-\delta)}{1+\delta}, & \text{if } \delta \geq \widetilde{\delta} \end{cases}, \text{ with } \widetilde{\delta} = \frac{s}{s+2c}.$$

Take the case $\frac{s}{c} \geq \frac{1+2\delta-\delta^2}{1+\delta^2}$. In this case,

$$\Delta P^{Ipm} \equiv \left| P_1^{Ipm} - P_2^{Ipm} \right| = \frac{(1-\delta)^2}{(1+\delta^2)} c.$$

Take the case $\frac{s}{c} \leq \frac{1+2\delta-\delta^2}{1+\delta^2}$. In this case,

$$\Delta P^{Ipm} = \frac{c-\delta s}{1+\delta}.$$

Note that $\Delta P^{Dpm} = 0$ for $\delta = \widetilde{\delta}$, and it is decreasing in $\delta$ for $\delta \leq \widetilde{\delta}$ and increasing in $\delta$ for $\delta \geq \widetilde{\delta}$. In the same way, note that $\Delta P^{Ipm}$ decreases with $\delta$. ■

**Proof. (Proposition 6)**

When the outside payoffs are such that $s = P_i^* + P_j^*$, note that, since the outside payoffs sum up to $s$, and the players have the possibility of opting out at any time of the game, the only equilibrium agreement is exactly their outside payoffs, because neither player will accept anything less.

In the case where $s > P_i^* + P_j^*$, since we concentrate in the case where the threat of breaking the negotiations and moving to the outside option is always credible for the proposer, the optimal strategy of the proposer will always be as follows: *propose* $(x_i, s - x_i)$ *and break the* *negotiations and move to the outside-option in case this offer is not accepted (or not submitted by the mediator).* By the same reasoning, the responder will accept this offer whenever submitted.

The proposal has to be such that the following restrictions are fulfilled:

1. $|2x_i - s| \leq \frac{1}{\alpha}\left(s - (P_i^* + P_j^*)\right) + \left|P_i^* - P_j^*\right|$. Otherwise, the mediator prefers to block the proposal and induce the players to move to the outside option.

2. $s - x_i \geq P_j^*$. Otherwise, the responder, even if the mediator submits the proposal, will prefer to reject it and ensure the outside option payoffs.

3. $x_i \geq P_i^*$. The proposer has to gain, at least, the same payoffs as in the outside option.

Taking this into account, let us see when $x_i^* = s - P_j^*$ constitutes an equilibrium offer. Note that this corresponds to the Ponsatí-Sákovics offer and (by 2.) it is the maximum the proposer can aim at achieving.

First, it is straightforward, since $s > P_1^* + P_2^*$, that this offer fulfills 3.

It fulfills 1. if and only if

$$\left|s - 2P_j^*\right| \leq \frac{1}{\alpha}\left(s - (P_i^* + P_j^*)\right) + \left|P_i^* - P_j^*\right|. \qquad (M_P)$$

First, if $\left|s - 2P_j^*\right| \leq \left|P_i^* - P_j^*\right|$ this condition always holds. It can be checked that this condition is equivalent to

$$P_i^* \leq P_j^* - \left|s - 2P_j^*\right|. \qquad (C_P)$$

It can be checked, moreover, that a sufficient condition for $(C_P)$ to hold is that $P_j^* \geq \frac{s}{2}$.

When $(C_P)$ does not hold, $(M_P)$ is fulfilled, provided $\alpha \leq \alpha_i^0$, with

$$\alpha_i^0 \equiv \frac{\left(s - (P_i^* + P_j^*)\right)}{\left|s - 2P_j^*\right| - \left|P_i^* - P_j^*\right|}.$$

Summarizing, $x_i^* = s - P_j^*$ constitutes an equilibrium offer if and only if: $(C_P)$ holds or, in case it does not hold, if $\alpha \leq \alpha_i^0$.

Otherwise, this proposal will not be submitted by the mediator. In this case, the proposer will ask for himself, the maximum share that is compatible with the block-pass decision of the mediator. Therefore, $x_i^*$ will be such that:

$$x_i^* = \frac{s}{2} + \frac{1}{2}\left(\frac{1}{\alpha}\left(s - (P_i^* + P_j^*)\right) + \left|P_i^* - P_j^*\right|\right).$$

It can be easily checked that, first $x_i^* \geq P_i^*$ and, hence 3. is fulfilled and that 2. is fulfilled as well since $x_i^* \leq s - P_j^*$ (given $P_j^* < \frac{s}{2}$, in this case).

This constitutes, therefore, an equilibrium offer. ■

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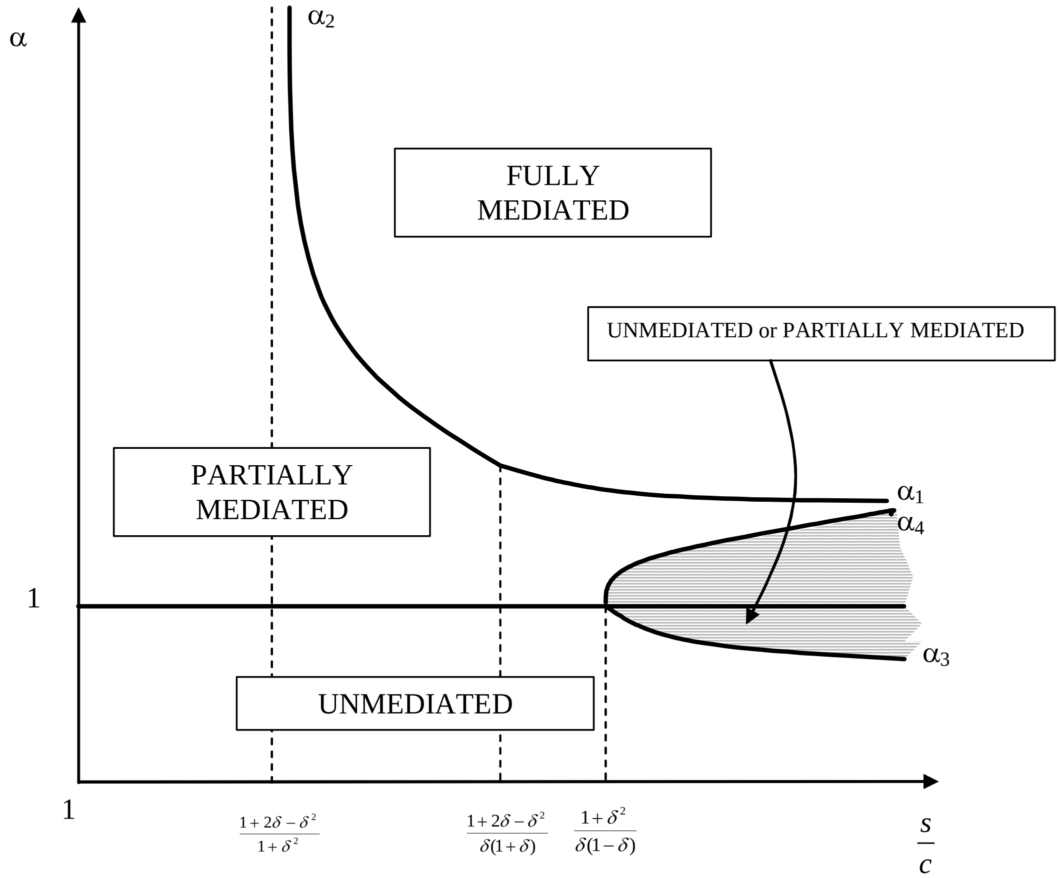


**Figure 1:** Structure of the equilibria in indirect negotiations under peacemaking.

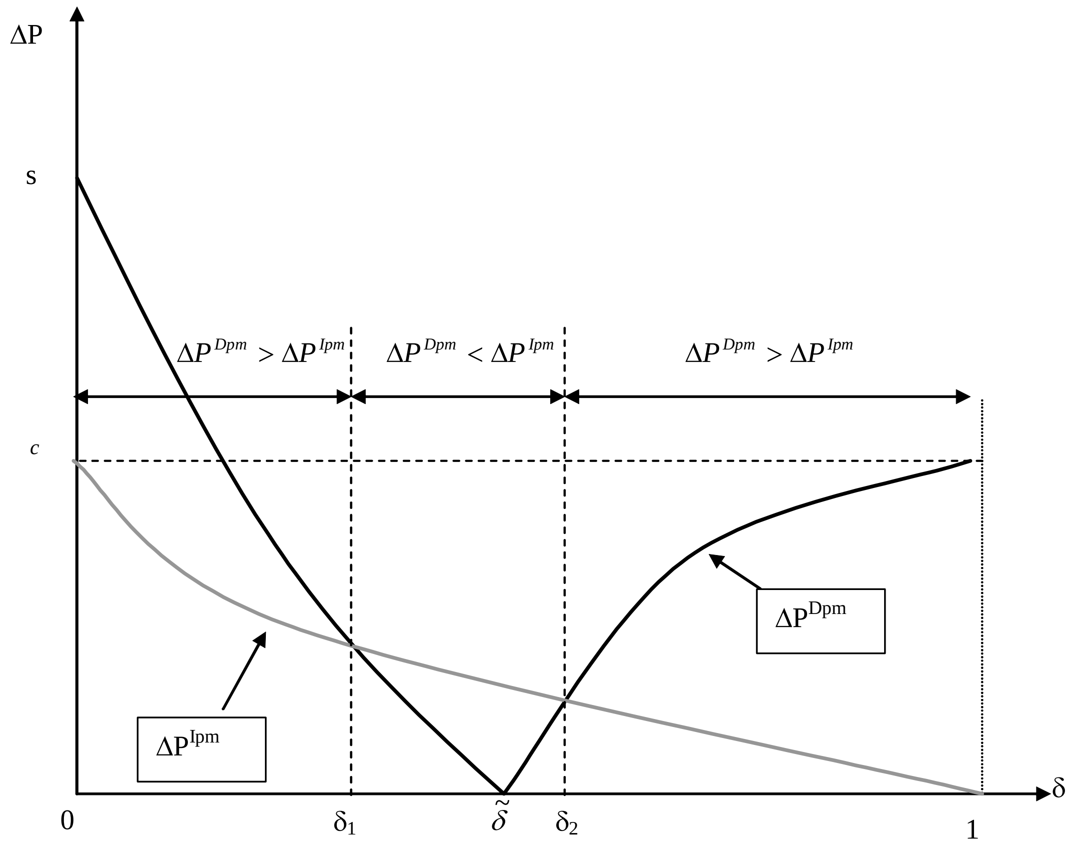


**Figure 2:** Comparison of the equality achieved in a direct and in an indirect negotiation by an equality-seeking ($\alpha \to \infty$) mediator.