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IT TAKES THREE TO TANGO: AN EXPERIMENTAL STUDY OF CONTRACTS WITH STIPULATED DAMAGES

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Abstract

Can incumbent sellers and buyers use contracts with stipulated damages to extract surplus from entrants? We experimentally study the strategic environments of Aghion and Bolton (1987) and Spier and Whinston (1995). As predicted, contract renegotiation weakens the commitment power of stipulated damage clauses. Behavioral deviations, including more generous offers from sellers and entrants, suggest non-monetary preferences. A dictator-seller environment indicates the limited role of inequity aversion. With communication, equitable allocations are more frequent and exclusion less frequent. Our results underscore the importance of payoff aspirations influenced by social norms of fairness. A theoretical extension accommodates our experimental findings.

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1 Introduction

It is fairly common for contracts to include clauses that stipulate damages to be paid in the event of breach by one of the parties.[1] A supply contract, for instance, may specify damages to be paid for late delivery by the seller or for the refusal of the buyer to accept delivery. Stipulated damage clauses (contract breach clauses) often serve legitimate and value-enhancing business purposes. They can help avoid the uncertainty associated with court proceedings, and more broadly they can reduce the transaction costs following breach. They may also serve to protect the relationship-specific investment of the breached-against party. On the other hand, stipulated damage clauses may be anticompetitive.

In the famous *United States v. United Shoe Machinery Corporation* (1922) case, the court ruled that the practice of leasing machines under long-term agreements that required the customers to pay damages for switching to a rival supplier violated the Sherman Act. The court found that the leases had been an important means by which United had monopolized the shoe machinery manufacturing market for over fifty years (Brodley and Ma, 1993). This decision was criticized by the Chicago School (Posner, 1976; Bork, 1978). Posner (1976) argued that "customers of United would be unlikely to participate in a campaign to strengthen United's monopoly position without insisting on being compensated for the loss of alternative and less costly (because competitive) sources of supply" (p. 203). Posner concluded that market foreclosure through contracts with stipulated damage clauses would be unprofitable for the monopolist.

[1]Stipulated damage clauses refer to any damages term included in a contract, regardless of its enforceability (Talley, 1994). Although the common law holds that penalty clauses (i.e., penalties that allow the non-breaching party to recover more than its actual or reasonably anticipated losses) are not enforceable, judicial interpretations are highly permissive and often enforce these clauses (Brodley and Ma, 1992).

In contrast, other scholars have argued that stipulated damage clauses can serve strategic purposes and may generate anticompetitive outcomes. As shown by Aghion and Bolton (1987), when potential entrants will have some market power, the incumbent seller and buyer may have a joint incentive to write a contract prior to entry that commits the buyer to pay high stipulated damages in the event of breach.[2] Contractually bound to the seller, the buyer's reservation price for the entrant's product is lowered, and the entrant must reduce its price if it is to make a sale. Through this mechanism, the entrant's producer surplus might be extracted.[3] When the entrant's cost is unknown at the time of contracting, this damage provision creates ex-post inefficiency because it acts as an entry fee that the entrant must pay to the seller, and hence, might block the entry of firms that are more efficient than the incumbent seller.[4] Aghion and Bolton's (1987) predictions rely heavily on the assumption that renegotiation does not occur. Introducing renegotiation of the contract terms weakens the commitment power of the original contract (Masten and Snyder, 1989; Spier and Whinston, 1995).[5] Our paper contributes to this literature by (i) experimentally studying the strategic use of contracts with stipulated damages for rent-extraction purposes; (ii) identifying and exploring the nature of non-random deviations from the theoretical point predictions; and, (iii) providing an empirically-relevant theoretical extension.

Specifically, we present the first experimental study of the design of stipulated damage clauses by incumbent monopolists to extract the profits of more efficient entrants and the potential anticompetitive effects of these clauses. We explore whether contract renegotiation weakens the commitment power of stipulated damages and whether complete information about the entrant's cost restores efficiency. Although the theoretical literature on the topic has been very active, there have been no empirical tests of these models.[6] This may be

[2]We will use the terms *entrant* and *potential entrant* interchangeably.

[3]Stipulated damages as a rent-extraction device were first studied by Diamond and Maskin (1979).

[4]The *Automatic Radio Manufacturing Co. v. Hazeltine Research* (1950) case illustrates a penalty agreement designed to capture an entrant's rent. The Court refused to condemn the agreement as misuse because it did not create another monopoly (Hovenkamp et al., 2004). Importantly, the Court did not consider the argument that the penalty clause could reduce competition by generating inefficient exclusion.

[5]This criticism was proposed by Masten and Snyder (1989) and formally studied by Spier and Whinston (1995). When referring to the effects of renegotiation, the rest of the paper will focus on Spier and Whinston's (1995) theoretical contributions. See Ziss (1996) for a refinement of Aghion and Bolton's (1987) results under asymmetric information about the incumbent's cost. Another branch of the literature has focused on contracts with externalities and market foreclosure. See Rasmusen et al. (1991), Segal and Whinston (2000), Fumagalli and Motta (2006), and Simpson and Wickelgren (2007) for theoretical work, and Landeo and Spier (2009) for experimental evidence.

[6]Sloof et al. (2003, 2006) study the effects of different damages regimes on the level of relationship-specific investment. This work does not consider the effects on third-party entrants.

due to the scarcity of data; in real-world settings, contracts are generally negotiated in private, and hence, are not observed by researchers. Conducting experiments to assess the predictions from these theoretical frameworks is a useful alternative to more traditional empirical analysis.

Our analysis also provides new behavioral insights regarding contracting with stipulated damages, and more generally, bargaining in exchange environments.[7] The strategic settings of Aghion and Bolton (1987) and Spier and Whinston (1995) involve three-player exchange bargaining environments. Importantly, the effective use of stipulated damages by incumbent sellers as a rent-extraction mechanism requires the participation of the other two parties, the buyer and the potential entrant: *It Takes Three to Tango.* As a result, previously non-modeled behavioral factors might be present in this environment. Specifically, the experimental economics literature on two-player bargaining games suggests that the more equitable off-equilibrium offers observed in these settings might be explained by the presence of non-monetary preferences in the form of inequity aversion, and the proposers' strategic anticipation of those preferences (Forsythe et al., 1994; Hoffman et al., 1994, 1996; Ochs and Roth, 1995).[8] Seminal interdisciplinary experimental work on bargaining emphasizes the importance of payoff aspirations (see, for instance, Siegel and Fouraker, 1960; Roth and Murnighan, 1983; Thompson, 1990),[9] and suggests that players' payoff aspirations might be influenced by social norms of fairness, among other factors (Siegel and Fouraker, 1960). Thus, non-monetary preferences in the form of inequity aversion and/or payoff aspirations, and the strategic anticipation of others' non-monetary preferences, might affect the design of stipulated damages.[10] To the best of our knowledge, ours is the first experimental investigation of this type of strategic setting.[11] Importantly, we are the first to propose that payoff aspirations influenced by social norms of fairness (and other exogenous factors) might explain

[7]Hoffman et al. (1994) classify bargaining environments into two main categories, *divide-the-pie* and *exchange* environments. The former category refers to environments in which the bargainers' task is to divide an amount of money (the pie). The latter group refers to bilateral bargaining between a buyer and a seller. We use the terms *buyer-seller exchange environment* and *exchange environment* interchangeably.

[8]Hoffman et al.'s (1994) findings suggest that the bargaining context might influence the elicitation of regards-for-others. Specifically, in buyer-seller exchange environments, it is expected that inequity-aversion will play a less important role in explaining bargaining outcomes.

[9]Payoff aspiration refers to the monetary goal the player strives to achieve (Siegel, 1957; Thompson, 1990). See also Baker and Siegel (1958), Tietz et al. (1978), Crott et al. (1978), Thompson (1995, 1998).

[10]Payoffs aspirations have also been studied in the context of learning in games (Mitzkewitz and Nagel, 1993) and pretrial bargaining (Landeo, 2009).

[11]Kagel and Wolfe (2001), Güth et al. (2007), Güth and van Damme (1998), and Bareby-Meyer and Niederle (2005), among others, study three-player bargaining games in divide-the-pie environments. See Fouraker and Siegel (1963) and Hoffman et al. (1994) for studies involving two-player exchange environments.

the more-equitable allocations of the surplus observed in exchange bargaining environments. Our experimental evidence and theoretical analysis support this claim.[12]

Finally, our paper makes independent methodological contributions to the experimental economics literature. Previous experimental studies of bargaining have constructed environments in which the proposer has absolute power to decide the allocation of the surplus (dictator environments) to explore the nature of non-random deviations observed in ultimatum games (Forsythe, et. al, 1994). We provide a novel implementation of a dictator-seller environment designed to study player's preferences in more complex contractual settings. Moreover, the experimental literature on bargaining suggests that communication between the players might elicit non-monetary preferences, and provides evidence regarding the nature of these preferences (Roth, 1996; Putnam and Jones, 1982). We present the first study of unstructured communication in three-player exchange environments. Our study contributes more broadly to the design of complex experimental environments in economics by introducing original interactive software.[13]

Our experimental design encompasses two information treatments: Incomplete information (where the entrant's cost is private information) and complete information (where the entrant's cost is common knowledge). We also consider four contract environment treatments: No-renegotiation (where renegotiation between the seller and buyer is not allowed); renegotiation (where the buyer and seller can renegotiate their contract after observing the entrant's price); no-renegotiation with a dictator-seller (where the allocation of the surplus is unilaterally decided by the incumbent seller); and, no-renegotiation with communication (where the buyer and the entrant can engage in unstructured communication, after the buyer receives the offer from the incumbent seller, and before she decides whether to accept the contract).[14] A combination of a subset of these treatments generates six experimental conditions. The subjects, a pool of undergraduate and graduate students from Yale University, were paid according to their performance.

Our main experimental findings are as follows. First, our results indicate that contract renegotiation raises the likelihood of low stipulated damages and high entrant's prices, sug-

[12]Our paper is motivated by contractual agreements between firms. Given that firms are run by individuals and contracts are negotiated by human agents, it is reasonable to expect that non-monetary preferences might be present in these settings (Dufwenberg et al., forthcoming).

[13]Among other novel features, our software includes a device that allows subjects to compute the payoffs related to the different contingencies before submitting their decisions at every stage of the game. This tool might help reduce the level of computational error, and hence, facilitate the detection of off-equilibrium regularities. (See Appendix E.) A complete set of software screens is available upon request.

[14]A buyer-entrant communication environment is more appropriate than a seller-buyer communication setting to assess about the nature of players' preferences. See Hypothesis 4 for details.

gesting that renegotiation weakens the commitment power of stipulated damages. Second, the dictator-seller environment increases the likelihood of high stipulated damages, suggesting that the more generous off-equilibrium stipulated damages offered by the seller in the other conditions reflect the seller's strategic anticipation of others' non-monetary preferences in the form of payoff aspirations. Third, communication between the buyer and the entrant increases the likelihood of equitable allocations and lowers the likelihood of exclusion, indicating the importance of payoff aspirations influenced by social norms of fairness in explaining the more generous off-equilibrium stipulated damages offered by the seller and the price proposed by the entrant.

We extend the theoretical literature on contracting with stipulated damages by incorporating non-monetary preferences in the form of payoff aspirations (influenced by social norms of fairness and exogenous factors) into the players' utility functions. We show how payoff aspirations might influence the design of stipulated damages, and might weaken the effect of contract renegotiation. The predictions of this model are aligned with our empirical regularities. Finally, we present a multi-player ultimatum bargaining environment under payoff aspirations, and show that the more equitable off-equilibrium offers previously observed in simple exchange bargaining environments might be equally explained by payoff aspirations.

Our paper is motivated by contracts with stipulated damages signed by an incumbent seller and a buyer for the purpose of extracting an entrant's profits. However, our findings and insights may apply to other contexts as well. Consider, for example, the widespread use of golden parachutes (severance pay contracts that compensate managers for the change in control and/or the loss of their jobs in the event of a takeover). The excessive amounts of compensation involved in golden parachutes might generate inefficiencies by blocking some efficient takeovers and inducing overinvestment in specific capital (Choi, 2004). Additional applications include break-up fees in merger environments and not-to-compete clauses in employment agreements (Cramton and Schwartz, 1991; Officer, 2003; Posner, Triantis, and Triantis, 2004; Hua, 2007; Marx and Shaffer, 2010).[15]

The rest of the paper is organized as follows. Section I outlines the theoretical framework. Section II discusses the qualitative hypotheses. Section III presents the experimental design. Section IV examines the experimental results. Section V presents a simple theoretical model of contracting with stipulated damages and a multi-player ultimatum bargaining framework under non-monetary preferences in the form of payoff aspirations. Section VI concludes the paper and discusses avenues for future research.

[15]Other examples of endogenous switching costs are frequent flyer programs, trading stamps, deferred rebates by shipping (Klemperer, 1986).

2 Theoretical Framework

This section outlines a binary model that reflects the strategic environments of Aghion and Bolton (1987) and Spier and Whinston (1995), and describes the numerical examination used in our experimental design. (See Appendix A for formal details.)

There are three risk-neutral Bayesian players, a buyer B, an incumbent seller I, and a potential entrant E. The buyer demands at most one unit of the good and values it at v. The cost of production for the incumbent seller is given by c_I, where $c_I \in (0, v)$. The entrant's cost of production is given by c_E, where $c_E = c_E^L$ with probability θ and $c_E = c_E^H$ with probability $1 - \theta$. $\theta \in (0, 1)$ is common knowledge. We assume that the entrant, regardless of his type, is more efficient than the incumbent, or $c_I > c_E^H > c_E^L$. In this environment, the surplus refers to $v - c_E$, and the net surplus refers to $c_I - c_E$ (the surplus minus the buyer's outside option $v - c_I$). We consider two information structures: Incomplete information (E's cost is known only by E),[16] and complete information (E's cost is common knowledge). We restrict attention to contracts of the form $\{p, d\}$, where p is the price to be paid by B to I if he purchases from I, and d are the stipulated damages to be paid by B to I if he purchases from E instead (after accepting I's contract offer).

The timing of the game is as follows. A random process (a coin flip) first determines the potential entrant's type, which is observed by the entrant only (incomplete information) or by the three players (complete information). In Stage 1, the Contract Stage, I makes a take-it-or-leave-it contract offer $\{p_0, d_0\}$ to B, and B decides whether to accept or reject it.[17] If the contract offer is rejected by B, we assume that E enters and captures the market at a price $p_E = c_I$, giving the three players payoffs of $(\pi_I^*, \pi_B^*, \pi_E^*) = (0, v - c_I, c_I - c_E)$, where $c_E \in \{c_E^L, c_E^H\}$, and the game ends.[18] In Stage 2, the Entry Stage, after observing

[16]Although Aghion and Bolton's (1987) and Spier and Whinston's (1995) environments involve uncertainty about the entrant's cost at the contracting stage, we decided to implement a numerical examination of these environments under the more empirically-relevant assumption of incomplete information about the entrant's cost. Note that the theoretical predictions will be similar under both information structures. However, different behavioral deviations might be observed under these two information environments.

[17]In theory, the results are robust to shared bargaining power between I and B under the bilateral contracting principle (Whinston, 2006). From a behavioral point of view, a structured bargaining process might reduce computational errors, and hence, facilitate the identification of non-equilibrium regularities.

[18]This assumption is consistent with Aghion and Bolton (1987), where Bertrand price competition occurs in the absence of a preexisting contract. To minimize subjects' computational costs, and given that the purpose of this study is to assess the determinants of the design of stipulated damages, we do not include the implied subgame in our experimental design. A potential shortcoming of our design might come from the vulnerability of players' decisions to game specification due to the violation of truncation consistency (truncation consistency implies that replacing a subgame with its equilibrium payoffs will not affect play

$\{p_0, d_0\}$, E decides whether to participate in the market and offer a price p_E to B.[19] In Stage 3, the Renegotiation Stage, after observing E's decision, I decides whether to offer a modified contract, $\{p_1, d_1\}$ to B, and B decides whether to accept the modified contract or remain with $\{p_0, d_0\}$. Finally, in Stage 4, the Breach Stage, B decides whether to buy from I or breach and buy from E. The equilibrium concepts are subgame perfect equilibrium and perfect Bayesian equilibrium (under complete and incomplete information, respectively).

Before proceeding any further, it is important to highlight the strategic role of stipulated damages. Given a contract, $\{p, d\}$,[20] the buyer would breach and buy from the entrant when $p_E + d \leq p$ but not otherwise. When this inequality holds, the buyer is weakly better off breaching the original contract, paying p_E to the entrant and d to the incumbent, than purchasing from the incumbent at price p. Absent renegotiation, if $c_E < p - d$, then the entrant would offer to sell to B for $p_E = p - d$ (minus a penny perhaps). The buyer would subsequently breach the contract, pay damages to the incumbent, and purchase from the entrant. By raising the stipulated damage payment, d, I and B can induce the entrant to lower his price in order to make a sale. If the entrant's cost c_E were known at the time of contracting, then in theory the incumbent seller could extract all of the entrant's profits through a contract $\{p_0, d_0\} = \{c_I, c_I - c_E\}$. The entrant could make a sale only by setting $p_E = p_0 - d_0 = c_E$, giving I, B, and E payoffs of $c_I - c_E$, $v - c_I$ and 0, respectively.

We assign numerical values to the model parameters.[21] The buyer's valuation of the good is $v = 1,600$. The incumbent seller's production cost is $c_I = 1,300$. The potential entrant's production costs, c_E, can take only two possible values $c_E^L = 100$ with probability $\theta = 3/4$ and $c_E^H = 600$ with the complementary probability $1 - \theta = 1/4$. To reduce subjects' computational costs, we restrict the incumbent seller's contracts to the set $\{p, d\} \in \{\{1100, 100\}, \{1100, 500\}, \{1100, 1000\}, \{1300, 100\}, \{1300, 500\}, \{1300, 1000\}\}$,[22] and the entrant's price to the set $p_E \in \{200, 400, 600, 700, 1100, 1300\}$. These sets include behaviorally-relevant representations of the equilibrium strategies,[23] and, as discussed later, allow for

elsewhere in the game). See Binmore et al. (2002).

[19]Since there is no cost of participation, not participating is a weakly dominated strategy. Note that the entrant's decision to participate does not guarantee that he will actually serve the market.

[20]This contract could be either the initial contract $\{p_0, d_0\}$, or the modified contract $\{p_1, d_1\}$.

[21]Our numerical examination satisfies the model's assumptions and, therefore, the predictions derived from these assumptions hold. From a behavioral point of view, a numerical examination different from the one presented here might affect the results.

[22]Although we could imposed a seller's price equal to 1300 (the equilibrium seller's price under the unrestricted set of contracts; see Appendix A), we decided to include the additional price 1100. An experimental setting in which the incumbent seller is allowed to decide price and damages is more aligned with real-life settings. Hence, it might induce better understanding of the experimental environment.

[23]Given the parameter values, the equilibrium strategies for I and E (under $c_E = 100$, the most common

behavioral deviations from the equilibrium strategies.

Proposition 1 characterizes the equilibrium for the case of incomplete information about the entrant's cost and no-renegotiation (our benchmark environment).

PROPOSITION 1: *(INC/NR) Suppose the potential entrant's cost is private information and the incumbent seller is unable to renegotiate the contract. In all perfect Bayesian equilibria, the incumbent seller offers a contract* $\{p_0, d_0\} = \{1300, 1000\}$ *and the buyer accepts the contract. If* $c_E = 100$*, the entrant participates in the market and offers a price* $p_E = 200$ *and the buyer breaches the contract and buys from the entrant. If* $c_E = 600$*, the buyer does not breach the contract and purchases from the incumbent seller. There is inefficient exclusion.*

These results capture Aghion and Bolton's (1987) findings. Under incomplete information, I faces an important choice. If he offers $\{p_0, d_0\} = \{1300, 1000\}$, then to make a sale the entrant must set $p_E = 200$. The entrant would only make such an offer if he has low costs, $c_E = 100$, which happens seventy five percent of the time. Thus, the incumbent seller's expected payoff from this strategy is 750. If I offers $\{p_0, d_0\} = \{1300, 500\}$, then the entrant can raise his price to $p_E = 700$. The entrant would be willing to enter one hundred percent of the time and the incumbent seller's payoff would be 500. The risk-neutral incumbent seller would opt for the former strategy, setting stipulated damages high and accepting the risk that the entrant has high costs and the buyer will not breach. Note that this is socially inefficient since only the low-cost entrant serves the market.[24]

The next proposition summarizes the equilibrium for the case of complete information about the entrant's cost and no-renegotiation.

PROPOSITION 2: *(C/NR) Suppose the potential entrant's cost is common knowledge, and the incumbent seller is unable to renegotiate the contract. There is a unique subgame perfect Nash equilibrium in which the incumbent seller offers a contract* $\{p_0, d_0\} = \{1300, 1000\}$ *if* $c_E = 100$ *and* $\{p_0, d_0\} = \{1300, 500\}$ *if* $c_E = 600$*, and the buyer accepts the contract. The*

entrant's cost) are $\{p, d\} = \{1300, 1200\}$ and $p_E = 100$ (no-renegotiation), and $\{p, d\} = \{1300, 0\}$ and $p_E = 1300$ (renegotiation). (See Appendix A for technical details.) To generate behaviorally-relevant divisions of the surplus in equilibrium (and break indifference for B (no-renegotiation and renegotiation) and E (no-renegotiation only)), we restricted the maximum and minimum damages to 1000 and 100. As a result, a 67-33 split of the surplus occurs in equilibrium (between I and the other two players under no-renegotiation, or between E and the other two players under renegotiation). (See Propositions 1 to 3 and Appendix A for technical details.) The mode splits of the pie in Hoffman et al.'s (1994) two-player exchange environment with random entitlement (role of the seller randomly assigned) study were 70-30 and 60-40. Then, a 67-33 split is a behaviorally relevant share of the surplus.

[24]The high-entrant cost entrant will not supply the market in equilibrium. Since the buyer will not breach, the entrant's price offer is not payoff relevant in this case and is not uniquely determined.

potential entrant participates in the market and offers a price $p_E = 200$ *if* $c_E = 100$ *and* $p_E = 700$ *if* $c_E = 600$*. The buyer subsequently breaches and purchases from the entrant. There is no inefficient exclusion.*

When the potential entrant's cost is commonly known, the incumbent seller will tailor the damages to the entrant's cost. Importantly, this environment does not involve inefficiency.

The last proposition describes the equilibria when renegotiation is possible, under both incomplete and complete information about the entrant's cost.

PROPOSITION 3: *(INC/R and C/R) Suppose the buyer and incumbent seller can renegotiate their contract following an offer by the entrant. There are multiple perfect Bayesian (subgame perfect Nash) equilibria. The entrant participates in the market and offers either* $p_E = 700$ *or* $p_E = 1100$ *(both cost types), the buyer breaches the contract, purchases from the entrant, and pays stipulated damages of* 100 *to the incumbent seller. Renegotiation occurs only if* $d_0 \neq 100$*. There is no inefficient exclusion.*

These findings resemble Spier and Whinston's (1995) results. The incumbent seller is indifferent between offering $p_0 = 1300$ and $p_0 = 1100$. Both strategies lead the buyer to breach and pay stipulated damages of 100.[25] Two features of these equilibria deserve to be mentioned. First, the opportunity for renegotiation shifts the bargaining power from the incumbent seller to the entrant. The entrant can make an aggressive offer, knowing that the incumbent seller will reduce the stipulated damages to 100 in order to induce the buyer to breach.[26] Second, there is no inefficient foreclosure when the seller and buyer can renegotiate their contract in light of the entrant's offer. The buyer is served by the entrant rather than the less efficient incumbent seller. Table 1 summarizes the equilibrium point predictions.

A final point is worth emphasizing. Our numerical examination allows us to explore relevant behavioral deviations. An interesting deviation occurs when $\{p, d\} = \{1300, 500\}$ and $p_E = 600$. This deviation generates payoffs $(\pi_I, \pi_B, \pi_E) = (500, 500, 500)$, i.e., equal split

[25] To see why this is true, suppose first that $p_0 = 1300$. At Stage 3, the entrant can succeed in capturing the net surplus by offering $p_E = 1100$. If the buyer does not breach the contract with the incumbent, the incumbent will net $p_0 - c_I = 1300 - 1300 = 0$. The incumbent would rather reduce the damages to 100 in order to induce breach (and the buyer will certainly breach since $p_E + d_1 = 1100 + 100 < 1300 = p_0$). Suppose instead that $p_0 = 1100$. The entrant cannot induce breach with $p_E = 1100$ in this case. Even if the incumbent seller were to reduce the stipulated damages to the lowest possible level, $d_1 = 100$, the buyer would still prefer to purchase from the incumbent at $p_0 = 1100$. The entrant would instead offer $p_E = 700$ and the buyer would breach and pay 100 in damages.

[26] In the more general representation of the binary model, the incumbent seller and the buyer would extract no value at all (see Appendix A). This is because the entrant could succeed by setting its price at the incumbent seller's cost.

Table 1: Perfect Bayesian Equilibrium and Subgame Perfect Nash Equilibrium

	Seller's Offers	Buyer's Accept.	Entr.'s Part.	Entr.'s Price	Seller's Reneg.	Buy.'s Reneg. Accept.	Buyer's Breach
INC/NR	{1300, 1000}	Accept	Yes	200			Breach
			[Yes/No]	[> 200/n.a.]			[No Br.]
C/NR	{1300, 1000}	Accept	Yes	200			Breach
	[{1300, 500}]			[700]			
INC/R	$\{p_0,\, d_0\}$	Accept	Yes	700, 1100	$\{p_1,\, 100\}$	Accept	Breach
C/R							

Notes: Decisions in case of high-cost entrants (when different from the case of low-cost entrants) are in brackets.

of the surplus between I, B and E when $c_E = 100$ and the buyer breaches the contract.[27] Hence, this deviation might suggest the presence of non-monetary preferences and/or the strategic anticipation of other players' non-monetary preferences.[28] Non-monetary preferences might reflect inequity-aversion considerations or, alternatively, players' payoff aspirations. A player's payoff aspiration refers to the monetary goal the player strives to achieve (Siegel, 1957; Thompson, 1990),[29] a value which might be influenced by social norms of

[27]Hoffman et al. (1994) study ultimatum games under exchange environments with random entitlement, and an eleven-offer set (which of course includes an offer that generates a 50-50 split of the pie). Their findings suggest off-equilibrium deviations towards more equitable allocations of the pie. Specifically, more than fifty percent of offers involved allocations in which the offeree received at least 40 percent of the surplus. In our numerical examination, damages of 500 may be viewed as concentrated off-equilibrium deviations that would be also present in environments with larger damages sets. (See Section IV, subsection C.) A potential shortcoming of our design might come from the vulnerability of players' decisions to equal splits. Güth et al. (2001) find that equitable offers occurred less frequently when equal splits were replaced by nearly equal splits. In our environments, an equal split of the pie occurs only if damages are equal to 500 *and* the entrant's price is equal to 600 (which is not under the seller's control). Given the seller's uncertainty about the entrant's choice, the split of the pie under damages equal to 500 might be perceived by the seller as *nearly* equal.

[28]Other behavioral deviations are as follows: (i) $\{p, d\} = \{1300, 500\}$ and $p_E = 400$ (under $c_E = 100$), which generate payoffs $(\pi_I, \pi_B, \pi_E) = (500, 700, 300)$, and might suggest that I exhibits non-monetary preferences and/or strategically anticipates others' non-monetary preferences, and that E also exhibits non-monetary preferences and/or strategically anticipates B's non-monetary preferences (and considers B's outside option equal to 300); and, (ii) the choice of $p_E = 1300$ (under complete information), which suggests subjects' computational errors, and hence, might provide an indicator of subjects' understanding of the experimental environment.

[29]Crott et al. (1978) and Tietz (1978) argue that player's aspiration might refer to the highest, actual, or

fairness, among other factors (Siegel and Fouraker, 1960).[30] Although inequity aversion has been extensively studied in recent experimental and theoretical economics literature on bargaining, the effects of payoff aspirations on bargaining outcomes have been mainly discussed in early work on experimental economics, experimental social psychology, and negotiations.

3 Qualitative Hypotheses

The first two hypotheses reflect the theoretical predictions regarding the effects of renegotiation and complete information about the entrant's cost.

HYPOTHESIS 1: *When the entrant's cost is private information (common knowledge), renegotiation decreases the seller's stipulated damages, increases the entrant's price conditional on breach occurring, and lowers (does not affect) the likelihood of inefficient exclusion.*

In theory, renegotiation weakens the commitment power of stipulated damages. Suppose E offers a price just below c_I. Then, I and B will have a joint incentive to purchase from the entrant, since the entrant's price is smaller than the opportunity cost of producing the product themselves, c_I. So through Coasian bargaining, they will renegotiate any stipulated damages provision to procure from the entrant. Then, we would expect the stipulated damages to be lower and the entrant's price higher under renegotiation. Remember that entry always occurs under renegotiation. Our theoretical predictions also suggest that, when the entrant's cost is private information, renegotiation will restore efficiency.

HYPOTHESIS 2: *When the incumbent seller is unable to renegotiate (can renegotiate) the terms of the contract following an offer by the entrant, complete information about the entrant's cost decreases (does not affect) the seller's average stipulated damages and lowers (does not affect) the likelihood of inefficient exclusion.*

In theory, inefficient exclusion occurs when the entrant's cost is private information and buyers and sellers are unable to renegotiate the contract. The incumbent seller, not knowing the entrant's cost, will set damages at the high level in order to extract value from the low-cost entrant. These high damages create a barrier to entry for the high-cost entrant. If, on

minimal aspired payoff (or goal). In our environment, an equal split of the pie might be interpreted as the *minimal aspired payoff*. A player's reservation value, on the other hand, refers to the *minimum acceptable amount*. Payoff aspirations might influence reservation values (Siegel and Fouraker, 1960; Thompson, 1990).

[30]Although social norms of fairness might be present in our experimental settings, the free-context feature of our environments might weaken the elicitation of other factors that influence the formation of payoff aspirations. Then, it is plausible that subjects' payoff aspirations reflect social norms of fairness.

the other hand, the incumbent seller knew that the entrant had high costs, the seller would set the lower level of stipulated damages and accommodate entry.

The presence of non-monetary preferences in our three-player exchange bargaining environment might alter or modify the design of stipulated damages and the effects of renegotiation and complete information. Indeed, systematic departures from the game-theoretic predictions observed in previous experimental economics work on bargaining environments might reflect non-monetary preferences.[31] Importantly, these findings do not necessarily indicate inequity aversion on the part of either offerors or receivers. We argue that non-monetary preferences in the form of payoff aspirations influenced by social norms of fairness (among other factors) might equally accommodate these results.[32]

In our strategic settings, sellers' non-monetary preferences and/or their strategic anticipation of the non-monetary preferences of buyers and entrants might explain the sellers' more generous off-equilibrium damages (500 instead of 1,000). Given that the no-renegotiation and the renegotiation environments might equally elicit non-monetary preferences, sellers might choose damages equal to 500 in both settings. If, in addition, the entrants exhibit non-monetary preferences and/or strategically anticipate the buyers' non-monetary preferences, they will choose a less aggressive price in the renegotiation environment (700 instead of 1,100). This lower entrant's price will not force sellers and buyers to renegotiate the contract (and reduce damages). As a result, the effect of renegotiation on seller's damages and entrant's price might be dampened. Similarly, the seller's non-monetary preferences and/or his anticipation of others' non-monetary preferences might induce more generous contracts in both complete and incomplete information environments. Consequently, the average level of stipulated damages and the likelihood of exclusion under incomplete and complete information (and no-renegotiation) might be similar.

The next two hypotheses (and their associated experimental conditions) are constructed to explore of the nature of players' preferences in our strategic settings.

[31] See Hoffman et al. (1994) for two-player exchange environments; Ochs and Roth (1989) for a two-period divide-the-pie bargaining environment; and, Roth (1995) for a survey on experimental work of bargaining. See Güth and van Damme's (1998) work on three-player divide-the-pie ultimatum environments for additional experimental evidence.

[32] The bargaining context might influence the elicitation of regards-for-others concerns (Hoffman et al., 1994). Inequity aversion might be weaker in exchange environments (compared to divide-the-pie environments) because buyers expect that sellers will behave in a selfish way (and believe that sellers are entitled to that behavior). As a result, buyers accept non-generous offers more frequently. (See Fouraker and Siegel (1963) and Brooks et al. (2010) for additional evidence of weak inequity-aversion concerns in exchange environments.) In contexts different from exchange environments, inequity-aversion might also play an important role in explaining bargaining outcomes.

HYPOTHESIS 3: *A dictator-seller environment induces sellers to choose the highest possible level of stipulated damages.*

Dictator environments might provide information regarding players' preferences in contractual settings, and more generally, in bargaining environments. In a dictator environment, the proposer has absolute power to allocate the split of the pie. Given that the receiver cannot punish the proposer by rejecting the offer, the proposer's offer can be interpreted as pure expression of her own preferences. In their seminal work, Forsythe et al. (1994) compare the behavior of proposers in ultimatum and dictator environments. Their findings suggest that while some of the subjects may be primarily motivated by fairness considerations, the high concentration of equal division offers cannot be attributed to the proposer's inequity aversion. Hence, off-equilibrium behavior results from the proposer's strategic anticipation of others' non-monetary preferences (Roth, 1995).

Our dictator-seller environment represents a novel implementation of Forsythe et al.'s (1994) two-player dictator environment in a contractual setting with three-players. In our environment, the incumbent seller chooses both the contract and the entrant's price. By construction, the seller has the power to unilaterally decide the allocation of the surplus among the three players since the buyers and potential entrant cannot reject these allocations.[33] Note that the strategic anticipation of others' non-monetary preferences is not elicited in our dictator-seller setting. As a result, our dictator-seller environment might help isolate the two possible reasons behind the choice of the off-equilibrium stipulated damages equal to 500: The seller's strong inequity-aversion concerns, and his strategic anticipation of others' non-monetary preferences.

Subgame perfection predicts that the seller will choose stipulated damages equal to 1,000 and an entrant's price equal to 200, in case of low-cost entrants; and damages equal to 500 and an entrant's price equal to 600 or 700, in case of high-cost entrants. If the seller's damages follow subgame perfection, this might indicate at most weak inequity aversion concerns, and that the seller's strategic anticipation of other players' non-monetary preferences is the driving force behind his behavior in the other conditions. Importantly, if the sellers exhibit weak inequity-aversion concerns, it is likely that they will believe that the other players share the sellers' preferences. In fact, findings from social psychology suggest that individuals presume that their preferences, beliefs, and opinions, are shared by others (Ross, 1977). Moreover, given the random allocation of subjects to roles, we might also infer that the buyers and entrants might exhibit at most weak inequity aversion concerns.[34]

[33] The only restriction on the allocation is that the payoffs for the other two players must be greater than or equal to their outside options. See Section III for details.

[34] We are assuming that the degree of inequity aversion is not role-induced.

HYPOTHESIS 4: *Non-binding two-way unstructured communication between the buyer and potential entrant at the contracting stage induces more generous offers from the incumbent seller and the entrant, and reduces the likelihood of exclusion.*

Communication environments might provide information regarding players' preferences, and affect contractual outcomes. In our experimental environment, two-way unstructured communication between the buyer and the entrant (through an instant messenger device) occurs after the seller makes a contract offer to the buyer and before the buyer decides whether to accept the contract. In this setting, the seller's binding offer is already set, and the buyer might influence the entrant's price (and hence, the allocation of the surplus). As a result, unstructured negotiation (requests and counter-requests) between the buyer and the entrant might occur. Following seminal work on the behavioral sciences (Siegel and Fouraker, 1960), and the negotiation literature (Thompson, 1998; Kray et al., 2001), the first requests might be interpreted as the players' payoff aspirations.[35]

Persuasion strategies might emerge in communication settings. The effectiveness of persuasion might provide additional information regarding the nature of players' preferences. Experimental social psychology work on negotiations (Putnam and Jones, 1982) suggests that communication might be used as a persuasion tool by a party who can affect the other party's payoff by credibly committing to a promise or a threat.[36] Experimental economics has also studied the role of nonbinding communication in strategic environments. One of the theoretical conditions for credible non-binding preplay communication proposed by Aumann (1990) and Farrell and Rabin (1996) is self-commitment. This condition is satisfied when the sender's message is part of an equilibrium strategy profile.[37] In our strategic setting, explicit and implicit persuasion might occur. Explicit persuasion strategies refer to messages involving threats or promises. Implicit persuasion strategies, on the other hand, refer to the threats or promises implicit in the buyers' payoff requests. Communication might allow the buyer to effectively induce the entrant to offer a price aligned with the buyer's payoff aspiration if the entrant believes that the action (explicitly or implicitly) implied by the buyer's message involves self-commitment. For example, the buyer might threaten not to breach if the entrant's offer is not aligned with her payoff aspiration. Credible promises and threats

[35]Note that the main purpose of the communication environment is to explore the nature of players' preferences. We could implement seller-buyer communication. Given that communication would not influence the entrant's price (and hence, the split of the pie), this environment will provide limited information about players' preferences.

[36]DellaVigna and Gentzkow (2010) discuss recent economics studies on persuasion through communication.

[37]Although Aumann's (1990) and Farrell and Rabin's (1996) work refers to preplay communication in coordination games, their insights might apply to other strategic settings.

could induce more generous offers by the entrant. Interestingly, if the action (explicitly or implicitly) implied by the message involves a loss of monetary payoff, it will be credible for the entrant only if he believes that the buyer holds non-monetary preferences.[38] Given that individuals presume that their opinions, preferences, and beliefs are shared by others (Ross, 1977), we might also expect that the entrants will exhibit non-monetary preferences.

Regards-for-others concerns might be also elicited by the communication environment (see Andreoni and Rao, 2011).[39] The entrant's regard for the buyer's well-being might induce her to make a lower price offer to the buyer (a more equitable division of the surplus). The buyer's concerns for the entrant, on the other hand, might trigger a higher likelihood of contract breach (if the entrant's price offer is perceived as fair). As a result, the likelihood of exclusion might be reduced.[40] The elicitation of social preferences through communication might be weakened by the exchange characteristic of our strategic environments.

The strategic sellers might anticipate that communication might exacerbate the negative responses of the buyers to high level of damages, and offer more generous damages. In sum, as a result of the behavior of the three players, more generous offers from sellers and entrants, and lower likelihood of exclusion might be observed under communication.

4 Experimental Design

In assessing the validity of the *qualitative* predictions derived from the theory and the behavioral predictions derived from previous experimental work, our study analyzes the effects of renegotiation, incomplete information about the entrant's cost, the dictator-seller environment, and buyer-entrant communication on the design of stipulated damages.

We specify the experimental setting in a way that satisfies the assumptions of the theory, use a free-context environment,[41] and human subjects paid according to their performance. Our experimental design encompasses two information treatments, incomplete information

[38]For instance, a buyer with non-monetary preferences in the form of payoff aspirations might be willing to sacrifice monetary payoff instead of accepting an offer that is not aligned with her aspirations.

[39]They find that one-way communication between the recipient and the offeror increases the offeror's proposal in dictator environments. The increase of social proximity under communication might explain these findings (Bohnet and Frey, 1999; Schelling, 1968). Although our experiments are characterized by anonymity, communication might still reduce social distance by allowing buyers to learn more about the entrants and vice versa. See also Hoffman et al. (1996) and Charness et al. (2007).

[40]The likelihood of exclusion might also decrease due to the effect of communication on the salience of the outcome for the negatively affected entrant (see Landeo and Spier, 2012).

[41]This ensures control and replicability. If our findings in this simple environment do not conform to the theory, there is little hope that this theory can explain subjects' behavior in more complex settings (see Davis and Holt, 1993).

Table 2: Experimental Conditions

		Sample Size
Incomplete Inf./No-Renegotiation	INC/NR	$[27, 54]$
Incomplete Inf./Renegotiation	INC/R	$[24, 48]$
Complete Inf./No-Renegotiation	C/NR	$[27, 54]$
Complete Inf./Renegotiation	C/R	$[27, 54]$
Complete Inf./No-Renegotiation (Dictator-Seller)	C/NR-D	$[30, 60]$
Complete Inf./No-Renegotiation (Buyer-Entrant Communication)	C/NR-CO	$[27, 54]$

Notes: Number of subjects and observations (number of groups for the 6 rounds) are in brackets.

(INC), where the entrant's cost is know only by the entrant; and, complete information (C), where the entrant's cost is common knowledge. We also consider four contractual environment treatments: No-renegotiation (NR), where renegotiation is not allowed; renegotiation (R), where contract renegotiation between the incumbent seller and buyer is permitted (after observing the entrant's price); no-renegotiation dictator-seller environment (NR-D), where the seller unilaterally decides the allocation of the surplus; and, no-renegotiation unstructured buyer-entrant communication (NR-CO), where the buyer and the entrant exchange unstructured messages (after the seller makes a contract offer to the buyer and before the buyer decides whether to accept the offer). A combination of a subset of these treatments generates six experimental conditions. Table 2 summarizes the experimental conditions.

4.1 The Games

The experiment is a three-player, multiple-stage game. Subjects play the role of Player A (the incumbent seller), Player B (the buyer), or Player C (the entrant). We use a laboratory currency called the "token" (187 tokens = 1 U.S. dollar).[42] Procedural regularity is accomplished by developing a software program that permits subjects to play the game by using networked personal computers.[43] The software consists of 6 versions of the game, reflecting the six experimental conditions. The software includes an interactive payoff calculator device, which allows subjects to compute the payoffs for the three players under each possible contingency. Then, this device helps minimize computational errors.

The benchmark game corresponds to the environment presented in Aghion and Bolton

[42]The use of tokens allows us to create a fine payoff grid that underlines the payoff differences among actions (see Davis and Holt, 1993).

[43]Software screens and a complete set of instructions are available upon request.

(1987), incomplete information/no-renegotiation. In the first stage, the seller makes a contract offer to the buyer. The contract offers consist of a selling price and damages in case of contract breach. In the second stage, after observing the contract offer, the buyer decides whether to accept or reject the contract offer. If the buyer accepts the offer, then the third stage starts. In the third stage, a potential entrant decides whether to participate in the market. In case of participation, he proposes a selling price. If the entrant decides to participate, then fourth stage starts. The buyer decides whether to accept the entrant's price offer (breach the contract) or reject the offer.

Variations of this benchmark game satisfy the other experimental conditions: (i) In the complete information conditions, the entrant's cost is common knowledge; (ii) in the renegotiation conditions, the instructions specify a renegotiation stage (which occurs immediately after the entrant proposes a price, and before the buyer decides whether to breach the contract). Specifically, after observing the entrant's selling price, the seller decides whether to revise the contract previously offered to the buyer. If a revised contract is proposed by the seller, the buyer decides whether to accept or reject it (rejection implies that the original contract remains valid); (iii) in the dictator-seller condition, the instructions specify that the buyer will always accept the contract and switch to the entrant, and the entrant will always participate in the market. The instructions also specify minimum payoffs for the buyer and entrant of 300 and 0, respectively;[44] and, (iv) in the communication condition, unstructured two way buyer-entrant communication (written messages through an instant-messenger device) occurs immediately after the seller makes a contract offer to the buyer, and before the buyer decides whether to accept the contract.

4.2 The Experimental Sessions

We ran twelve 90-minute to 120-minute sessions of 9 to 18 subjects each (two sessions per condition, 162 subjects in total) at experimental laboratories of Yale University.[45] The subject pool was recruited from undergraduate and graduate classes at Yale University, by posting advertisements on public boards and on an electronic bulletin board.[46]

At the beginning of each experimental session, written instructions were provided to the

[44] Consistent with the imposed strategies for the buyer and entrant, their minimum payoffs are set equal to their outside options. Specifically, the buyer's minimum payoff corresponds to the buyer's outside option in case of rejection of the original contract or refusal to breach the original contract. The entrant's minimum payoff corresponds to the entrant's outside option in case of refusal to participate.

[45] Several pilot experimental sessions were also conducted.

[46] Subjects were drawn from a variety of fields, and could participate in one experimental session only.

subjects (see Appendix D for a sample of instruction for the benchmark condition).[47] The instructions about the game and the software used were verbally presented by the experimenter to create common knowledge. Subjects were informed about the random process of allocating roles and types, and about the randomness and anonymity of the process of forming groups. Game structure, possible choices, payoffs, were common information among subjects. Subjects were informed only about the game version they were assigned to play. Subjects were also instructed that they would receive the dollar equivalent of the tokens held at the end of the experiment, and they were informed about the token/dollar equivalence. Finally, subjects were required to fill out a short questionnaire to ensure their ability to read the information tables. The rest of the session was entirely played using a computer terminal and the software designed for this experiment.

The experimental sessions encompassed three practice rounds[48] and six actual rounds. After the last practice round, every participant was randomly assigned a role.[49] At the beginning of each round, new three-subject groups were randomly and anonymously formed. In case of the role of entrant, a type (low or high) was also assigned at the beginning of each round.[50] Subjects did not play in the same group in two immediately consecutive rounds.[51] At the end of each round, subjects received information only about their own group's results and payoffs. Communication between players was done through a computer terminal, and therefore, players were anonymous to one another. Hence, this experimental environment did not permit the formation of reputations. Given the randomization process used to form groups, and the diversity of potential payoffs that subjects confronted (due to the heterogeneity of contract offers from the incumbent seller and selling prices from the entrant), the six actual rounds do not represent stationary repetitions of the game. Consequently, we can treat each round as a one-shot experience. The average payoff was

[47] Instructions for the other conditions are available upon request.

[48] Each player experienced the roles of seller, buyer, and entrant once. The outcomes from the three practice rounds were not considered in the computation of players' payoffs. Then, subjects had an incentive to experiment with the different options and hence, learn about the consequence of their choices.

[49] The role remained until the last round.

[50] The dictator-seller environment essentially involves individual-decision making. To ensure comparability across conditions, three players were also included in the experimental sessions related to this environment. To guarantee that anonymity of role assignment would be preserved, buyers and entrants were also active subjects in this environment. Instead of making decisions, buyers and entrants were asked to state their expectations regarding the sellers' choices. Given that this information was not central to our study (and for reasons of brevity), we are not including the analysis of this information.

[51] The computer was programmed to form groups taking into account this restriction and the maximization of the number of different groups in a six-period session.

\$45, for a time commitment of approximately 100 minutes.[52] At the end of each experimental session, subjects received their monetary payoffs in cash.

5 Results

5.1 Data Summary

Table 3 provides the descriptive statistics for the seller's final price and final damages for contract breach,[53] buyer's contract acceptance rate, entrant's participation rate and price, buyer's contract breach rate, exclusion rate, and sum of players' payoffs, in case of low-cost entrants.[54] (For reasons of brevity, the descriptive statistics for the case of high-cost entrants are relegated to Appendix C, Table C1.)

The buyer's contract acceptance rate is defined as the percentage of groups in which the buyer accepted the seller's initial contract offer;[55] the entrant's participation rate as the percentage of groups in which the entrant's decided to participate; the buyer's contract breach rate as the percentage of groups in which the buyer breached the contract and bought from the entrant; and, the exclusion rate as the percentage of groups in which the buyer bought from the incumbent seller. Note that the exclusion rate involves the cases in which the buyer accepted the original contract and bought from the seller because the entrant decided not to participate, and the cases in which the entrant decided to participate and the buyer accepted the original contract but did not breach the contract.[56] Our results suggest that renegotiation reduced the mean stipulated damages, and increased the mean entrant's price; the dictator-seller environment increased the mean stipulated damages, and reduced the entrant's price; and, buyer-entrant communication decreased the mean seller's damages, increased the mean entrant's price, and reduced the exclusion rate. Similar patterns are observed in case of high-cost entrants (see Appendix C, Table C1). Our findings do

[52] The participation fee was \$17 per hour.

[53] The seller's final damages (final price) refer to d_0 (p_0) in case of no-renegotiation or in case of renegotiation (when d_1 (p_1) was not proposed by the seller, or was proposed by the seller and rejected by the buyer). The seller's final damages (final price) refer to d_1 (p_1) in case of renegotiation (when d_1 (p_1) was proposed by the seller and accepted by the buyer).

[54] All the rates are computed with respect to the total groups, except for the participation rate (computed with respect to the groups in which the buyer accepted seller's initial contract offer), and the buyer's contract breach rate (computed with respect to the groups in which the entrant decided to participate).

[55] If the buyer rejected the seller's contract offer, we assumed that he bought from the entrant.

[56] Then, the buyer's breach rate and the exclusion rate presented in Tables 3 and C1 will add to 100% only if the buyer's acceptance rate and the entrant's participation rate are each equal to 100%, which is not the case in our experiments.

Table 3: Descriptive Statistics ($c_E = 100$)

Condition	Mean Seller's Fin. Pr.	Mean Seller's Fin. Dam.	Buyer's Accept. Rate	Entr.'s Part. Rate	Mean Entr.'s Price[a]	Buyer's Breach Rate	Exclus. Rate[b]	Mean Sum of Payoffs
INC/NR	1295.56	688.89	.91	.93	571.05	.87	.18	1286.67
[45]	(29.81)	(245.16)			(238.13)			(463.97)
INC/R	1260.00	617.50	.98	.95	627.03	.84	.20	1260.00
[40]	(81.02)	(332.73)			(330.53)			(486.11)
C/NR	1268.89	711.11	.98	.89	484.62	.85	.24	1206.67
[45]	(73.31)	(249.75)			(208.43)			(521.54)
C/R	1268.89	480.00	1.00	.93	695.24	.88	.18	1286.67
[45]	(73.31)	(281.72)			(278.46)			(463.97)
C/NR-D	1208.00	1000.00			200.00			1500.00
[50]	(100.69)	(.00)			(.00)			(.00)
C/NR-CO	1251.11	566.67	.84	1.00	578.95	.92	.07	1420.00
[45]	(86.92)	(171.89)			(121.16)			(302.72)

Notes: [a]Only cases in which the entrant decided to participate are included here; under the dictator-seller condition, the entrant's price is decided by the seller; [b]exclusion rate includes cases in which the entrant decided not to participate, and cases in which the entrant decided to participate but the buyer did not breach the contract with the seller; total groups are in brackets; standard deviations are in parentheses. See Table 2 for a description of the experimental conditions.

Table 4: Frequency of Seller's Final Prices, Seller's Final Damages, and Entrant's Prices

	Seller's Fin. Pr.		Seller's Fin. Dam.			Entrant's Price[a]				
Conditions	1100	1300	100	500	1000	200	400	600	700	1100
$c_E = 100$										
INC/NR	.02	.98	.00	.62	.38	.21	.11	.13	.50	.05
INC/R	.20	.80	.18	.45	.38	.30	.03	.03	.43	.22
C/NR	.16	.84	.00	.58	.42	.28	.18	.21	.33	.00
C/R	.16	.84	.24	.60	.16	.10	.14	.10	.43	.24
C/NR-D	.46	.54	.00	.00	1.00	1.00	.00	.00	.00	.00
C/NR-CO	.24	.76	.00	.87	.13	.05	.11	.63	.21	.00
$c_E = 600$										
INC/NR	.00	1.00	.00	.56	.44	.00	.00	.13	.88	.00
INC/R	.13	.88	.13	.50	.38	.00	.00	.00	.33	.67
C/NR	.22	.78	.11	.89	.00	.00	.00	.13	.63	.25
C/R	.00	1.00	.33	.56	.11	.00	.13	.00	.50	.38
C/NR-D	.70	.30	.00	1.00	.00	.00	.00	.30	.70	.00
C/NR-CO	.22	.78	.44	.44	.11	.00	.00	.00	.71	.29

Notes: [a]Only groups in which the entrant decided to participate are included; entrant's price equal to 1,300 was not chosen by any entrant in any condition, and hence, is not included in this table.

not indicate strong effects of complete information (under no-renegotiation) on the average damages (across types) or the exclusion rate.[57]

Table 4 gives a more detailed information of the frequencies of the final prices and final stipulated damages offered by the incumbent sellers, and the prices offered by low- and high-cost entrants.[58] The patterns in this table are broadly consistent with the theoretical predictions, but also suggest systematic departures from the theory. Consider the conditions with low-cost entrants in the top half of the table. Damages equal to 100 were never offered in the INC/NR and C/NR environments; in contrast, they were offered in 18 and 24 percent of the cases in the INC/R and C/R conditions, respectively. An entrant's price equal to 1,100 was rarely offered by entrants under the INC/NR and C/NR environments (5 and zero

[57]In fact, the average damages are equal to 668.52 and 694.44, under C/NR and INC/NR conditions (across types), respectively; and, the exclusion rates are equal to 26 and 22 percent, under C/NR and INC/NR conditions (across types), respectively.

[58]Frequencies of initial seller's prices (p_0) and final seller's prices (p_1) are similar for all renegotiation conditions (across entrant's cost), except for condition INC/R under low-cost entrant. In this case, the frequencies of initial seller's prices (p_0) are 13 and 88 percent, for prices equal to 1,100 and 1,300, respectively.

percent, respectively); in contrast, the entrant offered 1,100 in 22 and 24 percent of the cases under the INC/R and C/R conditions, respectively.[59] The behavior of the dictator-seller was also aligned with the equilibrium point predictions. Damages equal to 1,000 and an entrant's price equal to 200 were chosen in 100 percent of the cases by the dictator-seller. However, the data also suggest that damages equal to 500 and an entrant's price equal to 700 (under a seller's price equal to 1,300) were the mode offers under the INC/NR, INC/R, C/NR and C/R conditions. Moreover, the buyer-entrant communication environment induced more non-equilibrium behavior: Damages equal to 500 were chosen in 87 percent of the cases and the entrant's price equal to 600 was chosen in 63 percent of cases.[60] These patterns were not anticipated by the theory.[61]

Table 5 summarizes the renegotiation process: The initial damages offered by the seller (before the renegotiation stage),[62] and the final damages (that incorporate the renegotiated damages). On average, in 37 percent of the cases, sellers and buyers renegotiated the initial contracts (across renegotiation conditions and entrant's cost types). The data suggest that renegotiation provides entrants with power to induce lower damages: Under INC/R and C/R conditions, damages equal to 100 became more prevalent following renegotiation (across entrant's cost types), and damages equal to 1,000 became more rare following renegotiation (across entrants cost types; except for the case of C/R and high-cost entrants, where the frequency of damages equal to 1,000 remain constant). These findings suggest that renegotiation was effectively used by entrants as a tool to press sellers to reduce damages.

[59] An equilibrium entrant's price equal to 1,100 (under a seller's price equal to 1,300) was offered in 19 and 21 percent of the cases under the INC/R and C/R conditions, respectively; and, an equilibrium entrant's price equal to 700 (under a seller's price equal to 1,100) was offered in 5 and 2 percent of the cases under the INC/R and C/R conditions, respectively. Given the rare occurrences of an equilibrium entrant's price equal to 700 (under a seller's price equal to 1,100), our analysis of the renegotiation environments will be focused on the equilibrium entrant's price equal to 1,100 (under a seller's price equal to 1,300).

[60] In case of high-cost entrants, damages equal to 500 and entrant's prices equal to 600 or 700 were chosen in 100 percent of the cases by the dictator-seller. Damages equal to 100 were chosen in 44 percent of the cases under the communication condition.

[61] Note that damages equal to 500 were chosen, on average, in 56 percent of the cases across conditions. The fact that these results are aligned with Hoffman et al.'s (1994) findings suggests robustness of seller's choices to equal splits vulnerability (G*uth* et al., 2001). Hence, the choice of damages equal to 500 may be viewed as concentrated off-equilibrium deviations that would be also present in environments with a continuum of damage levels. (See Subsection C for details.)

[62] Initial damages correspond to d_0.

Table 5: Renegotiation Process

	Initial Damages			Final Damages		
Conditions	100	500	1000	100	500	1000
$c_E = 100$						
INC/R	.08	.38	.55	.18	.45	.38
C/R	.16	.58	.27	.24	.60	.16
$c_E = 600$						
INC/R	.00	.50	.50	.13	.50	.38
C/R	.11	.78	.11	.33	.56	.11

5.2 Analysis

Our regression analysis involves standard errors that are robust to general forms of heteroskedasticity (i.e., account for the possible dependence of observations within session).[63] Unless otherwise noted, the analysis corresponds to pooled results for rounds 1 to 6.[64]

No-Renegotiation and Renegotiation Environments

Table 6 presents the effects of renegotiation on entrant's price equal to 1,100 and seller's damages equal to 100.[65] Each probit model includes a treatment dummy variable and round as its regressors. For the case of the probit model that assesses the effect of renegotiation on seller's damages equal to 100, the dummy variable will take a value equal to one if the observation pertains to the conditions INC/R or C/R, and a value equal to zero if the observation pertains to the conditions INC/NR or C/NR. Marginal effects of treatments are reported here.[66]

The findings indicate that renegotiation increased the likelihood that sellers choose damages equal 100. In fact, seller's damages equal to 100 are elicited under renegotiation in 18

[63] Note that each person plays in 6 rounds and interacts with other players during the session. The reported estimations use sessions as clusters. Importantly, our qualitative results are robust to possible dependence of observations within groups with the same seller, groups with the same buyer, or groups with the same entrant. (These estimations use the seller's identification number, buyer's identification number, and entrant's identification number as clusters, respectively.) Estimations are available upon request.

[64] The results also hold if only the last three rounds are included. Probit estimations and data corresponding to the last three rounds of play are available upon request.

[65] See footnote 59.

[66] Given that probit magnitudes are difficult to interpret, we report the marginal effects. The variable round was statistically significant only for the probit model corresponding to the equilibrium seller's damages equal to 100. The marginal effect was equal to .006 (p-value = .009).

Table 6: Effects of Renegotiation on the Likelihood of Equilibrium Seller's Damages and Entrant's Price

	Final Damages = 100[a] Marginal Effect	$p_E = 1100$[b] Marginal Effect
Renegotiation	.206***	.231***
	(.106)	(.089)
Observations	210	166

Notes: [a]Pooled data on the C/NR, C/R, INC/NR, and INC/R conditions, in case of low- and high-cost entrants; [b]pooled data on the C/NR, C/R, INC/NR, and INC/R conditions, in case of low- and high-cost entrants (only cases in which the entrant participated, and the seller's price was equal to 1,300, are considered); probit analysis using sessions as clusters; marginal effects reported; robust standard errors are in parentheses; *** denotes significance at the 1% level; observations correspond to number of groups. See Table 2 for a description of the experimental conditions.

and 24 percent of the cases, while damages equal to 100 are not chosen by any seller in the no-renegotiation conditions, under complete information. The results also suggest that renegotiation increases the likelihood of getting an entrant's price equal to 1,100 (when a seller's price equal to 1,300). For instance, low-cost entrants moved from not offering a price equal to 1,100 to offering a price equal to 1,100 (when a seller's price equal to 1,300) in 21 percent of the cases, under complete information. Similar results are observed in case of incomplete information (5 and 19 percent of the cases, for the no-renegotiation and renegotiation conditions). These findings provide support to Hypothesis 1.

RESULT 1: *Renegotiation significantly increases the likelihood of seller's damages equal to 100, and the likelihood of entrant's price equal to 1,100 (when seller's price is equal to 1,300).*

Table 7 reports the results of the analysis of the determinants of the seller's damages in renegotiation environments. We are especially interested in assessing the effects of the initial seller's damages (d_0) on the likelihood of seller's final damages equal to 100. Intuitively, the initial level of damages might be interpreted as an indicator of seller's payoff aspiration, which might influence the seller's choice of damages, and hence, the seller's share of the surplus (Siegel and Fouraker, 1960; Thompson, 1998; Kray et al., 2001; Crott et al., 1978; Tietz, 1978). The estimation of a probit model is presented.[67] The results indicate that the higher the initial level of damages d_0 (the higher the payoff aspiration) chosen by the seller, the lower the probability that final damages (after renegotiation) will be equal to 100: An

[67]The probit model includes covariates that control for the seller's initial damages, entrant's price, and round.

Table 7: Determinants of the Seller's Final Damages equal to 100 under Renegotiation

	Marginal Effects
Seller's Initial Damages (d_0)	-.0002***
	(.0002)
Entrant's Price (p_E)	.0005***
	(.0002)
Observations	93

Notes: Pooled data on conditions INC/R and C/R, for low- and high-cost entrants (only cases in which the entrant participated are considered); probit analysis using sessions as clusters; marginal effects reported); robust standard errors are in parentheses; *** denotes significance at the 1% level; observations correspond to number of groups.

increase in the initial level of damages by one standard deviation decreases the likelihood of final damages equal to 100 by 7 percentage points. This result, not anticipated by the theory, is aligned with seminal findings reported by Siegel and Fouraker (1960).[68] Moreover, given that subjects are randomly assigned to roles, we might also expect that buyers' and entrants' choices are influenced by their payoff aspirations. Our findings also suggest that the entrant's price has a significant and positive effect on the likelihood of seller's final damages equal to 100: An increase of the entrant's price by one standard deviation increases the likelihood of final damages equal to 100 by 15 percentage points.[69] Hence, entrants successfully induce a low level of damages under renegotiation.

RESULT 2: *Under renegotiation, higher initial seller's damages (higher seller's payoff aspiration) significantly decrease the likelihood of final seller's damages equal to 100.*

RESULT 3: *Under renegotiation, higher entrant's prices made to the buyer significantly increase the likelihood of final seller's damages equal to 100.*

Incomplete and Complete Information Environments

Our probit analyses regarding the effects of complete information on average seller's damages and exclusion rate in case of no-renegotiation environments (across entrant's cost) do

[68] Siegel and Fouraker (1960) construct a buyer-seller exchange environment with random entitlement, and find that aspirations influence the players' reservation values, and hence, influence bargaining outcomes. Specifically, their results suggest that higher levels of aspiration are associated with higher shares of the pie. See also Roth and Murnighan (1982).

[69] The variables seller's initial damages and entrant's price take standard deviation equal to 295.838 and 304.286, respectively.

not suggest significant effects.[70] These results might indicate that the seller's non-monetary preferences and/or his anticipation of others' non-monetary preferences induced more generous contracts, in both complete and incomplete information environments (under no-renegotiation). Consequently, the average level of stipulated damages and the likelihood of exclusion in both environments were similar.[71] In fact, the average damages were equal to 668.52 and 694.44, under C/NR and INC/NR conditions (across types), respectively; and, the exclusion rates were equal to 26 and 22 percent, under C/NR and INC/NR conditions (across types), respectively.[72]

We next explore the nature of players' non-monetary preferences.

Dictator-Seller Environment

Table 8 reports the frequencies of damages level in the C/NR and C/NR-D conditions (low-cost entrants), for the first actual round.[73] Our findings suggest that the dictator-seller environment significantly increases the likelihood of high seller's stipulated damages (p-value = .021). This result provides support to Hypothesis 3. The relevant comparisons refer to damages equal to 1,000 chosen in 100 percent versus 56 percent of the cases for the C/NR-D

[70]Each probit model includes a treatment dummy variable and round as its regressors. The treatment dummy variable is constructed as follows: It will take a value equal to one if the observation pertains to C/NR, and a value equal to zero if the observation pertains to INC/NR.

[71]Our results regarding the effects of complete information also provide some insights regarding the effects of risk aversion. Two sources of risk aversion might be present in our environments: (i) Risk aversion associated with the uncertainty about the entrant's cost in the incomplete information environment; and, (ii) risk aversion associated with the uncertainty about non-monetary preferences of the other players (due to heterogeneity of preferences), in the complete and incomplete information environments. Our findings suggest that complete information does not affect contract design. These results suggest that risk aversion associated to the uncertainty about the entrant's cost does not significantly affect contract design. We might expect that the two sources of risk aversion will influence subjects' choices in similar ways. Then, it is expected that risk aversion associated with the uncertainty about non-monetary preferences of the other players will not significantly affect contract design in our complete and incomplete information environments. Hence, the more generous offers by sellers and entrants in our experimental environments might indicate players' non-monetary preferences and/or the strategic anticipation of others' non-monetary preferences.

[72]Our data also suggest that complete information marginally reduces the likelihood of exclusion only in case of renegotiation environments and high-cost entrants (marginal effect = -.528, p-value = .083). In theory, complete information should not affect exclusion rate under renegotiation.

[73]To make the C/NR and C/NR-D conditions comparable, we included six actual rounds in the C/NR-D condition too. Following the literature on one-shot dictator environments, and given that the dictator environments involve individual decision-making processes, our analysis of the effects of the dictator environment will involve the evaluation of the first actual round only. Given the small number of independent observations (and to avoid the t-test normality assumptions), we use the non-parametric Mann-Whitney test.

Table 8: Frequency of Seller's Stipulated Damages under the C/NR and C/NR-D Conditions
(Low-Cost Entrant; Round 1)

	Seller's Damages			
Condition	100	500	1000	Sample Size
C/NR	.00	.44	.56	[27, 9]
C/NR-D	.00	.00	1.00	[30, 10]

Notes: Number of subjects and observations (number of groups for round 1, low-cost entrant) are in brackets. See Table 2 for a description of the experimental conditions.

and C/NR conditions, and damages equal to 500 chosen in zero percent versus 44 percent of the cases for the C/NR-D and C/NR conditions. These results indicate at most weak inequity aversion and that the driving force behind the choice of the mode seller's stipulated damages equal to 500 was the seller's strategic anticipation of the other players' non-monetary preferences.[74] Given that individuals believe that others share their preferences (Ross, 1977), it is likely that sellers believed that the other players also exhibited weak inequity-aversion concerns. Moreover, given that subjects were randomly assigned to roles, we might also infer that buyers and entrants actually exhibited weak inequity-aversion concerns, and that entrants' off-equilibrium more generous choices were driven by their strategic anticipation of others' non-monetary preferences (in addition to their own payoff aspirations).

RESULT 4: *The dictator-seller environment significantly increases the likelihood of high seller's damages.*

Communication Environment

Table 9 summarizes the information regarding buyer's and entrant's initial payoff requests by types of messages.[75] (See Table C2 for a sample of messages.) Following seminal work on the behavioral sciences (Siegel and Fouraker, 1960), and the negotiation literature (Thompson, 1998; Kray et al., 2001), we infer that the initial requests from buyers and sellers reflect their

[74]Hoffman et al.'s (1994) and Siegel and Fouraker's (1963) findings in exchange environments also suggest a weak effect of inequity aversion on bargaining outcomes. See also Fershtman et al. (forthcoming).

[75]Some of the messages included threats and comments regarding a fair allocation of the surplus (55 and 26 percent, for buyers and entrants, respectively). Sixty nine percent of the total messages included numerical requests. In 90 percents of these cases, sellers offered damages equal to 500. A complete set of messages (and classification) are available upon request.

Table 9: Frequency of Buyer's and Entrant's Initial Payoff Requests

	Buyer's Pay. Req.			Entrant's Pay. Req.			
Message Types	400	500	> 500	< 500	500	600	> 600
Request	.20	.16	.09	.06	.23	.45	.10
Request with Fairness Comments	.00	.26	.00	.00	.13	.00	.00
Request with Threats	.00	.19	.03	.00	.00	.03	.00
Request with Fairness Com. and Threats	.00	.06	.00	.00	.00	.00	.00

Notes: Only low-cost entrant groups are included.

payoff aspirations.[76] Our findings suggest that the mode payoff aspirations for buyers and entrants were equal to 500 (67 percent of the total cases) and 600 (48 percent of the total cases), respectively.

The review of the messages exchanged between buyers and entrants indicates that 28 percent of the buyers used threats (i.e., not to breach the original contract). This information, together with the mode buyer's request and the mode entrant's price (Table 4, C/NR and C/NR-CO conditions), suggest that buyers may have persuaded the entrants to incorporate their payoff requests in the entrant's prices, i.e., to set a price equal to 600 (instead of a price equal to 700, which was aligned with the mode entrant's payoff aspiration under C/NR-CO, and was the mode price under C/NR). Our results also indicate that the buyers' payoff aspirations might be influenced by social norms of fairness (i.e., an equal allocation of the surplus among the three players). In fact, a payoff equal to 500 was the request (payoff aspiration) for 67 percent of the buyers.[77] Interestingly, only in cases in which buyers and entrants aspired a payoff equal to 500, fairness was invoked. These findings suggest that the players' concept of fairness was aligned with the social norms of fairness. In addition, these results might suggest that the players used social norms of fairness strategically, i.e., as an indirect persuasion tool.[78] Given that subjects were randomly assigned to roles, we might also infer that sellers' aspirations were influenced by social norms of fairness.

The findings outlined in Table 10 provide additional support to our previous analysis.

[76] Note that the elicitation of buyers' and entrants' payoff aspirations through unstructured communication did not involve a truthful-revelation incentive scheme.

[77] Assuming that under the factors that affect the formation of payoff aspirations are not condition-dependent, our findings might also suggest that social norms of fairness affected the formation of buyers' payoff aspirations in the other conditions.

[78] Importantly, the content of the messages reflects a price-bargaining environment, and suggests that regards-for-others concerns were not elicited by communication. Hence, it is unlikely that social norms of fairness affected contractual outcomes through inequity-aversion concerns.

Table 10: Effects of Communication on the Probability of Equitable Allocation and Exclusion
(Tests of Differences across Conditions)

Conditions	Equitable Allocation[a] Marginal Effect	Exclusion[b] Marginal Effect
C/NR versus	.447***	−.199**
C/NR-CO	(.117)	(.093)
Observations	68	108

Notes: [a]Only low-cost entrants and cases in which the entrant decided to participate are considered; [b]pooled data on low- and high-cost entrants; probit analysis using sessions as clusters; marginal effects reported; robust standard errors are in parentheses; *** and ** denote significance at the 1% and 5% levels, respectively; observations correspond to number of groups. See Table 2 for a description of the experimental conditions.

This table reports the results of the assessment of the effects of buyer-entrant communication on the likelihood of an equitable allocation of the surplus (defined as equal payoffs for the three players; 500, under low-cost entrants), and exclusion.[79]

Our results, together with the review of messages exchanged between buyers and entrants, suggest that the buyers' explicit threats (and the implicit threats represented by their payoff requests of 500) were credible to the entrants, i.e., the threats satisfied the self-commitment condition (Aumann, 1990; Farrell and Rabin, 1996). Then, we might infer that the entrant believed that the buyer's no breaching decision was the buyer's best response to an entrant's price equal to 700, and offered more frequently a price equal to 600.[80] Importantly, given that the buyer's decision not to breach involved a monetary loss of 100, it is plausible to infer that the entrant believed that the buyer held non-monetary preferences. Given that individuals presume that their preferences are shared by others (Ross, 1977), we might also infer that the entrants exhibited non-monetary preferences.

[79]We assess the effect of communication by estimating two probit models. The models include a treatment dummy variable and round as its regressors. The treatment dummy variable takes a value equal to one if the observation pertains to the condition C/NR-CO, and a value equal to zero if the observation pertains to the condition C/NR. The data for conditions C/NR and C/NR-CO are pooled to estimate the probit model regarding exclusion. In case of the assessment of the effects of communication on equitable allocation, due to the definition of equitable allocation used in this study, the probit model is estimated by considering data on low-cost entrants only. The variable round was statistically significant only in case of the probit model regarding exclusion (marginal effect equal to .039 and p-value $< .001$).

[80]In fact, communication significantly increases the likelihood of an entrant's price equal to 600 (p-value $= .011$).

As a result of the more generous mode entrant's price, buyers breached the original contracts and switched to the entrants more frequently (92 versus 85 percent of all cases, under the C/NR-CO and C/NR, respectively).[81] Hence, less exclusion was observed (7 versus 24 percent, for the C/NR-CO and C/NR conditions).[82] Our data also indicate that the strategic sellers anticipated the effects of communication. In fact, sellers offered damages equal to 500 more frequently (87 versus 58 percent, under the C/NR-CO and C/NR conditions).[83] As a consequence of the behavior of the three players, communication significantly increased the likelihood of an equitable allocation. These results provide support to Hypothesis 4.

RESULT 5: *Unstructured communication between the buyer and the entrant significantly increases the likelihood of equitable allocations of the surplus, and reduces the likelihood of exclusion.*

Summarizing, our findings regarding the effects of renegotiation on seller's damages and entrant's prices are aligned with the theoretical qualitative predictions. Our results also indicate that non-monetary preferences weaken the power of contract renegotiation. Importantly, our results suggest that non-monetary preferences might reflect players' payoff aspirations, and that these aspirations might be influenced by social norms of fairness.

5.3 A Comparison with Hoffman et al. (1994) Study

Hoffman et al. (1994) study two-player ultimatum and dictator environments under buyer-seller exchange and random-entitlement contexts, and provide experimental evidence about the nature of the non-random deviations in ultimatum settings. Table 11 compares Hoffman et al. (1992) results regarding offerors' proposals with our findings (sellers' proposed damages), for the case of C/NR and C/NR-D conditions and low-cost entrants.[84]

Table 11 indicates that, when the proposers do not have absolute power to decide the allocation of the surplus, more than half of the proposers give generous shares of the surplus

[81] The effect of communication on contract breach is marginally significant (p-value = .07) when sessions are used as clusters. However, it is not significant when player identification number (seller, buyer, or entrant) is used as a cluster.

[82] As a consequence, low-cost entrants captured a higher share of the total payoffs (37 versus 20 percent, for the C/NR-CO and C/NR conditions). This share was even higher than the one entrants captured under the C/R condition (31 percent).

[83] Although, sellers offered damages equal to 1,000 in 13 percent of the cases only, under C/NR-CO (versus 42 percent of the cases, under C/NR), buyers rejected contracts involving damages equal to 1,000 more frequently (71 versus 5 percent of all cases in which sellers offered damages equal to 1,000, under the C/NR-CO and C/NR conditions). As a result, communication significantly decreased the likelihood of contract acceptance (in 84 versus 98 percent of all cases, buyers accepted the seller's contract, under the C/NR-CO

Table 11: Offeror's Proposal

	Others' Share of the Surplus	
	< 40%	≥ 40%
Bargaining Environment		
C/NR	.42	.58
Hoffman et al. (1994)	.45	.55
Dictator Environment		
C/NR-D	1.00	.00
Hoffman et al. (1994)	.68	.32

Notes: The proposer for our study corresponds to the seller; observations for our study correspond to pooled data for rounds 1 to 6 in case of C/NR (low-cost entrant), and data for round 1 in case of C/NR-D (low-cost entrant); observation for Hoffman et al. (1994) correspond to the ultimatum and dictator environments under random entitlement and exchange buyer-seller settings. See Table 2 for a description of the experimental conditions.

to the other player(s). Our results and Hoffman et al.'s (1994) findings are aligned:[85] In Hoffman et al. (1994), in 55 percent of the total cases, the proposers made offers involving a share of the surplus greater than or equal to 40 percent for the receiver. In our study (for the C/NR condition), 58 percent of sellers chose damages equal to 500, which implied a share of the surplus greater than 66 percent for the buyer and the entrant (and a potential equal split of the pie in case of an entrant's price equal to 600). Hoffman et al. (1994) argue that the more generous offers observed in ultimatum environments indicate the proposer's strategic anticipation of the receiver's reservation value rather than inequity-aversion. The significant reduction in generous offers under dictator environments supports this argument: In Hoffman et al. (1994), only 32 percent of the proposals represented a share of the surplus greater than 40 percent for the receiver. In our study, all sellers proposed damages equal to 1,000 (a share of the surplus equal to 33 percent for the buyer and entrant).[86] Given that the

and C/NR conditions; marginal effect equal to $-.149$, and p-value = .040).

[84]Hoffman et al.'s (1994) settings involve two players, ultimatum and dictator single-round environments, and zero outside options. Our strategic environments encompass three players, a contractual setting, and a non-zero outside option for the buyer. Although the number of players, game structure, and outside options might affect the play of the game, offerors' non-monetary preferences and their strategic anticipation of others non-monetary preferences might be equally elicited in the environments used in both studies.

[85]Given that Hoffman et al. (1994) report their data graphically (i.e., exact information about the frequency of each offer is not provided), the data included in Table 11 represent an approximation of the actual values (see Fig. 3c and Fig. 4a, pp. 364 and 365, respectively).

[86]In Hoffman et al.'s (1994) dictator environment (under an eleven-offer set), 32 percent of proposers

proposers do not seem to hold strong inequity-aversion concerns, it is not clear why they will believe that the receivers hold these types of preferences (see the discussion of Hypothesis 3). We argue that the proposers' off-equilibrium behavior in contracting environments, and more generally, in exchange bargaining environments, might be explained by the players' non-monetary preferences in the form of payoff aspirations influenced by social norms of fairness (among other factors), and the strategic anticipation of others' non-monetary preferences. Our argument complements Hoffman et al.'s (1994) explanations. The next section provides theoretical analysis supporting our claim.

6 Non-Monetary Preferences: Theoretical Extension

This section first presents a simple model of contracting under non-monetary preferences. We relax the assumption that players' preferences depend only on their own monetary payoffs by adding a non-monetary preferences component to their utility functions. Given that inequity aversion seems to be at most weakly elicited in our experimental environments, and payoff aspirations seem to influence players' choices, we characterize the non-monetary preferences component as reflecting the player's payoff aspiration. We allow payoff aspirations to be influenced by social norms of fairness (an equal split of the available surplus, an endogenous component) and other exogenous factors.[87] Importantly, in contrast to the prior literature, the non-monetary component in our model does not involve inequity-aversion concerns.[88] We then outline a multi-player ultimatum environment, a more general framework of bargaining under non-monetary preferences in the form of payoff aspirations.

offered shares involving 40 and 50 percent of the pie to the received (approximately, 19 and 13 percent of proposers, respectively). Importantly, none of the proposers offered a share greater than 50 percent. Hence, 100 percent of proposers offered shares lower than or equal to 50 percent to the responders. Given that our environment involved a 3-level damages set (shares equal to 30, 70 and 93 percent of the surplus for the other two players, under damages equal to 1000, 500, and 100, respectively), our findings regarding damages equal to 1,000 may be viewed as concentrated offers involving shares lower than or equal to 50 percent. Consequently, our findings are aligned with Hoffman et al. (1994). Importantly, our dictator-seller findings suggest at most a weak *experimenter effect* on eliciting regard-for-others considerations. (See Hoffman et al.'s (1994) double-blind dictator environment for details.)

[87] In contexts different from exchange buyer-seller environments, a more appropriate specification of players' preferences might also include an inequity-aversion component (see Hoffman et al., 1994 for a discussion of the importance of bargaining contexts).

[88] See Fehr and Schmidt (1999) and Bolton and Ockenfels (1998, 2000) for theoretical work on inequity-aversion. See Bar-Gill and Fershtman (2004) for a study of endogenous non-monetary preferences.

6.1 Contracting with Stipulated Damages

As described in Section I, there are three players, the incumbent seller I, the buyer B, and the potential entrant E. We assume that the buyer's valuation of the good is represented by v, the incumbent seller's cost by c_I, the entrant's cost by c_E, and that the entrant is more efficient than the incumbent seller. Then, efficiency is achieved when the market is served by the entrant. We define the surplus as $X = v - c_E$ if the market is served by the entrant and $X = v - c_I$ if the market is served by the incumbent seller. The vector $x = (x_I, x_B, x_E)$ represents the monetary payoffs of the players and must satisfy $x_I + x_B + x_E = X$. $\overline{x} = X/3$, the average monetary payoff, represents an equal split of the available surplus.

The preferences of player i ($i = I, B, E$) are represented by the following utility function[89]

$$u_i(x_i) = (1 - \phi_i)x_i + \phi_i(x_i - A_i(\overline{x})). \tag{1}$$

Thus, player i cares not only about his or her monetary payoff, x_i, but also about how this payoff compares to his or her payoff aspiration, $A_i(\overline{x})$. $\phi_i \in [0, 1]$ is the weight that player i places on the non-monetary component.[90] Our framework allows for heterogeneity in payoff aspirations. Recall that a player's payoff aspiration refers to the monetary goal the player strives to achieve (Siegel, 1957; Thompson, 1990), and might be influenced by social norms of fairness (equal split of the available surplus), and by other exogenous factors (Siegel and Fouraker, 1960).[91] To facilitate the analysis, we adopt a simple linear specification, $A_i(\overline{x}) = \alpha_i + \beta_i\overline{x}$, where α_i and $\beta_i > 0$ are player-specific constants. Player i's payoff aspiration depends on factors that are both exogenous and endogenous to the game, and is increasing in the average monetary payoff. Importantly, in our setting, player i's payoff aspiration will affect his or her reservation value (minimum acceptable offer).[92] In particular, a player may reject an otherwise lucrative offer if that offer were to put that player's monetary payoff, x_i, sufficiently below his or her aspiration, $A_i(\overline{x})$. Next, we describe the equilibria in no-renegotiation and renegotiation environments. Rather than working with the utility function in (1) directly, we simplify notation and use $u_i(x_i) = x_i - \gamma_i\overline{x}$, where $\gamma_i \in [0, 1]$

[89] Although we have modeled the utility as a weighted average, the players' preferences are maintained for any affine transformation.

[90] When $\phi_i = 0$, the individual's utility does not depend on his payoff aspiration; when $\phi_i = 1$, it depends entirely on his own monetary payoff relative to his payoff aspiration.

[91] The non-monetary component of the player's utility function could be interpreted as the player's relative-position concerns, which might be the main determinants of the player's payoff aspiration in certain environments. (See the work on conspicuous consumption and games of status by Hopkins and Kornienko, 2004; and, the study of rank-dependent preferences in principal-agent settings by Dhillon and Herzong-Stein, 2008.)

[92] This feature follows empirical regularities observed in negotiations studies (Thompson, 1998).

is the weight that player i places on the equitable allocation of the surplus.[93] We consider complete information environments only.[94] The timing of the game follows Section I. (See Appendix B for formal details.)

No-Renegotiation Environment

PROPOSITION 4: *(C/NR/PA)*[95] *Suppose that the potential entrant's cost is common knowledge, and the incumbent seller is unable to renegotiate the contract. There is a unique subgame perfect Nash equilibrium where* $p_0 = c_I - (\frac{\gamma_I}{3})(c_I - c_E)$ *and* $d_0 = c_I - c_E - (\frac{\gamma_B + \gamma_I + \gamma_E}{3})(c_I - c_E)$. *The entrant participates in the market and offers* $p_E = c_E + (\frac{\gamma_E}{3})(c_I - c_E)$ *and the buyer breaches the contract. There is no inefficient exclusion.*

The equilibrium payoffs with no-renegotiation are

$$(x_I^{NR}, x_B^{NR}, x_E^{NR}) = (c_I - c_E - (\frac{\gamma_B + \gamma_I + \gamma_E}{3})(c_I - c_E), v - c_I + (\frac{\gamma_B + \gamma_I}{3})(c_I - c_E), (\frac{\gamma_E}{3})(c_I - c_E)).$$

Two points are worth emphasizing. First, with non-monetary preferences the incumbent seller is induced to share surplus with the entrant and the buyer. This happens not because the incumbent values equity per se; indeed, the incumbent seller's utility is strictly increasing in his own monetary payoff x_I. Instead, the incumbent is induced to share surplus because of the non-monetary preferences of the other players. If the incumbent were to demand too much, then the entrant would choose not to participate, the buyer would refuse to breach the contract, or both. This is consistent with our findings in the dictator-seller environment, which suggest that the driving force for the seller's decisions in no-dictator-seller environments is his strategic anticipation of others' non-monetary preferences. Second, when the non-monetary preferences of others are stronger, incumbent will need to reduce his demands in order to achieve cooperation from the buyer and the entrant. The entrant must also reduce its price in order to achieve cooperation from the buyer. In the limit, as the non-monetary preferences components γ_i approach 1, the incumbent's share of the surplus approaches zero. In this case, the buyer captures two thirds of the surplus and the entrant captures the remaining third.

[93]Without loss of generality, we dropped the constant term $\phi_i\alpha_i$. Note that $\gamma_i = \phi_i\beta_i$. Since $\phi_i \in [0,1]$ by assumption, the restriction $\gamma_i \in [0,1]$ is valid in our three player setting so long as $\beta_i < 3$, so a player does not aspire to receive more than one hundred percent of the aggregate surplus. Note that player i's utility function is increasing in x_i and decreasing in γ_i.

[94]The model parameters and constants are common knowledge.

[95]PA stands for *payoff aspiration.*

Renegotiation Environment

PROPOSITION 5: *(C/R/PA) Suppose that the potential entrant's cost is common knowledge, and the buyer and the incumbent seller can renegotiate their contract following an offer by the entrant. There are multiple subgame perfect Nash equilibria that share the feature that the entrant participates in the market and offers* $p_E = c_E + (\frac{\gamma_E}{3})(c_I - c_E)$*, and the buyer breaches the contract and pays* $d_1 = 0$ *to the incumbent. There is no inefficient exclusion.*[96]

The equilibrium payoffs with renegotiation are

$$(x_I^R, x_B^R, x_E^R) = (0, v - c_I + (\frac{\gamma_B + \gamma_I}{3})(c_I - c_E), c_I - c_E - (\frac{\gamma_B + \gamma_I}{3})(c_I - c_E)).$$

Because the contract lacks commitment value, the incumbent seller is unable to capture any net surplus in this environment. Non-monetary preferences do affect the allocation between the entrant and the buyer, however. When $\gamma_I = \gamma_B = 0$, then the buyer gets a monetary payoff $v - c_I$ only. When $\gamma_I = \gamma_B = 1$, then the buyer gets two thirds of the net surplus $c_I - c_E$ and the entrant receives one third. Interestingly, for the case where $\gamma_I = \gamma_B = \gamma_E = 1$, the shares of the three players with renegotiation are exactly the same as they were without it. Thus, in theory, the presence of non-monetary preferences mutes the effect of renegotiation. This theoretical insight help explain our experimental findings.

6.2 Multi-Player Ultimatum Environment

We now assess the effects of non-monetary preferences in the form of payoff aspirations influenced by social norms of fairness in a more general bargaining environment. Suppose that there are N players, $i = 1, 2, ..., N$, who are dividing a pie of size X. An allocation of this surplus, $x = (x_1, x_2, ..., x_N)$, must satisfy $\sum_{i=1}^N x_i = X$ and we let $\overline{x} = \frac{X}{N}$ be the average monetary payoff. As in the last section, the preferences of player i are given by the reduced form utility function $u_i(x) = x_i - \gamma_i \overline{x}$ where $\gamma_i \in [0, 1]$ is the weight that player i places on his or her payoff aspiration. We assume that $\gamma = (\gamma_1, \gamma_2, ...\gamma_N)$, are commonly known and let $\overline{\gamma} = \sum_{i=1}^N \frac{\gamma_i}{N}$ be the average value of γ in the population.

We consider a game with N stages. In stage $i = 1, 2, ..., N-1$, player i proposes a share x_i for himself. These proposals are publicly observed. In the last stage, player N must decide whether to accept the proposed allocation vector $(x_1, x_2, ..., x_N)$ where $x_N = X - \sum_{i=1}^{N-1} x_i$. By construction, player N receives any surplus remaining after the demands of the other $N-1$ players have been met. If player N rejects the proposed allocation $x = (x_1, x_2, ..., x_N)$, then all payers receive their outside options $x^0 = (x_1^0, x_2^0, ..., x_N^0)$. We assume that $\sum_{i=1}^N x_i^0 =$

[96] Renegotiation does not always occur. There is also an equilibrium where I and B do not contract.

$X^0 < X$, so the outside option is jointly inefficient for the players, and we let $\overline{x}^0 = \frac{X^0}{N} < \overline{x}$ be the average monetary payoff in the outside option.[97] Proposition 6 characterizes the equilibrium in this strategic environment. (See Appendix B for formal details.)

PROPOSITION 6: *In the subgame-perfect equilibrium, player* 1 *proposes a monetary payoff* $x_1 = x_1^0 + \gamma_1(\overline{x} - \overline{x}^0) + (1 - \overline{\gamma})(X - X^0)$ *and players* $i = 2, 3, ..., N-1$ *propose payoffs* $x_i = x_i^0 + \gamma_i(\overline{x} - \overline{x}^0)$. *Player* N *accepts the vector of proposals and receives monetary payoff* $x_N = x_N^0 + \gamma_N(\overline{x} - \overline{x}^0)$.

Several observations are in order. First, non-monetary preferences in the form of payoff aspirations imply that the players receive monetary payoffs larger than their outside options. This arises because non-monetary preferences create a credible threat for the players not to participate in the game. Second, players who put greater weight on their relative standing will command proportionally greater shares of the equilibrium surplus, i.e., non-monetary preferences will act as a commitment device. Finally, note that player 1, the first mover in the game, captures the entire residual surplus, $(1-\overline{\gamma})(X-X^0)$. When players all have traditional preferences, $\overline{\gamma} = 0$, then player 1 captures the entire net surplus, $X - X^0$. Interestingly, when all N players have strong non-monetary preferences, $\gamma_1 = \gamma_2 = ... = \gamma_N = \overline{\gamma} = 1$, then player 1's first-mover advantage disappears. In this special case, each and every player captures the average net surplus, $x_i = x_i^0 + \overline{x} - \overline{x}^0$ for $i = 1, 2, ..., N$. In this extreme non-monetary preferences case, the timing of moves would not matter. These findings are aligned with the more equitable off-equilibrium allocations of the pie observed in previous exchange bargaining environments (Hoffman et al., 1994).

7 Summary and Conclusions

The question of whether contracts with stipulated damage clauses can be used to extract the profits of potential entrants has been debated by legal scholars, economists, and policy makers for decades. In Aghion and Bolton (1987), stipulated damages are an effective commitment device. By making breach more expensive for the buyer, stipulated damages force the entrant to lower its price in order to secure a sale and may create a barrier to entry. Masten and Snyder (1989) and Spier and Whinston (1995) argue the ability of the incumbent seller and buyer to renegotiate the terms of their contract nullifies the commitment power of stipulated damages, shifts bargaining power to the entrant, and restores efficiency. Similar theoretical

[97]The total utility in the population is greater as well: $\sum_{i=1}^{N} u_i(x) = X - \sum_{i=1}^{N} \gamma_i x_i = X - \overline{\gamma} N \overline{x} = (1-\overline{\gamma})X > (1-\overline{\gamma})X^0$.

issues arise in other contexts, including break-up fees in mergers and not-to-compete clauses in labor contracts.

This paper contributes to the theoretical literature and to the policy debate by offering experimental evidence on the design of stipulated damage clauses to extract entrants' profits. Our experimental results suggest that the commitment value of stipulated damages is weakened by renegotiation. We also observe significant and interesting deviations from equilibrium behavior. Specifically, the high incidence of generous offers by sellers and entrants suggests the presence of non-monetary preferences (and the strategic anticipation of the non-monetary preferences of others). Through an innovative seller-dictator environment, we establish that inequity aversion plays at most a small role in determining bargaining outcomes. Instead, our evaluation of the bargaining dynamics, together with our assessment of unstructured communication between players, indicate the strong role of payoff aspirations influenced by social norms of fairness. More broadly, our analysis implies that payoff aspirations may better explain the more equitable off-equilibrium outcomes observed in other experimental buyer-seller bargaining settings.

Our work also extends the theoretical literature on contracting with stipulated damages and multi-player ultimatum games by explicitly incorporating non-monetary preferences in the form of payoff aspirations influenced by social norms of fairness (among other exogenous factors). In our theoretical framework, players will rationally reject lucrative offers and decline to participate when their shares of the surplus fall sufficiently short of their goals. Thus, higher payoff aspirations create higher player reservation values, and generous offers are absolutely essential to secure the cooperation of others. The theoretical predictions accommodate our experimental findings and, more generally, accommodate the findings from previous buyer-seller bargaining studies.

Possible theoretical extensions might involve more general representations of payoff aspirations, or the introduction of incomplete information regarding others' preferences. Future experimental work might attempt to deepen the understanding of the additional sources that might influence the formation of payoff aspirations. These, and other extensions, may be fruitful topics for future research.

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Appendix A. Benchmark Theoretical Framework

General characterization of the INC/NR, C/NR, INC/R, and C/R environments, and proofs of the general versions of Propositions 1-3 follow.

Incomplete Information about the Entrant's Cost and No-Renegotiation (INC/NR)

Suppose that the entrant's cost is known only by the entrant at the time of contracting, and there is no renegotiation. In contrast to the complete information condition, we may have inefficiency arising because stipulated damages form a barrier to entry for the high-cost entrants. The results are as follows.

When $\theta < (c_I - c_E^H)/(c_I - c_E^L)$ (so the low-cost types are relatively rare in the population of entrants), I will set

$$\{p_0, d_0\} = \{c_I, c_I - c_E^H).$$

Both types of entrant will enter and will set $p_E = c_E^H$. The ex-ante (expected) payoffs are

$$(\pi_I, \pi_B, \pi_E) = \big(c_I - c_E^H, v - c_I, \theta(c_E^H - c_E^L)\big).$$

When $\theta > (c_I - c_E^H)/(c_I - c_E^L)$ (so the low-cost types are relatively common in the population of entrants), I will set

$$\{p_0, d_0\} = \{c_I, c_I - c_E^L).$$

Only the low-cost entrant will enter and serve the market. The entrant's price is $p_E = c_E^L$. The high-cost entrant will not serve the market. The equilibrium (expected) payoffs are

$$(\pi_I, \pi_B, \pi_E) = (\theta(c_I - c_E^L), v - c_I, 0).$$

Note that the incumbent chooses a large damage payment $d_0 = c_I - c_E^L$ (instead of $d_0 = c_I - c_E^H$) in order to extract value from the low-cost entrant type, and that this inefficiently excludes the high-cost entrant. This is a simple version of Aghion and Bolton's main result.

PROOF OF PROPOSITION 1: If the incumbent sets $\{p_0, d_0\} = \{c_I, c_I - c_E^H)$ then clearly both types of entrant would enter and set $p_E = c_E^H$. The advantage of this contract is that the incumbent extracts the entire surplus from the high type of entrant. The downside is that the low type of entrant is earning rents. With this contract, the incumbent receives $c_I - c_E^H$. Suppose instead that the incumbent set $\{p_0, d_0\} = \{c_I, c_I - c_E^L)$ The entrant would enter if and only if its type was low, and set $p_E = c_E^L$ inducing breach by the buyer. The incumbent's payoff would be $c_I - c_E^L$. If the entrant's type is high the entrant would not enter. The incumbent would supply the buyer at cost and the incumbent's payoff would be zero. In expectation, the incumbent would receive $\theta(c_I - c_E^L)$. Comparing the two payoffs gives the result. Q.E.D.

Complete Information and No-Renegotiation (C/NR)

Suppose that the entrant's cost c_E is common knowledge and there is no opportunity for the incumbent to revise the contract in the renegotiation stage. The incumbent will offer a contract

$$\{p_0, d_0\} = \{c_I, c_I - c_E),$$

and the buyer will accept. The entrant will enter and offer a price $p_E = c_E$ and the buyer will breach the contract, pay damages $d_0 = c_I - c_E$ to the incumbent in damages, and purchase from the entrant. The equilibrium payoffs for the three players are

$$(\pi_I, \pi_B, \pi_E) = (c_I - c_E, v - c_I, 0).$$

Note that relative to the situation where there is no contract, I has stolen all of E's surplus. There is no efficiency loss from this strategic behavior, since the entrant serves the market as he should.

PROOF OF PROPOSITION 2: In order for the incumbent to extract all of the surplus, he must squeeze the entrant down to $p_E = c_E$ To do this, he must choose $\{p_0, d_0\}$ such that the buyer would refuse to breach for any price offer $p_E > c_E$. The buyer is (just) willing to breach when $p_E + d_0 \leq p_0$, or $p_E \leq p_0 - d_0$. Therefore I and B choose a contract with $p - d = c_E$. The incumbent does not want to leave any surplus for the buyer either, so it will set $\{p_0, d_0\}$ so that the buyer is indifferent between having no contract and breaching the contract and purchasing from the entrant. With no contract, the buyer receives $v - c_I$. With this contract, the buyer gets $v - c_E - d_0$. Combining, we have $\{p_0, d_0\} = \{c_I, c_I - c_E)$. Q.E.D.

Incomplete and Complete Information and Renegotiation (INC/R and C/R)

Suppose there is an opportunity for the incumbent to revise the contract in the renegotiation stage after the entrant has offered p_E. In this case, regardless of the contract between the incumbent and the buyer, the entrant can steal the buyer with an offer just below $p_E = c_I$. Since the entrant's price is below the incumbent's cost, the incumbent and buyer have a joint incentive to renegotiate any existing contract to induce the buyer to breach and buy from the lower-cost entrant. Since the buyer must be guaranteed payoff of at least $v - c_I$ in equilibrium (his outside option) and the entrant is capturing $c_I - c_E$, the incumbent gets no surplus at all.

In equilibrium, the payoffs for the three players are

$$(\pi_I, \pi_B, \pi_E) = (0, v - c_I, c_I - c_E),$$

where $c_E \in \{c_E^L, c_E^H\}$. Note that there are many distinct equilibria that could generate these payoffs. The incumbent could offer an "unacceptable" contract at Stage 1, or simply refrain from making a contract offer at all. He could write a "renegotiation-proof contract" with $\{p_0, d_0\} = \{c_I, 0\}$, in which case the entrant will offer $p_E = c_I$ (or just below) and the buyer breaches. There are other contracts, too, that could arise in equilibrium with renegotiation.

PROOF OF PROPOSITION 3: The insight in this case is that, regardless of the contract signed at Stage 1 between I and B, the entrant can always steal the buyer away at a price $p_E = c_I - \Delta$ where Δ is a very small number. First, suppose that the contract $\{p_0, d_0\}$ specifies that $p_0 - d_0 < p_E = c_I - \Delta$. In this case, the buyer would not breach absent renegotiation, and the payoffs would be $(p_0 - c_I, v - p_0, 0)$. If I offered a modified contract with $d_1 = p_0 - p_E = p_0 - c_I + \Delta$, then the buyer would be willing to breach and the payoffs would be $(p_0 - c_I + \Delta, v - p_0, c_I - \Delta - c_E)$ and in the limit as $\Delta \to 0$ this is $(p_0 - c_I, v - p_0, c_I - c_E)$. Anticipating this, the buyer would of course demand a price p_0 that makes him at least as well off as not having a contract at all, $p_0 = c_I$. The incumbent earns zero in this case.

Now suppose instead that the contract specifies that $p_0 - d_0 > c_I$. In this case, the buyer would breach absent renegotiation if the entrant offered $p_E = c_I$, and the payoffs would be $(d_0, v - c_I - d_0, c_I - c_E)$. The buyer would not be willing to agree to damages $d_0 > 0$ in this case. Again, the incumbent would earn zero. Q.E.D.

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Appendix B. Non-Monetary Preferences - Theoretical Extension

Characterization of the environments discussed in Section V, and the proof of Proposition 6 follow.

Contracting with Stipulated Damages under Non-Monetary Preferences

We begin by characterizing what would happen if the buyer were to reject the incumbent seller's offer $\{p_0, d_0\}$ in the contract stage. In this case, entry would occur and I and E would compete for B's business. Let the prices of I and E be p_I and p_E. If I were to win the game, the vector of monetary payoffs of the three players would be $(x_I, x_B, x_E) = (p_I - c_I, v - p_I, 0)$. The average monetary payoff in this case would be $\overline{x} = (\frac{1}{3})(v - c_I)$. If E were to win the game, the vector of monetary payoffs would be $(x_I, x_B, x_E) = (0, v - p_E, p_E - c_E)$, and the average monetary payoff would be $\overline{x} = (\frac{1}{3})(v - c_E)$. B prefers to purchase from E at price p_E than from I at price p_I when $v - p_E - (\frac{\gamma_B}{3})(v - c_E) \geq v - p_I - (\frac{\gamma_B}{3})(v - c_I)$ or, rearranging terms, $p_E \leq p_I - (\frac{\gamma_B}{3})(c_I - c_E)$. Note that if the entrant charged $p_E = c_I$, the buyer would surely reject E's offer. I would prefer to win at price p_I than to lose to E when $p_I - c_I - (\frac{\gamma_I}{3})(v - c_I) \geq 0 - (\frac{\gamma_I}{3})(v - c_E)$, or $p_I \geq c_I - (\frac{\gamma_I}{3})(c_I - c_E)$. Note also that the incumbent seller is willing to sell its product below cost to avoid losing to the entrant (and getting a monetary payoff below the average payoff). In equilibrium, the entrant wins the market with a price $p_E = c_I - (\frac{\gamma_B+\gamma_I}{3})(c_I - c_E)$ and the equilibrium payoffs of the three players are

$$x^* = (x_I^*, x_B^*, x_E^*) = (0, v - c_I + (\frac{\gamma_B + \gamma_I}{3})(c_I - c_E), c_I - c_E - (\frac{\gamma_B + \gamma_I}{3})(c_I - c_E)).$$

If $\gamma_B = \gamma_I = 0$, so neither the buyer nor the incumbent seller have non-monetary preferences, the entrant wins by charging a price equal to c_I. As in Section I, the entrant captures the entire net surplus. When $\gamma_B = \gamma_I = 1$, so the players have strong non-monetary preferences, then $p_E < c_I$ and the buyer captures two thirds of the net surplus.

Next, suppose that the buyer has signed a contract with the seller, $\{p_0, d_0\}$, and that the entrant has proposed p_E. If the buyer does not breach, the monetary payoffs are

$$x^0 = (x_I^0, x_B^0, x_E^0) = (p_0 - c_I, v - p_0, 0).$$

If the buyer does breach, the monetary payoffs are

$$x = (x_I, x_B, x_E) = (d_0, v - d_0 - p_E, p_E - c_E).$$

No-Renegotiation (C/NR/PA)

In the contract stage, I designs the contract $\{p_0, d_0\}$ to assure participation of E and B. First, E must prefer the allocation x (breach) to the allocation x^0 (no breach). This implies that $p_E - c_E - (\frac{\gamma_E}{3})(v - c_E) \geq 0 - (\frac{\gamma_E}{3})(v - c_I)$, or

$$p_E \geq c_E + (\frac{\gamma_E}{3})(c_I - c_E).$$

Second, B must be willing to breach the contract and buy from E, so $v - d_0 - p_E - (\frac{\gamma_B}{3})(v - c_E) \geq v - p_0 - (\frac{\gamma_B}{3})(v - c_I)$, or

$$p_E + d_0 \leq p_0 - (\frac{\gamma_B}{3})(c_I - c_E).$$

Finally, the buyer must be willing to accept the contract $\{p_0, d_0\}$ rather than reject it and enjoy price competition between I and E. This implies that B prefers the anticipated final allocation x (breach) to the allocation x^* (not signing a contract at all), or $v - d_0 - p_E - (\frac{\gamma_B}{3})(v - c_E) \geq v - c_I + (\frac{\gamma_B+\gamma_I}{3})(c_I - c_E) - (\frac{\gamma_B}{3})(v - c_E)$. Canceling terms and rearranging,

$$p_E + d_0 \leq c_I - (\frac{\gamma_B + \gamma_I}{3})(c_I - c_E).$$

In equilibrium, these three inequalities will bind. Solving them simultaneously, we have the equilibrium result for the complete information/no-renegotiation/payoff aspiration environment (C/NR/PA). Proposition 4 in the main text summarizes this equilibrium.

Renegotiation (C/R/PA)

Suppose that the buyer has signed a contract with the seller, (p_0, d_0), and that the damages are sufficiently high that the buyer would not breach absent renegotiation. For the entrant to succeed in making a sale, it must be the case that the incumbent is willing to lower the stipulated damages to a level d_1 where the buyer is willing to breach. The buyer would be willing to breach with damages d_1 when $v - d_1 - p_E - (\frac{\gamma_B}{3})(v - c_E) \geq v - p_0 - (\frac{\gamma_B}{3})(v - c_I)$. Rearranging this expression,

$$p_E + d_1 \leq p_0 - (\frac{\gamma_B}{3})(c_I - c_E).$$

The incumbent seller would prefer to induce breach with damages d_1 than sell the product himself at price p_0 when $d_1 - (\frac{\gamma_I}{3})(v - c_E) \geq p_0 - c_I - (\frac{\gamma_I}{3})(v - c_I)$, or

$$d_1 \geq p_0 - c_I + (\frac{\gamma_I}{3})(c_I - c_E).$$

Note that, given the contract (p_0, d_0), the entrant would raise his price p_E to the point where there is just enough surplus remaining to satisfy the buyer and the incumbent. Therefore these two inequalities would bind. Finally, the buyer must be willing to accept the contract (p_0, d_0) and forego allocation x^*. Anticipating paying p_E to the entrant and d_1 in damages to the incumbent seller, it must be that $v - d_1 - p_E - (\frac{\gamma_B}{3})(v - c_E) \geq v - c_I + (\frac{\gamma_B+\gamma_I}{3})(c_I - c_E) - (\frac{\gamma_B}{3})(v - c_E)$. This becomes:

$$d_1 + p_E \leq c_I - (\frac{\gamma_B + \gamma_I}{3})(c_I - c_E).$$

These three inequalities would bind in equilibrium. Solving them simultaneously, we find that $p_E = c_I + (\frac{\gamma_I+\gamma_B}{3})(c_I - c_E)$, $d_1 = 0$, and $p_0 = c_I - (\frac{\gamma_I}{3})(c_I - c_E)$. The equilibria for the complete information/renegotiation/payoff aspiration environment (C/R/PA) are summarized in Proposition 5 (main text).

Multi-Player Ultimatum Environment under Non-Monetary Preferences

It is straightforward to solve the game by backwards induction. In the last stage, player N would choose to accept the proposed allocation if and only if $x_N - \gamma_N \overline{x} \geq x_N^0 - \gamma_N \overline{x}^0$ or, rearranging terms, $x_N \geq x_N^0 + \gamma_N(\overline{x} - \overline{x}^0)$.[98] That is, player N requires a monetary payoff that is large enough to cover his outside option, x_N^0, plus a fraction of the average net surplus, $\overline{x} - \overline{x}^0$. This second term depends on player $N's$ non-monetary preferences. In the second to last round, and assuming that sufficient surplus remains on the table, player $N-1$ would raise his own demand, x_{N-1}, to the point where player N's share of the surplus is reduced to exactly $x_N^0 + \gamma_N(\overline{x} - \overline{x}^0)$. Similarly, player $N-2$ would propose a share x_{N-2} that would leave just enough value remaining on the table to satisfy the participation constraints of players $N-1$ and N. By this logic, players $i = 2, 3, ..., N$ receive shares that just induce their participation but no more. Player $i = 1$, the first mover, captures the residual value.

PROOF OF PROPOSITION 6: Incentive compatibility for players $i = 2, 3, ..., N$ requires that $x_i = x_i^0 + \gamma_i(\overline{x} - \overline{x}^0)$. Therefore the largest monetary payoff that player 1 could possibly extract is $x_1 = X - \sum_{i=2}^{N}[x_i^0 + \gamma_i(\overline{x} - \overline{x}^0)] = X + x_1^0 + \gamma_1(\overline{x} - \overline{x}^0) - \sum_{i=1}^{N}[x_i^0 + \gamma_i(\overline{x} - \overline{x}^0)]$ $= X + x_1^0 + \gamma_1(\overline{x} - \overline{x}^0) - [X^0 + \overline{\gamma}(X - X^0)] = x_1^0 + \gamma_1(\overline{x} - \overline{x}^0) + (1 - \overline{\gamma})(X - X^0)$. Suppose player 1 makes this offer. The remaining players are willing to participate and receive $x_i = x_i^0 + \gamma_i(\overline{x} - \overline{x}^0)$. If any subsequent player $i = 2, 3, ..., N-1$ demanded more than $x_i^0 + \gamma_i(\overline{x} - \overline{x}^0)$, then too little surplus would remain on the table to satisfy the participation constraints of the others. The allocation in the proposition is the unique subgame-perfect equilibrium of the game. Q.E.D.

[98] Notice that we are making the tie-breaking assumption that when indifferent, players participate in the game.

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Appendix C. Tables

Table C1: Descriptive Statistics ($c_E = 600$)

Condition	Mean Seller's Fin. Pr.	Mean Seller's Fin. Dam.	Buyer's Accept. Rate	Entr.'s Part. Rate	Mean Entr.'s Price[a]	Buyer's Breach Rate	Exclus. Rate[b]	Mean Sum of Payoffs
INC/NR	1300.00	722.22	.89	1.00	687.50	.63	.44	766.67
[9]	(.00)	(263.52)			(35.36)			(350.00)
INC/R	1275.00	637.50	1.00	.75	966.67	.33	.75	475.00
[8]	(70.71)	(329.23)			(206.56)			(324.04)
C/NR	1255.56	455.56	1.00	.89	787.50	.75	.33	766.67
[9]	(88.19)	(133.33)			(195.94)			(350.00)
C/R	1300.00	422.22	1.00	.89	812.50	.88	.22	844.44
[9]	(.00)	(290.59)			(258.77			(308.67)
C/NR-D	1160.00	500.00			670.00			1000.00
[10]	(96.61)	(.00)			(48.30)			(.00)
C/NR-CO	1255.56	377.78	.78	1.00	814.29	1.00	.00	1000.00
[9]	(88.19)	(307.32)			(195.18)			(.00)

Notes: [a]Only cases in which the entrant decided to participate are included here; under the dictator-seller condition, the entrant's price is decided by the seller; [b]exclusion rate includes the cases in which the entrant decided not to participate, and the cases in which the entrant decided to participate but the buyer did not breach the contract with the seller; total groups are in brackets; standard deviations are in parentheses. See Table 2 for a description of the experimental conditions.

Table C2: Sample of Buyers' and Entrants' Messages

Messages
PLAYER C: hi I can sell it for 700 tokens
PLAYER B: 1300 opt 500
PLAYER C: 700 gets you a profit of 400
PLAYER B: i will only buy from you if you offer 600. if you offer 700
and i decline i will lose 100 but you wont get anything
PLAYER B: 600 is my deal
PLAYER C: ok I'll offer 600
PLAYER C: hey so you should obviously accept. but if i offer 600 will you accept?
that way everyone gets 500
PLAYER B: give me anything lower than 700
PLAYER B: ok
PLAYER C: so 600 is done
PLAYER C: cool
PLAYER B: give me 200 or else you don't get anything
PLAYER C: yeah unless you reject :)
PLAYER B: no point in rejecting.
PLAYER C: i know. 200 it is.
PLAYER B: Hello!
PLAYER C: Hello Player B! :)
PLAYER B: You'll be able to offer a better price than what I have now :)
PLAYER C: I am willing to offer you 700. Then you will still have 400
which is more than you would if you went with A!
PLAYER B: Negotiate?
PLAYER C: Does that sound fair?
PLAYER B: Hmmm 600 is more fair
PLAYER B: That way we will all get 500
PLAYER C: Alright. Let's do 600 then.
PLAYER B: Great

Notes: Player B and Player C stand for buyer and entrant, respectively.

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Appendix D. Instructions (Benchmark Condition)

PLEASE GIVE THIS MATERIAL TO THE EXPERIMENTER AT THE END OF THE SESSION

INSTRUCTIONS

This is an experiment in the economics of decision-making. Several academic institutions have provided the funds for this research.

In this experiment you will be asked to play an economic decision-making computer game and to make decisions in several rounds. The experiment currency is the "token." The instructions are simple. If you follow them closely and make appropriate decisions, you may make an appreciable amount of money. At the end of the experiment you will be paid your total game earnings in CASH along with your participation fee. If you have any questions at any time, please raise your hand and the experimenter will go to your desk.

SESSION AND PLAYERS

The session is made up of 9 rounds. The first 3 rounds are practice rounds and will not be counted in the determination of your final earnings.

1) Before the beginning of each practice round, the computer will randomly form groups of three people: **Player A**, **Player B**, and **Player C**. The roles will be randomly assigned. Then, the computer will randomly choose a type for **Player C**. There are two possible types: **Low-Cost** type and **High-Cost** type. There is a 75% chance that the type will be **Low-Cost,** and a 25% chance that the type will be **High-Cost.** In other words, on average, 3 out 4 times, **Player C** will have a **Low-Cost** type, and 1 out of 4 times, he/she will have a **High-Cost** type. The type of **Player C** will be revealed only to **Player C**.

2) During the practice rounds, each person will play the roles of **Player A, Player B,** and **Player C** once.

3) After the third practice round, six actual rounds of the game will be played. Every participant will be randomly assigned a role. The roles will remain the same during the six actual rounds. At the beginning of each actual round, new groups of three people, **Player A, Player B,** and **Player C**, will be randomly formed. In case of **Player C**, a type will also be randomly assigned at the beginning of each actual round.

You will not know the identity of the other two players who pertain to your group in any round.

A PROPOSAL FROM PLAYER A

A proposal from **Player A** consists of a **SELLING PRICE** and an **OPT-OUT CHARGE**. The selling price refers to the price **Player B** pays to **Player A** in the event that **Player B buys from Player A** after **accepting Player A's proposal**. The opt-out charge refers to the amount **Player B** transfers to **Player A** in case **Player B buys from Player C** after **accepting Player A's proposal.**

. PRODUCTION COSTS AND VALUATION OF THE GOOD

Player A's production cost is equal to 1,300 tokens; **Player C**'s production cost is equal to 100 tokens (Low-Cost type) or 600 tokens (High-Cost type); and, **Player B**'s valuation of the good is equal to 1,600 tokens

THE ROUND

Each round has several stages.

STAGE 1

1) **Player A makes a proposal** to **Player B.**

The possible proposals that **Player A** can offer to **Player B** are as follow:

	Selling Price	**Opt-Out Charge**
Proposal	1,300 tokens	1,000 tokens
Proposal	1,300 tokens	500 tokens
Proposal	1,300 tokens	100 tokens
Proposal	1,100 tokens	1,000 tokens
Proposal	1,100 tokens	500 tokens
Proposal	1,100 tokens	100 tokens

When making his/her proposal decision, **Player A** should take into account that his/her round payoff will depend on his/her decisions and on the decisions of **Player B** and **Player C. Player A** should also check the possible round payoffs associated with **<u>the decisions of ALL players.</u>**

2) **Player A**'s proposal is **immediately revealed** to **Player B** and to **Player C**.

STAGE 2

1) After observing **Player A**'s proposal**, Player B decides whether to accept or reject** the proposal.

If the proposal is rejected, the **round ends**. The round payoff for **Player A** will be equal to 0 tokens, the round payoff for **Player B** will be equal to 300 tokens, and the round payoff for **Player C** will be equal to 1,200 tokens (Low-Cost type) or 700 tokens (High-Cost type)**.**

If the proposal is accepted by **Player B**, the **next stage starts**.

When making his/her decision, **Player B** should take into account that his/her round payoff will depend on his/her decisions and on the decisions of **Player A** and **Player C**. **Player B** should also check the possible round payoffs associated with **the decisions of ALL players.**

2) **Player B**'s decision is immediately revealed to **Player A** and to **Player C**.

STAGE 3

1) In case of **Player B**'s acceptance of the proposal, this stage starts. Otherwise, the **round ends**.

2) After observing **Player A**'s proposal and **Player B**'s decision, **Player C decides whether to participate in the game.**

If **Player C** does not participate in the game, **Player B** buys from **Player A** at **Player A**'s price and the **round ends**. The round payoff for **Player A** will be equal to **Player A**'s price minus **Player A**'s cost, the round payoff for **Player B** will be equal to **Player B**'s valuation of the good (1,600 tokens) minus **Player A**'s price, and the round payoff for **Player C** will be equal to 0 tokens**.**

If **Player C** participates in the game, he/she will also **propose** a **selling price** to **Player B**.

The possible options for **Player C** are as follows:

Player C’s Options
To Participate and offer a price equal to 1,300 tokens
To Participate and offer a price equal to 1,100 tokens
To Participate and offer a price equal to 700 tokens
To Participate and offer a price equal to 600 tokens
To Participate and offer a price equal to 400 tokens
To Participate and offer a price equal to 200 tokens
Not to participate

When making his/her decision, the **Player C** should take into account that his/her round payoff will depend on his/her decisions and on the decisions of **Player A** and **Player B**. **Player C** should also check the possible round payoffs associated with **<u>the decisions of ALL players</u>.**

2) **Player C**’s decision is immediately revealed to **Player A** and to **Player B**.

STAGE 4

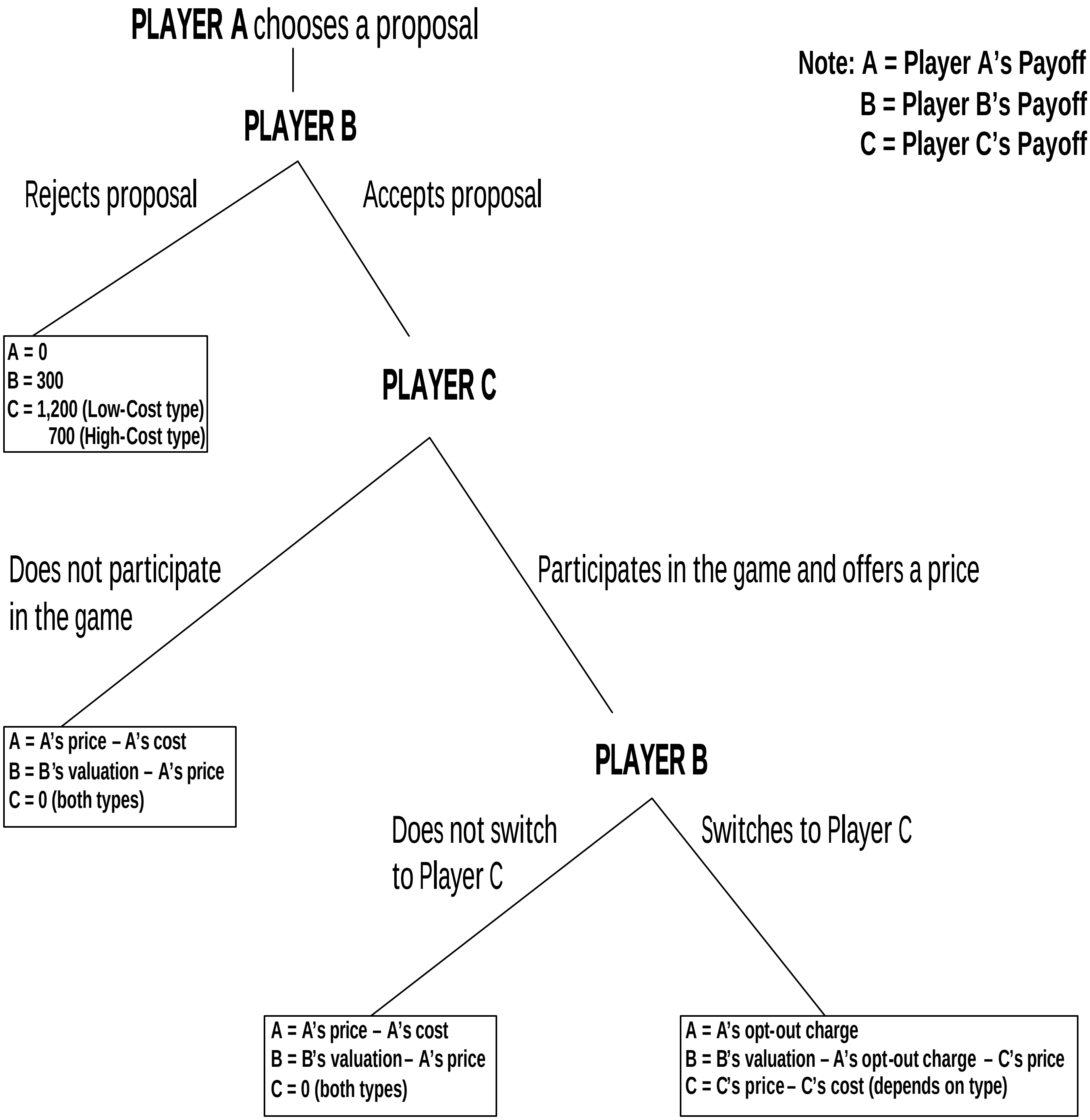
1) In case of **Player C**’s decision to participate, this stage starts. Otherwise, the **<u>round ends</u>**.

2) **Player B decides whether to switch to Player C** (i.e., whether to buy from **Player C**).

If **Player B** decides not to switch to **Player C**, **Player B** will buy from **Player A** and pay the price proposed by **Player A**. Then, the **<u>round ends</u>.** The round payoff for **Player A** will be equal to **Player A**’s price minus **Player A**’s cost, the round payoff for **Player B** will be equal to **Player B**’s valuation of the good (1,600 tokens) minus **Player A**’s price, and the round payoff for **Player C** will be equal to 0 tokens**.**

If **Player B** decides to switch to **Player C**, **Player B** will buy from **Player C** and pay the price proposed by **Player C**. In addition, **Player B** transfers the opt-out charge to **Player A**. Then, the **<u>round ends</u>**. The round payoff for **Player A** will be equal to **Player A**’s opt-out charge, the round payoff for **Player B** will be equal to **Player B**’s valuation of the good (1,600 tokens) minus **Player A**’s opt-out charge and **Player C**’s price, and the round payoff for **Player C** will be equal to **Player C**’s price minus **Player C**’s cost (100 tokens if Low-Cost type or 600 tokens if High-Cost type)**.**

POSSIBLE OUTCOMES: GRAPH



POSSIBLE OUTCOMES: TABLE

The possible outcomes are as follows.

If **PLAYER B REJECTS** the proposal:

Player A's payoff = **0 tokens**

Player B's payoff = **300 tokens**

Player C's payoff = **1,200 tokens** (Low-Cost type) or **700 tokens** (High-Cost type)

If **PLAYER B ACCEPTS** the proposal and **PLAYER C DOES NOT PARTICIPATE** in the game:

Player A's payoff = **Player A's price – Player A's cost**

Player B's payoff = **Player B's valuation – Player A's price**

Player C's payoff = **0 tokens** (both types)

If **PLAYER B ACCEPTS** the proposal, **PLAYER C PARTICIPATES** in the game, and **PLAYER B DOES NOT SWITCH** to **Player C**:

Player A's payoff = **Player A's price – Player A's cost**

Player B's payoff = **Player B's valuation – Player A's price**

Player C's payoff = **0 tokens** (both types)

If **PLAYER B ACCEPTS** the proposal, **PLAYER C PARTICIPATES** in the game, and **PLAYER B SWITCHES** to **Player C**:

Player A's payoff = **Opt-out charge**

Player B's payoff = **Player B's valuation – opt-out charge – Player C's price**

Player C's payoff = **Player C's price – Player C's cost** (depends on the type)

ROUND PAYOFF

The Payoff Table summarizes the round payoffs for **Player A, Player B,** and **Player C** related to the possible outcomes.

Payoff Table

Role	**B rejects the proposal**	**B accepts the proposal** **C does not participate in the game**	**B accepts proposal** **C participates in the game** **B does not switch to Player C**	**B accepts the proposal** **C participates in the game** **B switches to Player C**
Player A	0 tokens	A's price – A's cost	A's price – A's cost	Opt-out charge
Player B	300 tokens	B's valuation – A's price	B's valuation – A's Price	B's valuation – opt-out charge – C's price
Player C **Low-Cost Type**	1,200 tokens	0 tokens	0 tokens	C's price – C's cost (Low)
High-Cost Type	700 tokens	0 tokens	0 tokens	C's price – C's cost (High)

EXERCISES

Four exercises related to the Payoff Table are presented below. Please fill the blanks.

Exercise 1. Column 1 of Payoff Table (B rejects the proposal)

Suppose **Player A** offers a proposal consisting of a price equal to **Z** tokens and an opt-out charge equal to **Y** tokens to **Player B**, and **Player B rejects** the proposal. Then, **Player A**'s round payoff is equal to _______________ tokens, **Player B**'s round payoffs is equal to _______________ tokens, and **Player C**'s round payoff is equal to ______________ tokens if his/her type is High, or __________________ tokens if his/her type is Low.

Exercise 2. Column 2 of Payoff Table (B accepts the proposal and C does not participate in the game)

Suppose **Player A** offers a proposal consisting of a price equal to **U** tokens and an opt-out charge equal to **P** tokens to **Player B, Player B accepts** the proposal, and **Player C does not participate in the game**. Then, **Player A**'s round payoff is equal to ____________ tokens, **Player B**'s round payoffs is equal to ____________ tokens, and **Player C**'s round payoff is equal to_____________ tokens if his/her type is High, or ___________ tokens if his/her type is Low.

Exercise 3. Column 3 of Payoff Table (B accepts the proposal, C participates in the game, and B does not switch to C)

Suppose **Player A** offers a proposal consisting of a price equal to **W** tokens and an opt-out charge equal to **X** tokens to **Player B, Player B accepts** the proposal, **Player C participates in the game and offers a price equal to F** tokens, and **Player B does not switch to Player C**. Then, **Player A**'s round payoff is equal to __________________ tokens, **Player B**'s round payoffs is equal to _______________ tokens, and **Player C**'s round payoff is equal to ______________ tokens if his/her type is High, or _______________ tokens if his/her type is Low.

Exercise 4. Column 4 of Payoff Table (B accepts the proposal, C participates in the game, and B switches to C)

Suppose **Player A** offers a proposal consisting of a price equal to **S** tokens and an opt-out charge equal to **N** tokens to **Player B, Player B accepts** the proposal, **Player C participates in the game and offers a price equal to Z** tokens, and **Player B switches to Player C**. Then, **Player A**'s round payoff is equal to ____________ tokens, **Player B**'s round payoffs is equal to _____________ tokens, and **Player C**'s round payoff is equal to _______________ if his/her type is High, or _____________ tokens if his/her type is Low.

SESSION PAYOFF

The game earnings in tokens will be equal to the sum of payoffs for the 6 actual rounds. The game earnings in dollars will be equal to (Game Earnings in tokens)/187 (187 tokens = 1 dollar). Hence, the total earnings in dollars will be equal to the participation fee plus the game earning in dollars.

GAME SOFTWARE

The game will be played using a computer terminal. You will need to enter your decisions by using the mouse. A **payoff calculator** device will be provided at the decision screens (screens at which a decision needs to be entered). Please press the "Calculator" button (displayed in the upper left-hand side of the decision screens) to open the payoff calculator.

There will be two boxes, displayed in the upper right-hand side of your screen, that indicate the "Round Number" and "Your Role."

Press the NEXT >> button to move to the next screen. In some instances, you will need to wait until the other players make their decisions before moving to the next screen. Please **be patient**.

Please, **do not try to go back** to the previous screen and **do not close the browser**: the software will stop working and you will lose all the accumulated tokens.

Next, the **3 PRACTICE ROUNDS** will begin. After that, 6 actual rounds of the game will be played. **You can consult these instructions at any time during the session**.

THANKS FOR YOUR PARTICIPATION IN THIS STUDY!!

PLEASE GIVE THIS MATERIAL TO THE EXPERIMENTER AT THE END OF THE SESSION

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Appendix E. Payoff Calculator (Benchmark Condition)