

Getting to NO: The Strategic Use of Duplicitous Negotiations

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A substantial literature has examined negotiation problems. Throughout this literature, scholars have generally assumed that participants approach negotiations with the intent of reaching a deal and that aside from the direct costs of engaging in negotiations, negotiation participants cannot be significantly harmed by the negotiation process. In this paper, we challenge these assumptions. We define situations in which negotiators use the negotiation process to achieve goals other than reaching a potential agreement as *duplicitous negotiations*. We model the implications of this broader conceptualization of negotiations and consider the influence of outside options and asymmetric information. We demonstrate that the mere possibility of negotiating duplicitously and/or of encountering a duplicitous negotiator significantly changes the equilibrium outcomes and harms profits. We describe social welfare as well as prescriptive and policy implications of considering duplicitous negotiations. We also analyze the impact of information about players' outside options on the negotiation outcomes. We demonstrate that both the ownership-structure ('who knows what') and the precision of the information available to players can have a significant impact on outcomes.

1 Introduction

Negotiation scholars in both psychology and economics have assumed that individuals approach negotiations with the goal of reaching an agreement. This assumption is often implicit in the problem formulation, but many scholars have stated this assumption explicitly as well. For example, Fisher, Ury and Patton (1991: xvii) define negotiations as "back and forth communication *designed to reach an agreement*." Similarly, Rubin and Brown (1975: 2) define negotiations as "two or more parties [who] *attempt to settle* what each should give and take." Carnevale and Lawler (1986: 636) state that "Negotiation is a form of symbolic communication that involves two or more people *attempting to reach agreement* on issues where there are perceived differences of interest." And Rubinstein (1982: 97) defines negotiation as a situation in which "two individuals have before them several possible contractual agreements. *Both have interests in reaching agreement* but their interests are not entirely

identical. What will be the agreed contract, assuming that both parties behave rationally?”
[emphases added]

While prior research has accepted that negotiators might fail to reach an agreement, the extant work has attributed negotiation impasses to one of two causes. First, negotiation partners may lack a zone of agreement (e.g., the amount a buyer is willing to pay is lower than what a seller is willing to accept). Second, negotiation partners may fail to find their zone of agreement (e.g., the parties may fail to recognize opportunities for mutually beneficial trades). Prior work has rarely considered the possibility that negotiators may be motivated to use the negotiation process for an ulterior motive that is very different from reaching an agreement.

In this paper, we challenge the assumption that individuals enter negotiations with “interests in reaching agreement” (Rubinstein 1982:97). Instead, we argue that some individuals enter the negotiation process with ulterior motives. We define these negotiators as “*duplicitous negotiators*.” duplicitous negotiations occur when one or more parties use the negotiation process to achieve an outcome very different from reaching an agreement.

We adapt Carnevale and Lawler’s (1986) definition of negotiations to incorporate the possibility of duplicitous negotiators. We redefine negotiations in the following way:

Negotiation is a form of symbolic communication that involves two or more people with the *professed* objective of reaching an agreement. These parties may have divergent interests, including interests orthogonal to reaching an agreement.

In this paper, we model duplicitous negotiations and we consider the influence of outside options and asymmetric information. Our broader conceptualization of negotiations has important implications, and we describe how the mere possibility of encountering a duplicitous counterpart influences the decision to enter negotiations, the negotiation process, and negotiated outcomes. Section 2 motivates the analytical model by describing some actual instances of duplicitous negotiations in diverse settings. Section 3 reviews the relevant negotiations literature. Section 4 formulates and analyzes the main model of the paper. Section 4.1 derives the equilibrium outcomes for various parameter values, and analyzes when and how frequently duplicitous negotiations are observed. Section 4.2 analyzes the impact of duplicitous negotiations on individual profits and welfare, and studies the policy implications for welfare-maximizing governance. Clearly, as the results of Section 4 show, negotiators’

outside options affect their choice of sincere or duplicitous negotiations, as well as their decision to enter into negotiations in the first place. Section 5 demonstrates that each party's *information* about the other's outside option also plays a pivotal role in the negotiations. Section 5 first analyzes the case of perfect information about a counterpart's outside option, and then extends the analysis to *imperfect information*. Section 6 reviews practical policy prescriptions to counter the risks of duplicitous negotiations and discusses avenues for future research. Section 7 concludes.

2 Motivation

Prior research has generally assumed that individuals enter negotiations with the intent of reaching an agreement. In practice, individuals may enter negotiations *duplicitously* to achieve goals that are very different from reaching an agreement. One such reason individuals may enter negotiations is to stall for time. A second reason individuals may duplicitously enter negotiations is to create a (false) cooperative impression. A third reason individuals may duplicitously enter negotiations is to gather information about their counterpart. A fourth reason individuals may duplicitously enter a negotiation is to improve their bargaining position in a different negotiation.

Duplicitous negotiators seek to increase their payoffs by using the negotiation process for an ulterior motive. Duplicitous negotiations are characterized by intentional misdirection. For duplicitous negotiators to succeed, they need to mislead their counterpart into thinking that their intentions for reaching an agreement are sincere.

A classic example of the successful use of duplicitous negotiations involves the Peruvian government's negotiation with the radical Túpac Amaru Revolutionary Movement (also called MRTA: Movimiento Revolucionario Túpac Amaru) in 1996. In this case, the Peruvian government led by Fujimori, used negotiations to gain time and to gather information. As the Canadian ambassador to Peru who participated in the negotiations later asserted, Fujimori's negotiating team "...had served as little more than a cover to give [Fujimori] time to put in place the physical and political elements of a raid" (Schemo 1997).

On December 17, 1996, fourteen hostage takers belonging to the MRTA, a radical rebel movement, took over the Japanese Ambassador's residence. At the time, the Japanese Ambassador was hosting a large party and several prominent members of the Peruvian government were in attendance.

The hostage takers initially held approximately 600 people including the president's brother, two generals, and the chief justice of Peru. The MRTA made an initial demand for the release of 400 comrades. During the course of negotiations, the Peruvian government and the hostage takers negotiated over a wide range of issues. The progress of these negotiations was very slow. The head of the Red Cross, Michele Minick, served as a mediator, and the primary focus of the negotiations was on the composition of a Committee of Guarantees to enforce a potential agreement. For example, the two sides negotiated heatedly over the inclusion or exclusion of a representative from Guatemala on this panel (Shaw and Newman 1997).

Concurrent with the meandering negotiation process, the Peruvian military began preparations to storm the compound. Starting in late December just days after the hostage situation began, the Peruvian government built a full-scale model of the Japanese Ambassador's residence on a remote naval base. Special units from Peru's military began to practice storming the compound. The military also dug 170 meters of tunnels under the Japanese residence. The negotiations extended through April 1997, and in early April, Fujimori proclaimed that "We are not contemplating the use of force [except] in an unmanageable emergency, which we don't expect to happen" (Anderson 1997).

On April 23rd, 1997, while most of the hostage takers were playing soccer in the living room, the Peruvian military stormed the compound. During the operation one hostage was killed, two soldiers were killed, and all fourteen hostage takers were killed.

Duplicitous negotiations are prevalent across a very wide range of domains. For example, technology companies may enter merger or acquisition negotiations with a competitor with the real objective of learning technological secrets. One such example involved negotiations between Microsoft and Stac Electronics. After the (unsuccessful) negotiations process, Stac accused Microsoft of stealing its data compression code and using it in MS-DOS 6 (Stac Electronics' patent infringement complaint against Microsoft Corp., January 25, 1993). In this case, a California jury awarded Stac \$120 million in compensatory damages in 1994 (Fisher 1994).

In another example, the Boston Red Sox initiated negotiations to keep a pitcher from signing up with a rival baseball team. "When they began their pursuit of Daisuke Matsuzaka [in the fall of 2006] one of their main motivations was to keep him from the Yankees." (Chass 2007) By engaging Matsuzaka in negotiations, the Red Sox were able to preclude other baseball teams from negotiating with him. "If the Red Sox were unsuccessful in reaching a

deal, possession of Matsuzaka would have reverted to his Japanese team, the Seibu Lions, for at least one season and the Red Sox would have recouped their \$51.1 million bid. No money lost, and, at least for now, no Matsuzaka in the Bronx.” (Chass 2007)

Similar accusations have been made of individuals, corporations, and governments which have used the negotiation process to achieve aims very different from the classical notion of using the negotiation process to reach an agreement.

Although many negotiators approach negotiations with duplicitous motives, it is also possible that negotiator intentions can change during the course of negotiations. For example, the Boston Red Sox may have initiated negotiations with Matsuzaka with duplicitous motives, but shifted to negotiate sincerely as the negotiations progressed. Conversely, negotiators may initiate a negotiation with sincere motives, and shift to negotiating duplicitously during the course of negotiations.

3 Literature Review

A substantial literature in both economics (e.g., Nash 1950; Binmore *et al.* 1986; Rubinstein 1982) and psychology (see Bazerman *et al.* 2000) has studied negotiations. This work includes theoretical models, case studies, and experimental studies of negotiations.

Nash’s (1950) classic research used axiomatic methods to solve bargaining problems. This work mapped initial endowments and strategies to specific solutions. A large body of research extended Nash’s results. For example, Binmore *et al.* (1986) and Rubinstein (1982) extended early bargaining models by challenging the static formulation of mapping initial positions instantly to outcomes. Instead, these scholars began to focus on the negotiation process. For example, Binmore *et al.* (1986) considered strategic delay as a way to communicate credibility.

Related research has studied negotiator behavior (Bazerman *et al.* 2000). Most of this research has explored behavior within laboratory or classroom settings. Almost without exception, this work has assumed that “negotiation involves discussion between the parties with *the goal of reaching agreement*” (Carnevale and Pruitt 1992: 532, emphasis added). The dominant experimental paradigm in negotiation research involves exercises (e.g., ultimatum games or role-play exercises) with a positive zone of agreement and rewards for reaching an agreement (Bazerman *et al.* 2000; Camerer 2003). This research paradigm has been used to study a number of important constructs such as generosity (Larrick and Blount 1997),

judgment (Blount and Larrick 2000; Larrick and Wu 2007; Morris *et al.* 1999), emotions (Van Kleef *et al.* 2004), time pressure (Carnevale and Lawler 1986; Moore 2004a; Moore 2004b), and the relationship between communication processes and outcomes (Bolton *et al.* 2003; McGinn and Keros 2002).

A few negotiation exercises (e.g., Karp *et al.* 2006; Paulson 2004) have considered cases in which the normative outcome is an impasse. Even in these situations, however, participants enter negotiations with sincere intentions. This work has not considered situations in which negotiators are motivated to use the negotiation process to achieve an ulterior motive (e.g., to stall for time). Interestingly, many participants, even when they lack a zone of agreement, do reach agreement. This finding motivated scholars to introduce excessive agreement-seeking as a type of bias (Gibson *et al.* 1994; 1996; Thompson 2005, page 224).

Prior research has also considered costs negotiators might encounter for entering negotiations (e.g., Ghosh 1996; Lamm 1976; Watkins 1998). For example, negotiators may incur time delay costs for participating in negotiations (Watkins 1998). These costs may be asymmetric across negotiators, and delaying the negotiation process may confer a relative advantage to one party over another. This work, however, has still assumed that negotiators are interested in, and are better off for, reaching an agreement.

Related work (e.g., Pruitt 1981; Zartman 1978) has considered situations in which negotiators engage with multiple counterparts (e.g., a car buyer who negotiates with more than one dealer) and on multiple fronts with the same counterpart (e.g., going to court while at the same time negotiating to reach a settlement). In these cases, the prospects for reaching a favorable outcome in one domain (e.g., at trial) influence the negotiation process in the other domain (e.g., in settlement talks).

In this paper, we model and analyze the implications of using the negotiation process for ulterior motives. This approach is well suited for negotiators who may improve their position in one domain (e.g., competing with new information or preparing to launch an attack) by using the negotiation process in another domain (e.g., for gathering information or gaining time).

4 Model, Analysis and Policy Implications

Consider a bargaining game between two players with initial (pre-bargaining) endowments α and β , where $\alpha, \beta \geq 0$. A natural interpretation of α and β is as the players' outside options

if they decide not to negotiate. Each player is risk-neutral and seeks to maximize his own expected surplus. Player 1 can make a bargaining overture to player 2, at a cost $c_o > 0$. Player 2 could in turn consent to enter into negotiations, or reject the overture in favor of the status quo (in which case both players exercise their outside options, α and β). Further, player 1’s overture could be *sincere* or *duplicitous* (defined below), and player 2 has no way of distinguishing *a priori* between the two types of overtures.

We assume that both players have *private* information about the value of their own outside options. At the beginning of the game, each player knows, or learns, the value of his own outside option, as well as the probability distribution of the counterpart’s outside option (that is, the possible values of the counterpart’s outside option and their probabilities). We discuss the payoff structure under sincere and duplicitous negotiations below.

The case of sincere negotiations corresponds to the conventional paradigm with a positive zone of agreement; in this case, the size of the total pie expands so that instead of the payoffs (outside options) α and β , the players get $\alpha(1 + \delta)$ and $\beta(1 + \delta)$, respectively, where $\delta > 0$ is the *payoff expansion factor* under sincere negotiations.¹ The traditional approach (see Bazerman *et al.* 2000) assumes that negotiators cannot be harmed by the negotiations process; this is consistent with “sincere negotiations” in our model.

In contrast, “duplicitous negotiations” create no surplus for the system. Rather, such negotiations aim at increasing the payoff for player 1 at the expense of player 2. When player 1 is successful in negotiating duplicitously, there is a net transfer of a portion of player 2’s endowment, given by $\gamma\beta$, from player 2 to player 1, where $\gamma \in [0, 1]$ is a scaling factor. Thus, under duplicitous negotiations, player 1’s final endowment (excluding costs) increases to $(\alpha + \gamma\beta)$, and player 2’s final endowment falls to $(1 - \gamma)\beta$. The parameter γ has important governance and policy implications, discussed in Section 4.2. Figure 1 depicts the sequence of events, and the payoffs from the various possible outcomes, in an extensive game tree. ‘Nature’ determines the value of each player’s outside option. Based on his outside option, player 1 then decides from among three choices: No overture (preserving the status quo), sincere overture or duplicitous overture, where making any overture costs him c_o . As discussed, player 2 always loses under duplicitous negotiations, and is always better

¹A canonical example is the merger of two firms in duopolistic competition. Consider two firms—each producing at zero marginal costs—selling in a market characterized by the demand curve $P(q) = 1 - q$. Theory predicts that under Cournot competition, each firm would make a profit of $\frac{1}{9}$. The monopoly firm resulting from their merger would make a profit of $\frac{1}{4}$, and so, the owners of each firm would make $\frac{1}{8}$ from the merger. Comparing their pre- and post-merger profits, $\frac{1}{8} = \frac{1}{9}(1 + \delta)$, where the payoff expansion factor $\delta = \frac{1}{8}$ is a measure of the benefit of eliminating competition through (sincere) negotiations.

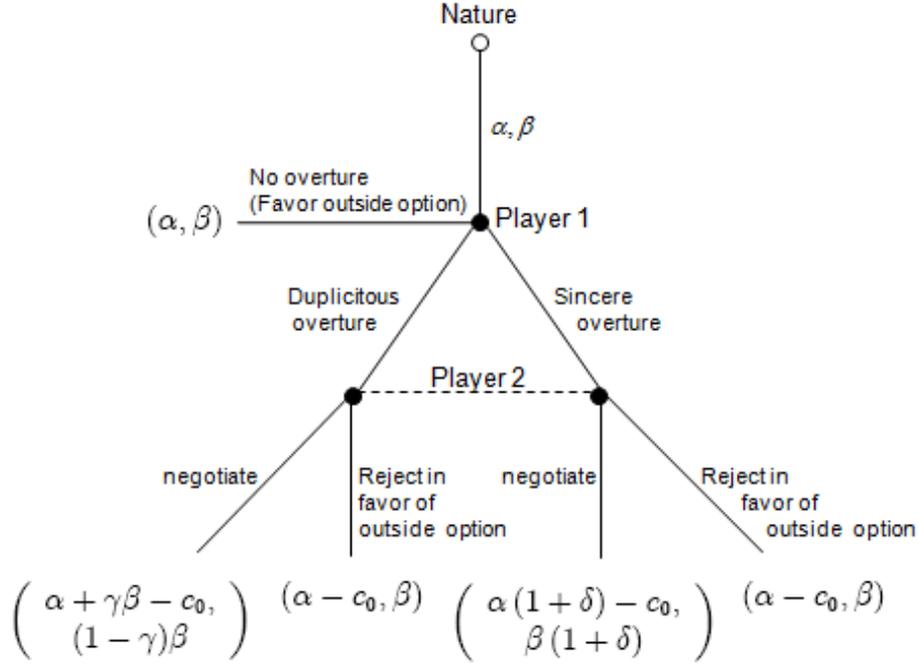


Figure 1: Sequence of Events in the Extensive Form Game: Tuples in the end nodes depict Player 1's and Player 2's payoffs respectively.

off under sincere negotiations. The challenge for player 2 is that he cannot observe player 1's outside option, and so his decision either to enter into negotiations or to reject player 1's overture is a function of his *estimate* of player 1's motives.

We will assume that players' outside options are drawn from the following binary distributions:

$$\alpha = \begin{cases} \alpha_H, & \text{with probability } q \\ \alpha_L, & \text{otherwise} \end{cases} \quad (1)$$

and

$$\beta = \begin{cases} \beta_H, & \text{with probability } r \\ \beta_L, & \text{otherwise} \end{cases}, \quad (2)$$

where $\alpha_H > \alpha_L \geq 0$, $\beta_H > \beta_L \geq 0$, and $q, r \in [0, 1]$ (The subscripts H and L denote *High* and *Low* values respectively). We assume that the distributions given in (1) and (2) as well as the negotiation overture cost, c_o , are *common knowledge*. Thus, even though the players do not know their counterpart's outside option value exactly, they know the distribution from which that value is drawn.

4.1 Analysis of equilibria

In this Section, we derive the equilibrium of the game. We first compare player 1's payoffs from sincere versus duplicitous negotiations to derive his preferences. As Figure 1 shows, the *expected* payoffs for player 1, given what he knows, for any value of α are $\alpha(1 + \delta) - c_o$ under sincere negotiations and $\alpha + \gamma\mathbb{E}\beta - c_o$ under duplicitous negotiations, where $\mathbb{E}\beta = r\beta_H + (1 - r)\beta_L$ is the expected value of player 2's outside option. There exists a unique threshold, α^* , for player 1's outside option which determines his preferences between negotiating sincerely or duplicitously. This threshold satisfies $\alpha^* + \gamma\mathbb{E}\beta = \alpha^*(1 + \delta)$, or $\alpha^* = \frac{\gamma\mathbb{E}\beta}{\delta}$. *Conditional* on his decision to negotiate, player 1 will negotiate sincerely if $\alpha \geq \alpha^*$ and duplicitously otherwise. Observe that *duplicitous negotiations are more attractive to player 1 when his outside option is less attractive*.

For duplicitous negotiations to play a meaningful role in the game, player 1's expected payoff from duplicitous negotiations must exceed that from sincere negotiations for *some but not all* values of α ; i.e., we must have $\alpha_L < \alpha^* < \alpha_H$. We provide the intuition below. When $\alpha_L \geq \alpha^*$, player 2 correctly anticipates that player 1's overtures will always be sincere (recall that $\alpha_H > \alpha_L$), and the outcome is always sincere negotiations. Similarly, when $\alpha_H < \alpha^*$, player 1 always prefers negotiating duplicitously, and player 2, correctly anticipating this, rejects any and all of player 1's overtures. Player 1, in turn, avoids making a (futile) overture to save on the overture cost c_o . Thus, when $\alpha_H < \alpha^*$, the *inevitable* outcome is the preservation of the status quo. Therefore the only interesting (non-trivial) case is when

$$\alpha_L < \alpha^* = \frac{\gamma\mathbb{E}\beta}{\delta} < \alpha_H, \quad (3)$$

which we will assume for the rest of this paper. One implication is that player 1's outside option directly determines his "negotiation type"—he prefers to negotiate duplicitously if his outside option is α_L (which occurs with probability $(1 - q)$) and sincerely if his outside option is α_H (which occurs with probability q).

Hence, even though player 2 does not observe player 1's outside option, he can rationally anticipate that player 1 will negotiate sincerely with probability q and duplicitously with probability $(1 - q)$. Player 2 will enter negotiations if his expected benefit from negotiations is at least as high as his outside option. Thus, player 2 will negotiate *if and only if* $q\beta(1 + \delta) + (1 - q)(1 - \gamma)\beta \geq \beta$, i.e.,

$$q \geq \frac{\gamma}{\gamma + \delta}. \quad (4)$$

Condition (4) shows that the probability that player 2 enters into negotiations in response to an overture from player 1 *increases* as (i) the probability q of a high outside option for player 1 *increases* (making it more likely that the overture is sincere), (ii) the payoff expansion factor δ under sincere negotiations *increases*, and (iii) the scale parameter γ (which determines the potential harm to player 2 from a duplicitous overture) *falls*. Further, condition (4) shows that player 2's *decision* to enter into negotiations is independent of his outside option β . This is because, while β determines the *scale* of player 2's payoffs under the different possible outcomes (viz., sincere, duplicitous or no negotiations), it does not alter the *relative* attractiveness of these outcomes.

Before deriving the equilibrium of the entire game, we make a few observations. First, as Figure 1 makes clear, this is a *dynamic* game, in which Nature and the players move *sequentially*. Second, this is a game of *incomplete information*: When making his move, Player 1 does not know Player 2's outside option precisely (and vice-versa). For such dynamic games of incomplete information, the appropriate equilibrium concept is the *Perfect Bayesian Nash Equilibrium (PBNE)* (cf Fudenberg and Tirole (1991)), which we derive. As is almost *de rigueur* in the game theory literature, we focus on PBNE in *pure strategies*. A PBNE has the following requirements: (i) Whenever a player has incomplete information, the *beliefs* (probability distributions) under which he operates (to fill the gaps in his information) must be specified; (ii) These beliefs must be derived, as far as possible, in Bayesian fashion, and must be *consistent* with the actual probabilities of outcomes. They must be specified both on and off the equilibrium path; and (iii) Each player's strategies must be *sequentially rational*, i.e., maximize his expected payoffs given his beliefs. Thus, under PBNE, beliefs are elevated to the same level of importance as strategies: Both the beliefs and the strategies of each player must be specified to constitute an equilibrium, as we do in Theorem 1.

Theorem 1 *For the game of Figure 1, there exists a pure-strategy Perfect Bayesian Nash Equilibrium (PBNE) for each set of parameter values, as specified below:*

Case 1: $c_o \leq \gamma \mathbb{E}\beta$ and $q \geq \frac{\gamma}{\gamma + \delta}$:

Player 1's strategy and beliefs: *Player 1 always makes an overture. His overture is sincere when his outside option is α_H and duplicitous when his outside option is α_L . His beliefs regarding player 2's outside option are that $\beta = \beta_H$ with probability r and β_L with probability $(1 - r)$, consistent with the prior distribution of β (given by expression (2)).*

Player 2's strategy and beliefs: *Player 2 always enters into negotiations in response to player 1's overture. His beliefs regarding player 1's outside option reflect its prior distribution (recall expression (1)), whether or not player 1 makes an overture. Thus, he believes that $\alpha = \alpha_H$ with probability q and α_L with probability $(1 - q)$, both on and off the equilibrium path.*

Outcome of the game: *Negotiations always occur in equilibrium. Sincere negotiations occur with probability q (when $\alpha = \alpha_H$) and duplicitous negotiations occur with probability $(1 - q)$ (when $\alpha = \alpha_L$).*

Case 2: $(c_o \leq \gamma \mathbb{E}\beta$ or $c_o > \alpha_H \delta)$ and $q < \frac{\gamma}{\gamma + \delta}$:

Player 1's strategy and beliefs: *Player 1 makes no overture. His beliefs regarding player 2's outside option reflect its prior distribution (given by expression (2)).*

Player 2's strategy and beliefs: *Player 2 always rejects player 1's overture, preferring to exercise his outside option instead. His beliefs regarding player 1's outside option reflect its prior distribution (recall expression (1)), whether or not player 1 makes an overture. Thus, he believes that $\alpha = \alpha_H$ with probability q and α_L with probability $(1 - q)$, both on and off the equilibrium path.*

Outcome of the game: *No negotiations take place. Each player exercises his outside option in equilibrium.*

Case 3 $c_o \in (\gamma \mathbb{E}\beta, \alpha_H \delta]$:

Player 1's strategy and beliefs: *Player 1 makes an overture only when his outside option is α_H , in which case his overture is sincere. When his outside option is α_L , he makes no overture, preferring instead to exercise his outside option. His beliefs regarding player 2's outside option reflect its prior distribution.*

Player 2's strategy and beliefs: *Player 2 always enters into negotiations in response to player 1's overture. His beliefs regarding player 1's outside option reflect player 1's strategy. Thus, he believes that $\alpha = \alpha_H$ with certainty when player 1 makes an overture, and that $\alpha = \alpha_L$ with certainty when player 1 does not make an overture.*

Outcome of the game: *Only sincere negotiations occur in equilibrium. Sincere negotiations occur when $\alpha = \alpha_H$ (i.e., with probability q). When $\alpha = \alpha_L$ (with probability $(1 - q)$), player 1 makes no overture, in which case both players exercise their outside options.*

Case 4: $c_o > \alpha_H \delta$ and $q \geq \frac{\gamma}{\gamma + \delta}$:

Player 1's strategy and beliefs: *Player 1 does not make an overture. His beliefs regarding player 2's outside option reflect its prior distribution.*

Player 2's strategy and beliefs: *Player 2 always enters into negotiations in response to player 1's overture. His beliefs regarding player 1's outside option reflect its prior distribution (recall expression (1)) both on and off the equilibrium path (i.e., whether or not player 1 makes an overture).*

Outcome of the game: *No negotiations take place. Each player exercises his outside option in equilibrium.*

Proof: The proofs of all Theorems are provided in the appendix. ■

Theorem 1 establishes that the equilibrium negotiation outcomes depend on c_o —the magnitude of player 1's initial investment in a negotiation overture— and other parameters such as the scaling factor γ for payoffs under duplicitous negotiations. When the overture cost is low enough (mathematically, when $c_o \leq \gamma E\beta$) and the probability of a sincere overture is high enough (i.e., $q \geq \frac{\gamma}{\gamma + \delta}$), it is attractive both for player 1 to make an overture and for player 2 to accept player 1's overture (Case 1 of Theorem 1). Under Case 2 of Theorem 1, the same equilibrium occurs for two disjoint ranges of c_o (i.e., $c_o \leq \gamma E\beta$ or $c_o > \alpha_H \delta$), but for slightly different reasons. When $c_o > \alpha_H \delta$, making an overture is not attractive to player 1; hence, no negotiations take place in equilibrium. When $c_o \leq \gamma E\beta$, the negotiations outcome is attractive to player 1, but because $q < \frac{\gamma}{\gamma + \delta}$, player 2 finds the probability of a duplicitous overture too high for him to risk accepting player 1's overture. Hence, player 2 would reject any negotiation overture from player 1. Anticipating this, player 1 forgoes making a futile overture (thus, avoiding the overture cost) and exercises his outside option.

Case 3 of Theorem 1 is unusual in that player 2 responds favorably to player 1's overture even for very low values of q . This is because, by making an overture, player 1 *perfectly* reveals that his outside option is α_H ; i.e., his overture is sincere (Also, when he does not make an overture, player 1 perfectly reveals that his outside option is α_L). Thus, Case 3

corresponds to the classical ‘pure separating equilibrium’ of Game Theory. Finally, Case 4 has the same no-negotiations outcome as Case 2, except that, in this case, player 2 wants to negotiate. Thus, had player 1 made an overture, player 2 would have responded favorably, contrary to his strategy in Case 2. However, c_o is too high for player 1 to bother with an overture.

Observe that duplicitous negotiations only occur when $c_o \leq \gamma E\beta$ and $q \geq \frac{\gamma}{\gamma+\delta}$ (Case 1). That is, for duplicitous negotiations to occur in equilibrium, player 1’s overture cost must be low enough to make such an overture worthwhile. Furthermore, the probability of sincere negotiations should be high enough that player 2 finds it attractive to accept negotiations. Both conditions are more likely to hold as the scale parameter γ increases.

Furthermore, when q and c_o are low enough ($q < \frac{\gamma}{\gamma+\delta}$ and $c_o \leq \gamma E\beta$), the fear of duplicitous negotiations causes player 2 to reject all overtures (including sincere overtures) because the probability of a duplicitous overture is high. This, in turn, discourages player 1 from making any overture. Thus in this case potential profits are lost and money that could be earned by both sides (from sincere negotiations) is left on the table.

In the next Section, we will build on the results of Theorem 1 to study firm and industry-level profits under different conditions. We will also study the implications, both to individual firms and to welfare, of governance policies that limit the occurrence of duplicitous negotiations.

4.2 Implications for Policy

Governance structures, including the court system, play an important role in determining outcomes for individuals and firms when negotiations go sour (or, specific to our research, when one party turns duplicitous). Stac Electronics could take legal recourse against Microsoft, and was awarded \$120 Million in compensatory damages by a jury in California. Other regulatory agencies can modulate the gains and risks from duplicitous negotiations through their policies. For example, companies’ incentives to negotiate duplicitously are affected by patent laws, and the degree of strictness or lenience in awarding and enforcing intellectual property rights.

In the negotiations game of figure 1, the parameter γ plays such a modulatory role. Mathematically, it determines the fraction of the other player’s outside option that it can extract. In the analysis of Section 4.1, we treated γ as an exogenously fixed parameter. In this Section, we relax this assumption— we allow γ to be set endogenously, say by an

appropriate regulatory agency, and study the policy implications in terms of outcomes of the game, such as the frequency of duplicitous negotiations, individual firm profits and welfare.

Conditional on an overture being made, for duplicitous negotiations to be profitable, we must have that $\alpha_L < \alpha^*$. The condition $\alpha_L < \alpha^*$ can be equivalently expressed as: $\gamma > \frac{\alpha_L \delta}{\mathbb{E}\beta}$ (see expression (3)). Moreover, depending on the value of c_o , player 1 may prefer not to negotiate, because the cost of an overture is too high. For duplicitous negotiations to be preferred to the outside option, we must have $\gamma > \frac{c_o}{\mathbb{E}\beta}$. Combining the two conditions, we get that a *necessary* condition for duplicitous negotiations to be beneficial to player 1 is $\gamma > \gamma_{LB}$, where $\gamma_{LB} = \max \left\{ \frac{\alpha_L \delta}{\mathbb{E}\beta}, \frac{c_o}{\mathbb{E}\beta} \right\}$; i.e., γ must be greater than the lower bound γ_{LB} for duplicitous negotiations to be relevant to outcomes. As γ increases, the governance structure becomes less protective and more *laissez-faire* with respect to patents and intellectual property, with $\gamma = 1$ corresponding to the most extreme form of ‘free markets’. Of course, duplicitous overtures are beneficial to player 1 only when player 2 accedes to his overtures. Rewriting condition (4), the necessary and sufficient condition for a positive response from player 2, to player 1’s overture, is that $\gamma \leq \frac{q}{1-q}\delta$. Lemma 1 summarizes the preceding discussion.

Lemma 1 [*Policy repercussions for duplicitous negotiations*] *Given a policy parameter γ , player 1 makes a duplicitous overture only if $\gamma > \gamma_{LB}$, where $\gamma_{LB} = \max \left\{ \frac{\alpha_L \delta}{\mathbb{E}\beta}, \frac{c_o}{\mathbb{E}\beta} \right\}$. Player 2 responds favorably to player 1’s overture if and only if $\gamma \leq \frac{q}{1-q}\delta$.*

Thus, the condition $\gamma > \gamma_{LB} = \max \left\{ \frac{\alpha_L \delta}{\mathbb{E}\beta}, \frac{c_o}{\mathbb{E}\beta} \right\}$ ensures that the payoffs from duplicitous negotiations are attractive to player 1. Two important, related questions are: Can duplicitous negotiations be eliminated by appropriate policy, and if so, should they be? Theorem 2 below derives the equilibria for the different possible values of γ , building on previous results from Section 4.1.

Theorem 2 [*Equilibria under endogenous γ*] *The PBNE depend on the policy parameter γ , the negotiation cost c_o and other parameters, as follows:*

Case 1: *When $\gamma \leq \gamma_{LB}$,*

1. *If $c_o \leq \alpha_L \delta$, player 1 always makes a sincere overture. Player 2 always agrees to negotiate, consistent with his belief that the overture from player 1 is always sincere.*
2. *If $c_o \in (\alpha_L \delta, \alpha_H \delta]$, player 1 makes a sincere overture if $\alpha = \alpha_H$ and favors his outside option if $\alpha = \alpha_L$. Player 2 always agrees to negotiate, consistent with his belief that an overture from player 1 is always sincere.*

3. Otherwise, if $c_o > \alpha_H \delta$, player 1 always prefers to exercise his outside option. Hence, no negotiations occur.

Case 2: When $\gamma \in (\gamma_{LB}, \frac{q}{1-q} \delta]$, negotiations always occur in equilibrium. Player 1 makes a sincere overture with probability q and a duplicitous overture with probability $(1 - q)$. Player 2 always accedes to the negotiation overture.

Case 3: When $\gamma > \frac{q}{1-q} \delta$, no negotiations occur in equilibrium. Player 2 rejects all overtures made, which leads player 1 to favor his outside option.

To gain more insight to inform policy prescriptions, we now analyze the expected profits for each player as well as the industry surplus. The derivation is straightforward from Theorem 2 and the payoffs of the end nodes provided in Figure 1.

Lemma 2 *The profits for each player, and the total industry surplus, in the range $\gamma \in [0, 1]$, depend on the value of c_o and are as follows:*

Case 1: $\gamma \in [0, \gamma_{LB}]$ and $c_o \leq \alpha_L \delta$:

$$\begin{aligned}\mathbb{E}[\Pi_1] &= (1 + \delta) \mathbb{E}\alpha - c_o \\ \mathbb{E}[\Pi_2] &= (1 + \delta) \mathbb{E}\beta \\ \mathbb{E}[\Pi_{Tot}] &= (1 + \delta) (\mathbb{E}\alpha + \mathbb{E}\beta) - c_o.\end{aligned}$$

Case 2: $\gamma \in [0, \gamma_{LB}]$ and $c_o \in (\alpha_L \delta, \alpha_H \delta]$:

$$\begin{aligned}\mathbb{E}[\Pi_1] &= \mathbb{E}\alpha + q\delta\alpha_H - qc_o \\ \mathbb{E}[\Pi_2] &= (1 + q\delta) \mathbb{E}\beta \\ \mathbb{E}[\Pi_{Tot}] &= \mathbb{E}\alpha + q\delta\alpha_H + (1 + q\delta) \mathbb{E}\beta - qc_o.\end{aligned}$$

Case 3: $\gamma \in \left(\gamma_{LB}, \frac{q}{1-q} \delta\right]$ and $c_o \leq \alpha_H \delta$: $\mathbb{E}[\Pi_1] = \mathbb{E}\alpha + q\delta\alpha_H + (1 - q)\gamma\mathbb{E}\beta - c_o$, $\mathbb{E}[\Pi_2] = (1 + q\delta - \gamma(1 - q)) \mathbb{E}\beta$ and $\mathbb{E}[\Pi_{Tot}] = \mathbb{E}\alpha + q\delta\alpha_H + (1 + q\delta) \mathbb{E}\beta - c_o$.

Case 4: $\gamma > \frac{q}{1-q} \delta$ or $c_o > \alpha_H \delta$: $\mathbb{E}[\Pi_1] = \mathbb{E}\alpha$, $\mathbb{E}[\Pi_2] = \mathbb{E}\beta$ and $\mathbb{E}[\Pi_{Tot}] = \mathbb{E}\alpha + \mathbb{E}\beta$.

Lemma 2 shows that for any set of parameter values, both players' profits as well as the total profits are constant as long as $\gamma \leq \gamma_{LB}$ (cases 1 and 2). In this range, depending on the value of c_o , either only sincere negotiations occur (case 1) or sincere negotiations occur

with probability q and no negotiations take place, with probability $1 - q$ (case 2). When $\gamma \in \left(\gamma_{LB}, \frac{q}{1-q}\delta \right]$ (case 3), sincere negotiations occur with probability q and duplicitous negotiations occur with probability $1 - q$. In this case, player 1's profit linearly increases in γ (the slope equals $(1 - q)\mathbb{E}\beta$) and player 2's profits linearly decrease in γ at the same rate. Because player 2 is harmed from the possibility of duplicitous negotiations, there is a discontinuity in his profits at $\gamma = \gamma_{LB}$. Total profits are again constant in this range, but they are lower than the profits for $\gamma \leq \gamma_{LB}$. Finally, when $\gamma > \frac{q}{1-q}\delta$ (case 4), player 2 rejects any negotiation overture from player 1, which implies that the status quo remains in equilibrium and both players exercise their outside options. Both players' profits as well as the total profits are constant. Because player 1 is harmed from not negotiating, there is a discontinuity in player 1's profits at $\gamma = \frac{q}{1-q}\delta$. Total profits are again constant in this range, and they are lower than the profits when $\gamma < \frac{q}{1-q}\delta$. Finally, if $c_o > \alpha_H\delta$, the overture cost is so high that no negotiations take place. Both players' profits are constant (and equal to the players' outside options) for all values of γ .

Building on the results of Lemma 2, Figures 2 and 3 plot the expected profits for the two players and the industry, for the entire range $\gamma \in [0, 1]$. Figures 2(a) and 3(a) correspond to low values of the overture cost ($c_o \leq \alpha_L\delta$). In this case, $\gamma_{LB} = \max\left\{ \frac{\alpha_L\delta}{\mathbb{E}\beta}, \frac{c_o}{\mathbb{E}\beta} \right\} = \frac{\alpha_L\delta}{\mathbb{E}\beta}$. When $\gamma \leq \gamma_{LB}$, sincere negotiations take place always, and when $\gamma \in \left(\gamma_{LB}, \frac{q}{1-q}\delta \right]$, sincere and duplicitous negotiations occur with probabilities q and $(1 - q)$ respectively. In the range $\gamma > \frac{q}{1-q}\delta$, no negotiations occur.

Figures 2(b) and 3(b) correspond to medium values of the overture cost ($c_o \in (\alpha_L\delta, \alpha_H\delta]$). In this range, $\gamma_{LB} = \frac{c_o}{\mathbb{E}\beta}$. When $\gamma \leq \gamma_{LB}$, sincere negotiations occur with probability q and no negotiations occur with probability $(1 - q)$. When $\gamma \in \left(\gamma_{LB}, \frac{q}{1-q}\delta \right]$, sincere negotiations occur with probability q and duplicitous negotiations with probability $(1 - q)$. In the range $\gamma > \frac{q}{1-q}\delta$, no negotiations occur as before.

Finally, Figures 2(c) and 3(c) correspond to very high values of the overture cost ($c_o > \alpha_H\delta$). Hence, in this range, player 1 does not make any overture. Since no negotiations occur, the expected profits of both players as well as the industry are constant with respect to the policy parameter γ .

A study of Figures 2(a) and 2(b) shed some interesting insights into the effect of duplicitous negotiations on player profits. Observe that player 1's expected profits in both Figures 2(a) and 2(b) are maximized when $\gamma = \frac{q}{1-q}\delta$. This is the point at which player 1 is able to extract the most out of player 2 while carrying out duplicitous negotiations successfully.

However, as is evident from Figures 2(a) and 2(b), player 2's profits are maximized in the range $\gamma \leq \gamma_{LB}$. In fact, Figures 3(a) and 3(b) show that the industry profits are also maximized in this range. Industry profits are monotonically decreasing in γ . Figures 3(a) and 3(b) show that total industry profits take on one of three values: the slightest possibility of duplicitous negotiations (i.e., at $\gamma > \gamma_{LB}$) leads to a sharp drop in industry profits, because at that point player 1 resorts to duplicitous negotiations, harming player 2. Then, at $\gamma = \frac{q}{1-q}\delta$, there is another discontinuous decrease in total profits, because player 2 switches his strategy from acceding to all of player 1's overtures to rejecting any of his overtures. This leads player 1 to abandon making overtures altogether, thus hurting his, and the industry's, profits.

The preceding analysis makes it clear that the policy maker should set γ to as low a value as possible. In practice, a confounding factor is the feasibility (and cost) of reducing γ . In complex environments such as our modern industrial societies, implementing a governance structure that eliminates duplicitous negotiations through strict monitoring and enforcement is both costly and difficult. If so, the minimum value of γ set by the policy maker should be γ_{LB} : This maximizes industry profits with the least governance. At γ_{LB} , there is a sharp fall in player 2's, and the industry's, profits: the slightest possibility of duplicitous negotiations vitiates trust.

5 Information about the other player's outside option

Negotiators rarely have no information about their counterpart's outside options. At the very least, they are able to learn something about their counterpart's intentions during the negotiation process. In this Section, we study how such information affects players' behavior and negotiation outcomes.

5.1 Perfect knowledge about outside options

The model of Section 4 assumed that players do not know the exact value of their counterpart's outside option—only the distributions of these outside options are known. In this Section, we discuss two special cases of the general model. The cases differ in the information known to each player and are described in what follows.

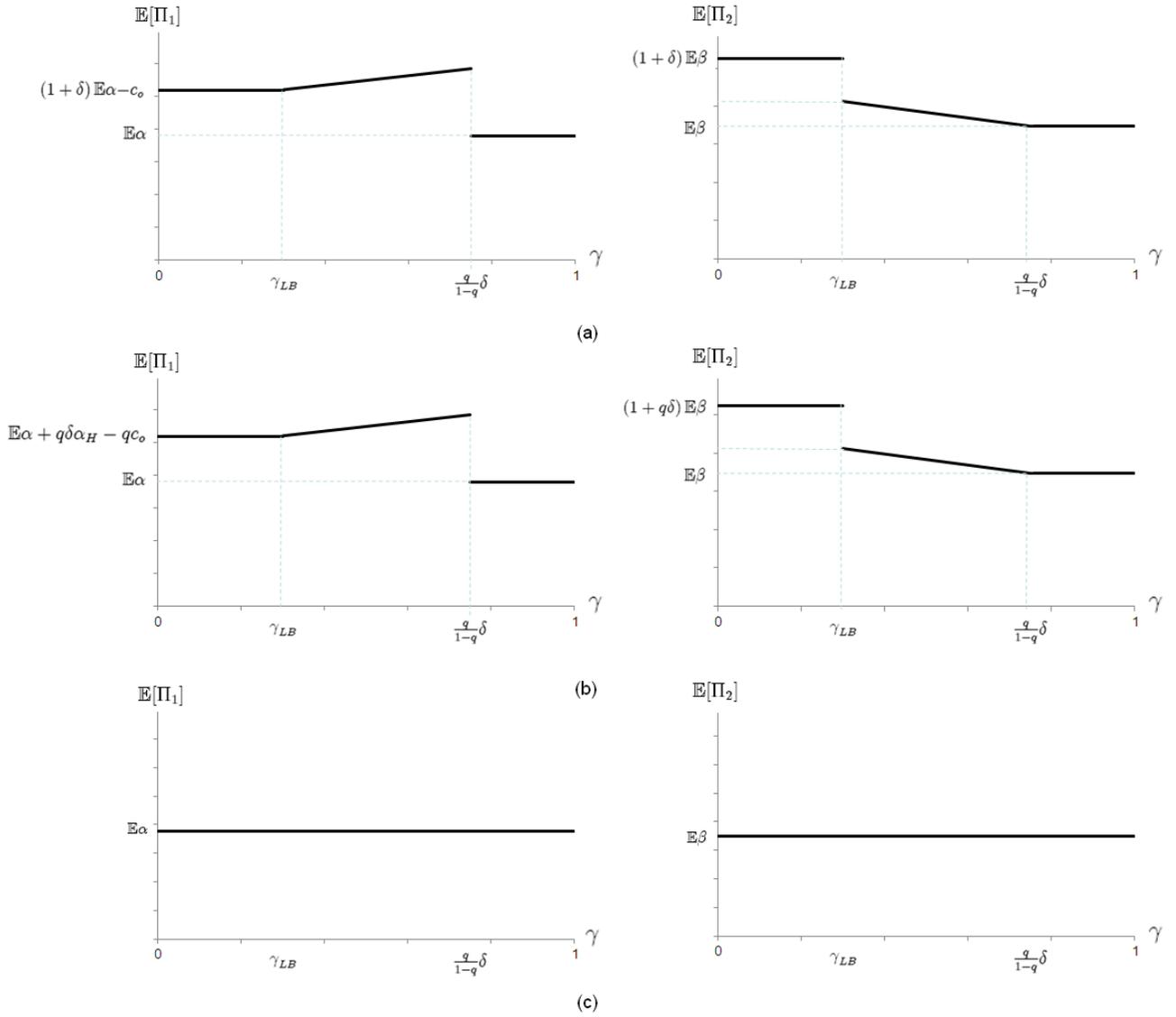
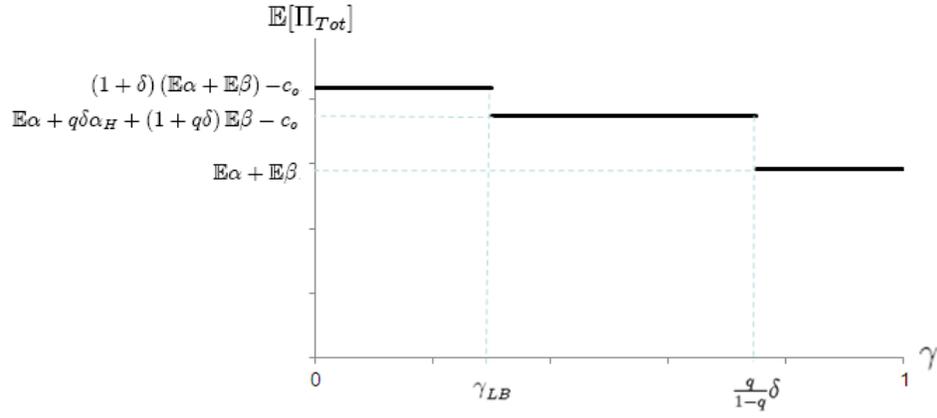
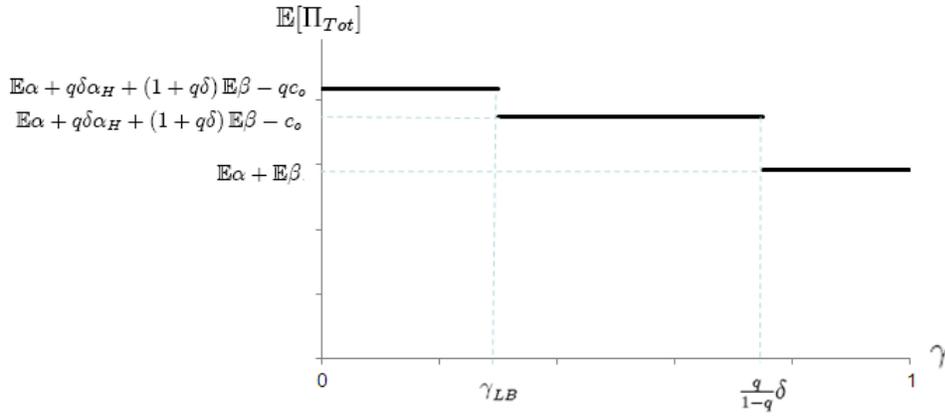


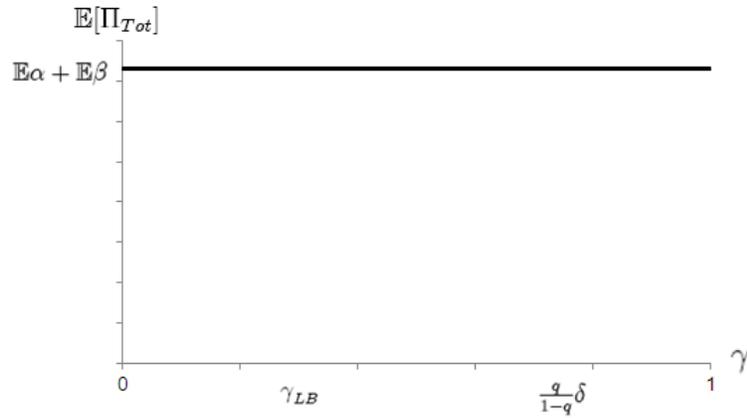
Figure 2: Expected profits of the two players as a function of the policy parameter γ for different overture cost values. (a) $c_o \leq \alpha_L \delta$; (b) $c_o \in (\alpha_L \delta, \alpha_H \delta]$; and (c) $c_o > \alpha_H \delta$.



(a)



(b)



(c)

Figure 3: Expected industry profit as a function of the policy parameter γ for different overture cost values. (a) $c_o \leq \alpha_L \delta$; (b) $c_o \in (\alpha_L \delta, \alpha_H \delta]$; and (c) $c_o > \alpha_H \delta$.

5.1.1 When player 1 knows player 2's outside option perfectly:

In the first case, player 2's outside option, β , is common knowledge. This implies that player 1 has full information—he learns the value of his outside option before deciding on whether to negotiate or not and he knows his counterpart's outside option. Player 2, on the other hand, as before, knows the value of his outside option, but only knows the distribution of player 1's outside option value. Because player 1 knows β for certainty, $\mathbb{E}\beta = \beta$ and his threshold value becomes $\alpha^* = \frac{\gamma\beta}{\delta}$. Assuming that $\alpha_L < \alpha^* < \alpha_H$, the rest of the results follow through. Player 2 will negotiate if condition (4) holds (See Section 4.1). In this case, if $c_o \leq \gamma\beta$, sincere negotiations will occur in equilibrium with probability q and otherwise, duplicitous negotiations will occur. If $c_o \in (\gamma\beta, \alpha_H\delta]$, player 1 will only enter negotiations if $\alpha = \alpha_H$ and thus only sincere negotiations will occur and if $c_o > \alpha_H\delta$ player 1 will remain with outside option and thus no negotiations will occur in equilibrium. Finally, if condition (4) fails, player 2 will reject all negotiations overtures made by player 1. Knowing this, player 1 will not make a negotiation overture. Consequently, no negotiations will occur and both players will remain with their outside options.

5.1.2 When player 2 knows player 1's outside option perfectly:

The second case is when player 2 possesses full information: Player 1's outside option, α , is common knowledge to both players. Player 2 observes the value of his outside option β , but player 1 only knows that his counterpart's outside option β follows the distribution (2). Player 1 knows that under duplicitous negotiations he gets $\alpha + \gamma\mathbb{E}\beta$ and under sincere negotiations he gets $\alpha(1 + \delta)$ (net of negotiation cost). Comparing both payoffs, conditional on negotiating, player 1 chooses to duplicitously negotiate if

$$r \geq \frac{\alpha\delta - \gamma\beta_L}{\gamma(\beta_H - \beta_L)}. \quad (5)$$

Otherwise, player 1 negotiates sincerely. Player 2 anticipates that if condition (5) holds, player 1 will negotiate duplicitously, in which case he will reject player 1's overture. Thus, player 1 is better off not making any overture in the first place. If (5) does not hold, player 1 will negotiate sincerely and knowing that, player 2 will accept. Thus, in this case duplicitous negotiations can never occur. For high values of r , the players turn to their outside options, and if r is low enough, sincere negotiations occur. Note that by having full knowledge about player 1's outside option, player 2 is able to control the type of negotiations that take place—

player 2 is able to perfectly infer player 1's intentions and prevent him from negotiating duplicitously entirely.

As shown in Section 5.1, the question of “who knows what” drives duplicitous negotiations. In the Peruvian hostage case, duplicitous negotiations were possible, because the MRTA did not have perfect information about Fujimori's outside options. The group was not certain whether Fujimori was negotiating sincerely or not and thus had an incentive to continue negotiations. These negotiations eventually enabled Fujimori to lead a successful rescue operation. Similarly, Stac Electronics agreed to negotiate its acquisition by Microsoft, not knowing what Microsoft's real intentions (reflected through the prism of its outside options) were.

5.2 Partial Information about Outside Options

Complete information about the other party's type is unrealistic in many cases. In many situations, however, it does make sense that negotiators can learn at least something about their counterpart's negotiation type or outside option once negotiation has begun (Camerer 2003).

We saw in the previous section that when player 1's outside option is known to player 2, there cannot be any duplicitous negotiations. In other words duplicitous negotiations arise only when player 1's intentions (as determined by his type) cannot be perfectly inferred by player 2. In this Section, we study the effects of partial information about player 1's outside option. Suppose that, as in Section 5.1.1, player 2's outside option, β , is common knowledge, but that player 1's outside option α is unknown to player 2 *a priori*. In the case that player 1 decides to make a negotiation overture, player 2 receives a noisy signal, $X \in \{L, H\}$ about player 1's outside option, and can update his priors with respect to player 1's type. Let ϕ be the precision (or quality) of the signal X (i.e. the probability that the signal is correct). Thus, if player 1's type is α_H , the signal's probabilities are:

$$\begin{aligned}\mathbb{P}\{X = H|\alpha = \alpha_H\} &= \phi \\ \mathbb{P}\{X = L|\alpha = \alpha_H\} &= 1 - \phi\end{aligned}\tag{6}$$

and if player 1 is α_L , the signal's probabilities are:

$$\begin{aligned}\mathbb{P}\{X = H|\alpha = \alpha_L\} &= 1 - \phi \\ \mathbb{P}\{X = L|\alpha = \alpha_L\} &= \phi\end{aligned}\tag{7}$$

Furthermore, the unconditional probabilities of obtaining a high and low signal are:

$$\begin{aligned}\mathbb{P}\{X = H\} &= q\phi + (1 - q)(1 - \phi), \text{ and} \\ \mathbb{P}\{X = L\} &= q(1 - \phi) + (1 - q)\phi.\end{aligned}\tag{8}$$

Without loss of generality, we let $\phi \in [\frac{1}{2}, 1]$. We refer to player 2 who received a high signal as ‘type H ’ and to player 2 who received a low signal as ‘type L ’. Thus, the probabilities that player 2 is ‘type H ’ or ‘type L ’ are given by (8). Then, given the received signal, each type of player 2 can calculate the posterior probabilities of α_H and α_L . The following are the posterior probabilities for each type of player 2. Given that a high signal was received, that is, for player 2 who is ‘type H ’, the posterior probability that $\alpha = \alpha_H$ is

$$\xi_H(\alpha_H) = \mathbb{P}\{\alpha = \alpha_H | X = H\} = \frac{\mathbb{P}\{\alpha = \alpha_H, X = H\}}{\mathbb{P}\{X = H\}} = \frac{q\phi}{q\phi + (1 - q)(1 - \phi)}.\tag{9}$$

His posterior probability that $\alpha = \alpha_L$ is

$$\xi_H(\alpha_L) = \mathbb{P}\{\alpha = \alpha_L | X = H\} = 1 - \xi_H(\alpha_H) = \frac{(1 - q)(1 - \phi)}{q\phi + (1 - q)(1 - \phi)}\tag{10}$$

Similarly, for a ‘type L ’ player 2, the posterior probability of a high outside option is

$$\xi_L(\alpha_H) = \mathbb{P}\{\alpha = \alpha_H | X = L\} = \frac{q(1 - \phi)}{q(1 - \phi) + (1 - q)\phi},\tag{11}$$

and the posterior probability of a low outside option is

$$\xi_L(\alpha_L) = \mathbb{P}\{\alpha = \alpha_L | X = L\} = 1 - \xi_L(\alpha_H) = \frac{(1 - q)\phi}{q(1 - \phi) + (1 - q)\phi}.\tag{12}$$

The following Lemma derives player 2’s optimal strategy— i.e., when he should, or should not, agree to negotiations when player 1 makes an overture.

Lemma 3 *Player 2’s positive response to player 1’s overture depends on the signal, X , he receives, the precision of the signal, ϕ , and his priors on Player 1’s type, q , as follows: If player 2 gets a high signal (i.e., if player 2 is of ‘type H ’), he agrees to negotiate if $q \geq q_H(\phi)$, where*

$$q_H(\phi) \equiv \frac{\gamma(1 - \phi)}{\gamma(1 - \phi) + \delta\phi}.\tag{13}$$

If player 2 gets a low signal (i.e., if he is of ‘type L ’), he negotiates if $q \geq q_L(\phi)$, where

$$q_L(\phi) \equiv \frac{\gamma\phi}{\gamma\phi + \delta(1 - \phi)}.\tag{14}$$

The proof of Lemma 3 is straight-forward. Conditional on a negotiation overture, player 2 knows that if $\alpha = \alpha_H$, player 1 is sincere and if $\alpha = \alpha_L$, player 1 is duplicitous. Based on the posterior probabilities calculated above, a ‘type H ’ player 2 will choose to negotiate if

$$(1 - \gamma) \beta \xi_H(\alpha_L) + \beta (1 + \delta) \xi_H(\alpha_H) \geq \beta$$

which simplifies to $q \geq q_H(\phi)$. Similarly, a ‘type L ’ player 2 will choose to negotiate if

$$(1 - \gamma) \beta \xi_L(\alpha_L) + \beta (1 + \delta) \xi_L(\alpha_H) \geq \beta$$

which simplifies to $q \geq q_L(\phi)$. Observe that both these conditions reduce to condition (4) when the signal is completely uninformative (i.e., $\phi = \frac{1}{2}$).

A closer look at (13) and (14) reveals that $q_H(\phi)$ is decreasing in ϕ , while $q_L(\phi)$ is increasing in ϕ . Further, $q_H(\phi) = q_L(1 - \phi) \leq q_L(\phi) \forall \phi \in [\frac{1}{2}, 1]$, with equality when $\phi = \frac{1}{2}$. As the accuracy ϕ of the signal increases, the range of agreement for a ‘type H ’ player 2 increases, while that for a ‘type L ’ player 2 decreases. In the limit, when $\phi = 1$, the ‘type H ’ player 2 can perfectly infer that player 1 is sincere, leading him to always agree to negotiations, while the ‘type L ’ player 2 perfectly infers that player 1 is duplicitous, leading him to always reject player 1’s overtures. The following Theorem derives Perfect Bayesian Nash Equilibria for the entire game under partial information.

Theorem 3 *For the game of partial information, there exists a pure-strategy Perfect Bayesian Nash Equilibrium (PBNE) for each set of parameter values, as specified below:*

Case 1: $q \geq q_L(\phi)$ and $c_o \leq \gamma\beta$:

Player 1’s strategy and beliefs: *Player 1 always makes an overture. His overture is sincere when his outside option is α_H and duplicitous when his outside option is α_L . Player 1’s beliefs about player 2’s type depend on whether player 1 is high or low type—i.e., whether he received $\alpha = \alpha_H$ or $\alpha = \alpha_L$.*

Type H *Type H ’s beliefs regarding player 2’s type are a function of the precision of player 2’s information and are consistent with the prior distribution of the signal given by (6). Thus, he believes that player 2 is type H with probability ϕ and type L with probability $(1 - \phi)$.*

Type L Type L's beliefs regarding player 2's type are a function of the precision of player 2's information and are consistent with the prior distribution of the signal given by (7). Thus, he believes that player 2 is type H with probability $(1 - \phi)$ and type L with probability ϕ .

Player 2's strategy and beliefs: Both types of player 2 always enter into negotiations in response to player 1's overture. Player 2's beliefs depend on whether player 2 is high or low type—i.e., whether he received $X = H$ or $X = L$.

Type H Type H's beliefs regarding player 1's outside option are reflected by the posterior distribution given by expressions (9) and (10). Thus, he believes that $\alpha = \alpha_H$ with probability $\xi_H(\alpha_H)$ and α_L with probability $\xi_H(\alpha_L)$, both on and off the equilibrium path.

Type L Type L's beliefs regarding player 1's outside option are reflected by the posterior distribution given by expressions (11) and (12). Thus, he believes that $\alpha = \alpha_H$ with probability $\xi_L(\alpha_H)$ and α_L with probability $\xi_L(\alpha_L)$, both on and off the equilibrium path.

Outcome of the game: Negotiations always occur in equilibrium. Sincere negotiations occur with probability q (when $\alpha = \alpha_H$) and duplicitous negotiations occur with probability $(1 - q)$ (when $\alpha = \alpha_L$).

Case 2: $q \in (q_H(\phi), q_L(\phi))$ and $c_o \leq (1 - \phi)\gamma\beta$:

Player 1's strategy and beliefs: Player 1 always makes an overture. His overture is sincere when his outside option is α_H and duplicitous when his outside option is α_L . Player 1's beliefs about player 2's type depend on whether player 1 is high or low type and are consistent with expressions (6) or (7), respectively.

Player 2's strategy and beliefs: Player 2's strategies and beliefs depend on whether player 2 is high or low type.

Type H Type H always agrees to negotiate. His beliefs regarding player 1's outside option are reflected by the posterior distribution given by expressions (9) and (10). Thus, he believes that $\alpha = \alpha_H$ with probability $\xi_H(\alpha_H)$ and α_L with probability $\xi_H(\alpha_L)$, both on and off the equilibrium path.

Type L *Type L always rejects player 1's negotiation overtures. His beliefs regarding player 1's outside option are reflected by the posterior distribution given by expressions (11) and (12). Thus, he believes that $\alpha = \alpha_H$ with probability $\xi_L(\alpha_H)$ and α_L with probability $\xi_L(\alpha_L)$, both on and off the equilibrium path.*

Outcome of the game: *Sincere negotiations occur with probability ϕq and duplicitous negotiations occur with probability $(1 - \phi)(1 - q)$. Otherwise, with probability $q(1 - \phi) + (1 - q)\phi$, no negotiations occur in equilibrium.*

Case 3: $(q \in (q_H(\phi), q_L(\phi)) \text{ and } c_o \in ((1 - \phi)\gamma\beta, \min\{\phi\alpha_H\delta, \gamma\beta\}]) \text{ or } c_o \in (\gamma\beta, \alpha_H\delta]$:

Player 1's strategy and beliefs: *Player 1 makes an overture only when his outside option is α_H , in which case his overture is sincere. When his outside option is α_L , he makes no overture, preferring instead to exercise his outside option. Player 1's beliefs about player 2's type depend on whether player 1 is high or low type and are consistent with expressions (6) or (7), respectively.*

Player 2's strategy and beliefs: *Both types of player 2 always enter into negotiations in response to player 1's overture. Their beliefs regarding player 1's outside option reflect player 1's strategy. Thus, both types believe that $\alpha = \alpha_H$ with certainty when player 1 makes an overture, and that $\alpha = \alpha_L$ with certainty when player 1 does not make an overture.*

Outcome of the game: *The signal is worthless. Sincere negotiations occur with probability q . Otherwise, with probability $1 - q$, no negotiations occur.*

Case 4: $q \in (q_H(\phi), q_L(\phi)) \text{ and } (c_o \in (\phi\alpha_H\delta, \gamma\beta] \text{ or } c_o > \alpha_H\delta)$:

Player 1's strategy and beliefs: *Player 1 does not make an overture. Player 1's beliefs about player 2's type depend on whether player 1 is high or low type and are consistent with expressions (6) or (7), respectively.*

Player 2's strategy and beliefs: *Player 2's strategies and beliefs depend on whether player 2 is high or low type.*

Type H *Type H always agrees to negotiate. His beliefs regarding player 1's outside option are reflected by the posterior distribution given by expressions (9) and (10), both on and off the equilibrium path.*

Type L *Type L always rejects player 1's negotiation overtures. His beliefs regarding player 1's outside option are reflected by the posterior distribution given by expressions (11) and (12), both on and off the equilibrium path.*

Outcome of the game: *No negotiations take place. Each player exercises his outside option in equilibrium.*

Case 5: $q \leq q_H(\phi)$ and $(c_o \leq \gamma\beta \text{ or } c_o > \alpha_H\delta)$:

Player 1's strategy and beliefs: *Player 1 does not make an overture. Player 1's beliefs about player 2's type depend on whether player 1 is high or low type and are consistent with expressions (6) or (7), respectively.*

Player 2's strategy and beliefs: *Both types of player 2 reject negotiations in response to player 1's overture. Player 2's beliefs depend on whether player 2 is high or low type.*

Type H *Type H's beliefs regarding player 1's outside option are reflected by the posterior distribution given by expressions (9) and (10), both on and off the equilibrium path.*

Type L *Type L's beliefs regarding player 1's outside option are reflected by the posterior distribution given by expressions (11) and (12), both on and off the equilibrium path.*

Outcome of the game: *No negotiations take place. Each player exercises his outside option in equilibrium.*

Case 6: $q \geq q_L(\phi)$ and $c_o > \alpha_H\delta$:

Player 1's strategy and beliefs: *Player 1 does not make an overture. Player 1's beliefs about player 2's type depend on whether player 1 is high or low type and are consistent with expressions (6) or (7), respectively.*

Player 2's strategy and beliefs: *Both types of player 2 accept negotiations in response to player 1's overture. Player 2's beliefs depend on whether player 2 is high or low type.*

Type H *Type H's beliefs regarding player 1's outside option are reflected by the posterior distribution given by expressions (9) and (10), both on and off the equilibrium path.*

Type L *Type L's beliefs regarding player 1's outside option are reflected by the posterior distribution given by expressions (11) and (12), both on and off the equilibrium path.*

Outcome of the game: *No negotiations take place. Each player exercises his outside option in equilibrium.*

Theorem 3 establishes that the equilibrium negotiation outcomes depend on c_o —the magnitude of player 1's initial investment in a negotiation overture, ϕ —the precision of the signal and other parameters such as the scaling factor γ for payoffs under duplicitous negotiations.

In Case 1, making an overture is attractive to player 1 and accepting is attractive to player 2. In Case 2, making an overture is attractive to player 1, but player 2's response depends on the signal he gets. If he gets a high signal he accepts negotiations, but if his signal is low, he rejects the overture. Under Case 3, the outcome is a 'pure separating equilibrium'. Making an overture reveals that player 1's outside option is α_H and implies that the negotiation overture is sincere, while not making an overture reveals that player 1's outside option is α_L . In Case 4, making an overture is unattractive to player 1, so the equilibrium outcome is no negotiations. In this case, player 2 wants to negotiate if he observes a high signal and reject if the signal is low. Thus, had player 1 made an overture (by deviating from the equilibrium), player 2 would have responded favorably if he were of high type and rejected the overture otherwise. In Case 5 of the Theorem, the same equilibrium emerges under two disjoint ranges of c_o , for slightly different reasons. When $c_o \leq \gamma\beta$, player 1 finds negotiations attractive (he would make an overture if he knew that player 2 would accept), but decides to exercise his outside option, because he anticipates correctly that player 2 will always reject his overture. On the other hand, when $c_o > \alpha_H\delta$, player 1's overture cost is so high, that it is not worthwhile for player 1 to make an overture. Finally, in Case 6, the equilibrium outcome is no negotiations. While the outcome is the same as in Case 4, player 2's strategy is different. He always wants to negotiate under Case 6, irrespective of the signal he gets. Thus, if player 1 were to make an overture (by deviating off the equilibrium path), player 2 would always respond favorably. However, the overture cost is too high for player 1 to make an overture, leading to no negotiations in equilibrium.

Observe that when $c_o > \gamma\beta$, player 2 can correctly anticipate player 1's strategy: When $c_o \in (\gamma\beta, \alpha_H\delta]$, player 1's overture is always sincere, and when $c_o > \alpha_H\delta$, player 1 will never make an overture because c_o is too high. Thus, for high values of c_o , the signal X does not

provide player 2 with any useful information, and is thus worthless. However, learning does occur for low values of c_o . When $c_o < \gamma\beta$, the overture cost is low enough, so that player 1 may be duplicitous. Player 2 uses the signal he gets about player 1's type to make a more informed negotiation decision. Consequently, this may change the outcome of the game.

Comparing the results of Theorems 1 and 3 provides insight into the impact of information on the frequency and success of duplicitous negotiations. When player 2 learns partial information about player 1's outside option, duplicitous negotiations may occur under two cases. First, when $q \geq q_L(\phi)$ and $c_o \leq \gamma\beta$ (Case 1), duplicitous negotiations occur with probability $(1 - q)$. This is similar to the condition for duplicitous negotiations in the no-information case of Section 4.1 (Case 1 of Theorem 1). Note, however, that in this case, duplicitous negotiations occur in a smaller range (as $q_L(\phi) > \frac{\gamma}{\gamma+\delta}$)—*player 2 is able to better protect himself from duplicitous negotiations, because of the information he obtains about player 1's outside option.* Second, Duplicitous negotiations also occur when $q \in (q_H(\phi), q_L(\phi))$ and $c_o \leq (1 - \phi)\gamma\beta$ (Case 2). Here, the 'type H ' player 2 accepts negotiations whereas the 'type L ' player 2 rejects any overture. Since the overture cost is low, player 1 always makes an overture in this case. While the signal is informative, the information it provides is not perfect. By relying on the signal, player 2 ends up accepting negotiations for lower values of q (specifically, $q \in (q_H(\phi), \frac{\gamma}{\gamma+\delta})$) for which he would have rejected any overture under the no-information setting of Theorem 1. Of course, in this range, player 1's overtures can be duplicitous with probability $(1 - q)$, and such duplicitous overtures are accepted with probability $(1 - \phi)(1 - q)$. *Thus we see that more information may actually lead to more duplicitous negotiations.*

Finally, Theorem 1 also sheds light on whether it is worthwhile for player 1 to signal information about his outside option to player 2. In fact, we see that depending on the parameter values, player 1 may want to signal or conceal his outside option. If $q \in (q_H(\phi), \frac{\gamma}{\gamma+\delta}]$, player 1 has an incentive to signal his outside option to player 2, because it will make the 'type H ' player 2 accept player 1's overtures, which will increase player 1's profits. If, however, $q \in (\frac{\gamma}{\gamma+\delta}, q_L(\phi))$, player 1 would rather conceal his type. In this case, having no information regarding player 1's outside option makes player 2 accept all overtures, while having partial information causes the 'type L ' player 2 to reject any of player 1's overtures, which decreases player 1's profits.

6 Discussion

Prior negotiation research has largely ignored the possibility of duplicitous negotiations. Results from our model demonstrate that this is a serious omission. Even the mere possibility of duplicitous negotiations impacts negotiated outcomes and social welfare.

The potential for engaging in duplicitous negotiations harms negotiators in two ways. First, some negotiators are exploited by duplicitous counterparts. Second, many sincere invitations to negotiate are rejected by counterparts fearful of an duplicitous counterpart. Both of these effects harm social welfare.

We analyzed the influence of information in general, and asymmetric information in particular, on players' outside options. We demonstrate that both the ownership-structure ('who knows what') and the precision of the information available to players can have a significant impact on outcomes. Some kinds of information (e.g. player 1 gaining information about player 2's outside option, in our model) have little effect on the probability of duplicitous negotiations, while other kinds of information (such as player 2 learning about player 1's outside options) have a significant impact on outcomes.

Prescriptively, our findings challenge prior negotiation research, which has largely ignored the potential harm of duplicitous negotiations. Prior work that has exhorted managers to seek and engage in negotiations has understated the potential risks they might face by engaging in negotiations with a duplicitous counterpart. Although the negotiation process can create the joint gains that prior work has promised, the decision to enter and continue a negotiation represents a risky decision that should be made carefully and strategically.

Our findings also highlight the important role of policy in governing negotiations. For example, laws that curtail the possibility of engaging in duplicitous negotiations (e.g., labor laws that prohibit management from engaging in duplicitous negotiations; patent laws that prohibit negotiators from stealing secrets learned during negotiations) may increase social efficiency more than prior work has assumed. Policies designed to curtail the gains from duplicitous negotiations may help potential targets of duplicitous negotiations and ultimately prompt more negotiators to participate in sincere and constructive negotiations.

Results from our work identify the decisions to enter and to continue negotiations as important research questions. Quite possibly, potential targets of duplicitous negotiations may enter (duplicitous) negotiations more often than our model predicts. Prior studies have found that negotiators tend to be overconfident and overly optimistic about the likelihood

of attaining favorable outcomes (e.g. Bazerman and Neale 1982; Lim 1997; Bazerman *et al.* 1999). This bias may extend to the decision to enter potentially duplicitous negotiations as well.

Similarly, future work should explore aspects of the communication process related to negotiator decisions to continue or to terminate negotiations. As people negotiate, they may signal important information about their underlying intentions as they equivocate or delay the negotiation process. Perceptive targets of duplicitous negotiators may glean important information from the negotiation process, and terminate negotiations.

More broadly, future work should examine the decision process of negotiators who choose to engage in duplicitous negotiations. Like models of unethical decision making, negotiators may be influenced by incentives as well as psychological factors that prompt them to choose to negotiate either sincerely or duplicitously. One interesting direction for future work is the exploration of how negotiators might approach an interaction with one intention and switch during the course of the negotiation.

There are, of course, important risks to conducting duplicitous negotiations. Having faced, or learned about, a duplicitous counterpart, negotiators may be reluctant to re-engage that person in a future negotiation. Related research studying reputations in negotiations (e.g., Tinsely *et al.* 2002) and trust recovery may inform this investigation. For example, prior work has found that trust may never fully recover following deception (e.g., Schweitzer *et al.* 2006). As a result, negotiator reputations and negotiator relationships may be even more important than prior work suggests.

7 Conclusion

The extant literature in bargaining and negotiations has generally assumed that parties to a negotiation are sincere in their intentions to reach an agreement. If parties fail to reach an agreement, prior work has generally assumed that negotiation parties either lacked a zone of agreement or failed to find the zone of agreement. In contrast to this approach, we consider the possibility that some negotiators may use the negotiation process to achieve aims very different from reaching an agreement. Even when a positive zone of agreement exists, some negotiators may not search for it.

This broader conceptualization of the negotiation process has important consequences. Not only do duplicitous negotiators directly harm their counterparts, but the mere threat

of encountering a duplicitous negotiator is also likely to prompt individuals to reject sincere overtures. The possibility of duplicitous negotiations harms social welfare, and public policy can mitigate this harm.

Of course, for some, the prospect of engaging in duplicitous negotiations represents an opportunity. In general, we conceptualize duplicitous negotiations as harmful. There are situations, however, in which duplicitous negotiations may benefit others in addition to themselves. This may well have been the case for Fujimori in Peru. His successful use of duplicitous negotiations saved lives.

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Appendix: Proofs

Proof of Theorem 1: If player 1's type is α_H , he prefers to negotiate sincerely rather than duplicitously (conditional on his making an overture). Further, he prefers the negotiated outcome to his outside option, *if and only if* $\alpha_H(1 + \delta) - c_o \geq \alpha_H$, or $c_o \leq \alpha_H\delta$. If player 1's type is α_L , he prefers to negotiate duplicitously rather than sincerely (again, conditional on his making an overture). Furthermore, he prefers the negotiated outcome to his outside option, *if and only if* $\alpha_L + \gamma\mathbb{E}\beta - c_o \geq \alpha_L$, or $c_o \leq \gamma\mathbb{E}\beta$. Also, by condition (3), $\gamma\mathbb{E}\beta < \alpha_H\delta$. Combining these conditions, five different cases arise depending on the parameter values:

Case 1: $c_o \leq \gamma\mathbb{E}\beta$ and $q \geq \frac{\gamma}{\gamma+\delta}$: Since $c_o \leq \gamma\mathbb{E}\beta < \alpha_H\delta$, player 1 always prefers to enter into negotiations: If his outside option is α_H , he negotiates sincerely, and if his outside option is α_L , he negotiates duplicitously. Because condition (4) holds (i.e., $q \geq \frac{\gamma}{\gamma+\delta}$), player 2 always agrees to negotiate. Consistent with player 1's strategy, player 2 believes that player 1 is sincere (i.e., $\alpha = \alpha_H$) with probability q and duplicitous (i.e., $\alpha = \alpha_L$) with probability $(1 - q)$. Thus, negotiations always occur in equilibrium; sincere negotiations occur with probability q and duplicitous negotiations occur with probability $(1 - q)$.

Case 2: This case occurs under two conditions. (1) $c_o \leq \gamma\mathbb{E}\beta$ and $q < \frac{\gamma}{\gamma+\delta}$: Since $c_o \leq \gamma\mathbb{E}\beta < \alpha_H\delta$, player 1 always prefers a negotiated outcome to exercising his outside option: If his outside option is α_H , his preference is for the outcome under sincere negotiations, and if his outside option is α_L , he prefers the outcome under duplicitous negotiations. Player 2's beliefs are, correspondingly, that player 1 is sincere (i.e., $\alpha = \alpha_H$) with probability q and duplicitous (i.e., $\alpha = \alpha_L$) with probability $(1 - q)$. However, because $q < \frac{\gamma}{\gamma+\delta}$ (i.e., condition (4) does not hold), player 2 always rejects player 1's negotiation overtures. Knowing this, player 1 avoids incurring a cost c_o by not making an overture in the first place; (2) $c_o > \alpha_H\delta$ and $q < \frac{\gamma}{\gamma+\delta}$: Since $\gamma\mathbb{E}\beta < \alpha_H\delta < c_o$, player 1 prefers his outside option to making an overture, regardless of his outside option (the overture cost c_o is too high). Moreover, if player 1 were to make an overture, player 2 would reject the overture when his beliefs about player 1's outside option reflect its prior distribution (because $q < \frac{\gamma}{\gamma+\delta}$). In both cases, the equilibrium outcome is no negotiations.

Case 3: $c_o \in (\gamma\mathbb{E}\beta, \alpha_H\delta]$: When player 1's outside option is α_L , he prefers exercising his outside option to negotiating duplicitously (because $c_o > \gamma\mathbb{E}\beta$). Also, when player 1's outside option is α_H , he prefers the outcome of sincere negotiations to exercising his outside option (because $c_o \leq \alpha_H\delta$). Thus, player 1 will make a sincere overture if his outside option is α_H (with probability q), and not make any overture otherwise (with probability $(1 - q)$). Player 2 correctly infers player 1's strategy for this parameter range. So, whenever player 1 makes an overture, player 2 correctly infers that it is sincere, and always accedes to negotiations.

Case 4: $c_o > \alpha_H\delta$ and $q \geq \frac{\gamma}{\gamma+\delta}$: Since $\gamma\mathbb{E}\beta < \alpha_H\delta < c_o$, player 1 prefers his outside option to making an overture, regardless of his outside option (the overture cost c_o is too high). However, if player 1 were to make an overture, player 2 would agree to negotiate, believing that player 1 is sincere with probability q and duplicitous with probability $(1 - q)$ (consistent with player 1's prior distribution), and because $q \geq \frac{\gamma}{\gamma+\delta}$. Obviously, the equilibrium outcome is no negotiations. ■

Proof of Theorem 2: When $\gamma > \gamma_{LB}$, Theorem 1 applies, and the results of cases 2 and 3 follow. From Lemma 1, we know that when $\gamma \leq \gamma_{LB}$, player 1 will never make a duplicitous overture. Thus, in the range $\gamma \leq \gamma_{LB}$, player 1 has three alternative strategies: (i) favor his outside option regardless of his type (resulting in expected profit of $\mathbb{E}\alpha$), (ii) make a sincere overture regardless of his type (resulting in an expected profit of $(1 + \delta)\mathbb{E}\alpha - c_o$, since player 2 would always accede to the overture), or (iii) negotiate sincerely if his type is high and not to negotiate if his type is low (resulting in expected profit of $q((1 + \delta)\alpha_H - c_o) + (1 - q)\alpha_L$, since, once again, player 2 would always accede to the overture). Comparing the expected payoffs under these three strategies, we get the stated results under Case 1. ■

Proof of Theorem 3: As in Theorem 1, if player 1's type is α_H , he prefers to negotiate sincerely rather than duplicitously (conditional on him making an overture). Further, he prefers the negotiated outcome to his outside option, *if and only if* $c_o \leq \alpha_H\delta$. If player 1's type is α_L , he prefers to negotiate duplicitously rather than sincerely (again, conditional on his making an overture). Furthermore, he prefers the negotiated outcome to his outside option, *if and only if* $c_o \leq \gamma\beta$. Also, by condition (3), $\gamma\beta < \alpha_H\delta$. Combining these conditions, we get that if $c_o \leq \gamma\beta$, player 1 always prefers the negotiated *outcome* over his outside option. (But, of course, player 2's decision of whether or not to accept negotiations affects this outcome.) If $c_o \in (\gamma\beta, \alpha_H\delta]$, an α_L player will *never* enter negotiations because

he prefers his outside option. Only an α_H player will enter (sincere) negotiations, if at all. Thus, only sincere negotiations are possible in this range. Finally, if $c_o > \alpha_H \delta$, player 1 will never enter negotiations.

Moreover, player 2 receives a noisy signal which informs him about player 1's type. From Lemma 3 and because $q_H(\phi) \leq q_L(\phi) \forall \phi \in [1/2, 1]$, it follows that there exist three distinct strategies for both types of player 2. If $q \geq q_L(\phi)$ player 2 always agrees to negotiate regardless what signal value he gets. If $q \leq q_H(\phi)$, player 2 always rejects negotiations overtures and if $q \in (q_H(\phi), q_L(\phi))$, a player 2 who received a low signal ('type L ') rejects negotiations and a player 2 who receives a high signal ('type H ') negotiates.

Combining these conditions, six different cases arise depending on the parameter values:

Case 1: $q \geq q_L(\phi)$ and $c_o \leq \gamma\beta$: Condition $q \geq q_L(\phi)$ implies that conditional on an overture, player 2 always agrees to negotiate, regardless of the received signal. Knowing that, $c_o \leq \gamma\beta$ implies that player 1 always prefers negotiating to his outside option. If his outside option is α_H , he negotiates sincerely, and if his outside option is α_L , he negotiates duplicitously. Consistent with player 1's strategy and the obtained signal, a high type player 2 believes that player 1 is sincere (i.e., $\alpha = \alpha_H$) with probability $\xi_H(\alpha_H)$ and duplicitous (i.e., $\alpha = \alpha_L$) with probability $\xi_H(\alpha_L)$, whereas a low type player 2 believes that player 1 is sincere (i.e., $\alpha = \alpha_H$) with probability $\xi_L(\alpha_H)$ and duplicitous (i.e., $\alpha = \alpha_L$) with probability $\xi_L(\alpha_L)$. Thus, negotiations always occur in equilibrium; sincere negotiations occur with probability q and duplicitous negotiations occur with probability $(1 - q)$.

Case 2: $q \in (q_H(\phi), q_L(\phi))$ and $c_o \leq (1 - \phi)\gamma\beta$: Condition $q \in (q_H(\phi), q_L(\phi))$ implies that a 'type H ' player 2 agrees to negotiate and a 'type L ' player 2 rejects negotiations. Anticipating player 2's behavior and after observing his outside option, player 1 needs to decide whether to remain with his outside option, or negotiate. Suppose player 1 observes $\alpha = \alpha_H$. Then, with probability ϕ , player 2 observes a high signal and negotiates and with probability $1 - \phi$, he observes a low signal and rejects. Because conditional on a negotiation overture, player 1 is sincere, his expected payoff in this case is $\phi\alpha_H(1 + \delta) + (1 - \phi)\alpha_H - c_o$. Comparing this payoff to player 1's outside option, we get that a high type player 1 will make a (sincere) negotiation overture if $c_o \leq \phi\alpha_H\delta$. Similarly, a low type player 1 knows that his negotiation overture will be rejected if the signal is accurate (with probability ϕ) and that player 2 will negotiate

if the signal is wrong. In this case, negotiating (dupliciously) will lead to expected payoff of $\phi(\alpha_L - c_o) + (1 - \phi)(\alpha_L + \gamma\beta - c_o)$. Comparing the expected payoff under negotiation with player 1's outside option implies that he will make a duplicitious negotiation overture if $c_o \leq (1 - \phi)\gamma\beta$. Comparing the two conditions, note that because $\alpha_H > \alpha^*$ and $\phi > 0.5$, we have $\phi\alpha_H\delta > (1 - \phi)\gamma\beta$. Thus, in this case player 1 always makes an overture. The overture will be sincere with probability q and duplicitious with probability $(1 - q)$. Sincere negotiations will occur in equilibrium with probability ϕq and duplicitious negotiations will occur with probability $(1 - \phi)(1 - q)$. Otherwise, no negotiations will take place.

Case 3: This case occurs under two conditions. (1) $c_o \in ((1 - \phi)\gamma\beta, \min\{\phi\alpha_H\delta, \gamma\beta\}]$ and $q \in (q_H(\phi), q_L(\phi))$: The reasoning for this case follows from the derivation in case 2. If $c_o \in [(1 - \phi)\gamma\beta, \min\{\phi\alpha_H\delta, \gamma\beta\})$, player 2 can infer that if player 1 makes a negotiation overtures, he will be sincere. Knowing that, player 2 can disregard the signal and accept the negotiation overture; or (2) $c_o \in (\gamma\beta, \alpha_H\delta]$: Following Theorem 1, player 1 always negotiates sincerely in this range, leading player 2 to accept all negotiation overtures regardless on the signal. The equilibrium in both cases is such that sincere negotiations occur with probability q and with probability $1 - q$, no negotiations occur.

Case 4: $q \in (q_H(\phi), q_L(\phi))$ and $(c_o \in (\phi\alpha_H\delta, \gamma\beta]$ or $c_o > \alpha_H\delta)$: From the derivation in case 2, if $q \in (q_H(\phi), q_L(\phi))$ and $c_o \in (\phi\alpha_H\delta, \gamma\beta]$, it is too costly for player 1 to make a negotiation overture, no matter what his type is. Moreover, it follows from Theorem 1 that when $c_o > \alpha_H\delta$, player 1 also prefer his outside options. Thus, no negotiations will occur in equilibrium. Player 2's beliefs depend on his type. Conditional on an overture being made, a 'type H ' player 2 believes that player 1 is sincere (i.e., $\alpha = \alpha_H$) with probability $\xi_H(\alpha_H)$ and duplicitious (i.e., $\alpha = \alpha_L$) with probability $\xi_H(\alpha_L)$, whereas a low type player 2 believes that player 1 is sincere (i.e., $\alpha = \alpha_H$) with probability $\xi_L(\alpha_H)$ and duplicitious (i.e., $\alpha = \alpha_L$) with probability $\xi_L(\alpha_L)$.

Case 5: This case occurs under two conditions. (1) $q \leq q_H(\phi)$ and $c_o \leq \gamma\beta$: Condition $q \leq q_H(\phi)$ implies that both types of player 2 reject all negotiations overtures if both sincere and duplicitious negotiations are beneficial for player 1 over his outside option (that is, if $c_o \leq \gamma\beta$). Knowing that both types of player 2 will reject, player 1 will not make a negotiations overture; or (2) $q \leq q_H(\phi)$ and $c_o > \alpha_H\delta$: $c_o > \alpha_H\delta$ implies that

player 1 does not make a negotiations overture (following Theorem 1). If an overture is made, both types of player 2 will reject the overture, since $q \leq q_H(\phi)$. Thus, in both cases no negotiations will occur in equilibrium. A high type player 2 believes that player 1 is sincere (i.e., $\alpha = \alpha_H$) with probability $\xi_H(\alpha_H)$ and duplicitous (i.e., $\alpha = \alpha_L$) with probability $\xi_H(\alpha_L)$, whereas a low type player 2 believes that player 1 is sincere (i.e., $\alpha = \alpha_H$) with probability $\xi_L(\alpha_H)$ and duplicitous (i.e., $\alpha = \alpha_L$) with probability $\xi_L(\alpha_L)$.

Case 6: $q \geq q_L(\phi)$ and $c_o > \alpha_H \delta$: Condition $q \geq q_L(\phi)$ implies that both types of player 2 would accept a negotiation overture, if made. However, $c_o > \alpha_H \delta$ implies that player 1 prefers to exercise his outside option, even if all negotiations are accepted. Thus, no overtures will be made in equilibrium and no negotiations would occur. If an overture is made, player 2's beliefs about the type of negotiations depend on the signal he gets (his type). A 'type H' player 2 believes that player 1 is sincere (i.e., $\alpha = \alpha_H$) with probability $\xi_H(\alpha_H)$ and duplicitous (i.e., $\alpha = \alpha_L$) with probability $\xi_H(\alpha_L)$, whereas a low type player 2 believes that player 1 is sincere (i.e., $\alpha = \alpha_H$) with probability $\xi_L(\alpha_H)$ and duplicitous (i.e., $\alpha = \alpha_L$) with probability $\xi_L(\alpha_L)$. ■