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STIPULATED DAMAGES AS A RENT-EXTRACTION MECHANISM: EXPERIMENTAL EVIDENCE*

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Abstract

This paper experimentally studies stipulated damages as a rent-extraction mechanism. We demonstrate that contract renegotiation induces the sellers to propose the lowest stipulated damages and the entrants to offer the highest price more frequently. We show that complete information about the entrant's cost lowers exclusion of high-cost entrants. Unanticipated findings are observed. The majority of sellers make more generous offers than expected. Rent extraction also occurs in renegotiation environments. Our findings from the dictatorial seller and buyer-entrant communication treatments suggest the presence of social preferences.

KEYWORDS: Stipulated Damages; Rent Extraction; Market Foreclosure; Renegotiation; Social Preferences; Experiments

JEL Categories: C72, C91, D86, K12, K21, L42

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1 Introduction

It is very common for contracts to stipulate damages to be paid in the event of breach by one of the parties.[1] Supply contracts governing the delivery of goods and services routinely specify damages to be paid for late delivery by the seller, or to be paid for the refusal of the buyer to accept delivery. Stipulated damage clauses or contract breach clauses often serve legitimate and value-enhancing business purposes: they help to protect the relationship-specific investment of the breached-against party, can reduce risk and uncertainty, and facilitate court proceedings following breach. At the same time, scholars, practitioners, and policy makers have long recognized the strategic power of stipulated damages, and their possible anticompetitive effects.[2]

Seminal theoretical literature explores the strategic use of stipulated damages as a rent-extraction mechanism in environments where an incumbent monopolist contracts with a buyer in anticipation of potential entry (Aghion and Bolton, 1987).[3] When the potential entrant will have some market power, the incumbent seller and buyer 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. 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 additional value or surplus created by the entrant might be extracted by the incumbent seller and buyer. When the entrant's cost is unknown at the time of contracting, stipulated damages might block the entry of firms that are more efficient than the incumbent seller.[4] These predictions rely heavily on the assumption that renegotiation does not occur. Introducing renegotiation of the contract terms weakens the commitment power and strategic value of stipulated damages (Spier and Whinston, 1995).[5] Although the theoretical literature

[1]Stipulated damage clauses refer to any damages term included in a contract, regardless of its enforceability (Talley, 1994). Although 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). Hence, the the strategic use of stipulated damages remains an empirically-relevant problem.

[2]See for instance, *United States v. United Shoe Machinery Corporation*, 258 U.S. 451 (1922).

[3]See also Diamond and Maskin (1979), Klemperer (1986), Cramton and Schwartz (1991), Ziss (1996), Choi (2004), Hua (2007), Muehlheusser (2007), and Marx and Shaffer (2010).

[4]This is in contrast to the view of the Chicago School scholars (Posner, 1976; Bork, 1978), who argue that contracts with stipulated damages can only serve to enhance social value.

[5]This criticism, initially proposed by Masten and Snyder (1989), is formally studied by Spier and Whinston (1995). Another branch of the literature focuses 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; Landeo and Spier (2012, 2009) for experimental evidence, and Landeo (forthcoming)

has been very active, empirical work is scarce. Our paper contributes to this literature by experimentally studying the effects of contract renegotiation and complete information about the entrant's cost on the design of stipulated damages, rent extraction, and market foreclosure. To the best of our knowledge, ours is the first experimental study of stipulated damages as a rent-extraction mechanism.[6] We first construct a simple bargaining framework that captures key strategic features of the rent-extraction literature. We then replicate this framework in a laboratory setting.

Our model involves three players, an incumbent seller, a buyer, and a more efficient potential entrant. The incumbent seller and the buyer contract in the shadow of the more efficient entrant. Although the existence of the entrant's cost advantage is assumed to be common knowledge among the players, the magnitude of the cost advantage may be unknown to the incumbent seller and buyer. The contract involves a selling price and stipulated damages to be charged to the buyer in case of contract breach. In the absence of a contract between the incumbent seller and the buyer, the more efficient entrant captures the market. Stipulated damages play a fundamental role in this environment. Once bound by contract to the incumbent seller, the buyer would breach and buy from the entrant only if the sum of the entrant's price and stipulated damages is smaller than the seller's price. By raising the level of stipulated damages, the incumbent seller can force the entrant to lower his price in order to make a sale to the buyer. Thus, through the stipulated damage provision, the incumbent seller extracts the profits of the more efficient entrant. Note that in this strategic setting, contract breach by the buyer actually benefits the incumbent seller. The challenge facing the incumbent seller is then to design a contract with stipulated damages that is both acceptable to the buyer and allows the seller to capture the entrant's profits.

In equilibrium, rent extraction through stipulated damages only occurs when contract renegotiation is not permitted. Renegotiation switches bargaining power from the incumbent monopolist to the entrant. Although market foreclosure is not the goal of the seller when designing the stipulated damages, inefficient exclusion of the high-cost entrant occurs when the entrant's cost is private information and contract renegotiation is impossible.

Our basic experiment involves a 2 X 2 design. It includes two contract treatments, no-renegotiation (where renegotiation of the original contract between the seller and buyer is not allowed) and renegotiation (where the buyer and seller can renegotiate their contract after ob-

for a survey of experimental work on vertical restraints.

[6]Sloof et al. (2003, 2006) experimentally study the effects of different damages regimes on the level of relationship-specific investment. This work does not consider the effects of stipulated damages on potential entrants, and hence, it does not investigate the role of stipulated damages as a rent-extraction mechanism. See Feess et al. (2015) for an empirical study of contracts as rent-seeking devices using data from German soccer.

serving the entrant's price). We also study two information treatments, incomplete information (where the entrant's cost is private information) and complete information (where the entrant's cost is common knowledge). A combination of these treatments generates four experimental conditions.

As predicted, our experimental findings suggest that contract renegotiation induced the sellers to propose the lowest stipulated damages and the entrants to offer the highest price more frequently. When armed with complete information about the entrant's cost, the incumbent fine-tunes the stipulated damages to reflect this more precise information. As a consequence, lower exclusion of high-cost entrants from the market occurs.

Other experimental results were not anticipated, however. First, it is predicted that the sellers will propose the highest stipulated damages when renegotiation is not permitted. We find that, although a small group of sellers exhibited a behavior aligned with the theory, the majority of sellers departed from that behavior and made more generous offers. Second, our theory predicts that stipulated damages lose their rent-extraction value when renegotiation is permitted. However, our findings indicate that the incumbent seller extracted value from the more efficient entrant in renegotiation environments as well. In particular, our data suggest that the generous stipulated damages offered by the seller in renegotiation environments protected him from the entrant's aggressive behavior. Anticipating that generous damages might trigger buyer's expectations of equitable outcomes, the entrant avoided the consequences of buyer's negative reciprocity by offering a lower price.[7] Since the entrant's price was low, the seller did not need to reduce the stipulated damages. As a result, high rent-extraction power rates were also observed in renegotiation environments. These findings are aligned with recent literature on contractual reference points and renegotiation (see Fehr et al., 2015),[8] which suggests that contractual reference points are robust to revision opportunities, and that opportunistic revisions trigger negative reciprocity. Our study provides evidence that the perception of contracts as reference points also applies to a third-party (the entrant) not involved in the initial contractual agreement. Our findings also indicate that social preferences affect players' behavior.[9]

To better understand the behavioral aspects of the design of stipulated damages, we have conducted two additional experimental treatments, dictatorial seller (where the allocation of

[7]The buyer could decide not to breach the contract and switch to the entrant as a retaliation to an entrant's price perceived as unkind.

[8]See also Hoppe and Schmitz (2011), Bartling and Schmidt (forthcoming), and Iyer and Schoar (2008).

[9]See Fehr and Schmidt (1999) for seminal work on social preferences; Hoppe and Schmitz (2013) for experimental evidence on social preferences in principal-agent contracts with private information; and Landeo and Spier (2015) for experimental evidence on reciprocity in team contracts.

the surplus is unilaterally decided by the incumbent seller) and buyer-entrant two-way unstructured communication (where the buyer and the entrant can communicate after observing the seller's offer and before the buyer decides whether to accept the contract). The dictatorial seller treatment allows us to assess whether the seller's anticipation of the other players' social preferences is the driving force behind the more generous offers observed in the no-renegotiation conditions. The communication treatment promotes bargaining between the buyer and the entrant, and hence, allows us to directly observe the buyers' and entrants' requests and learn more about the influence of social preferences on players' behavior. Importantly, in the communication treatment, the buyer has the chance to directly convey his expectations to the entrant and persuade the entrant to accept his requests. If the buyer's preferred outcome is influenced by social preferences, we expect that the likelihood of equitable allocations in the case of low-cost entrant (equal split of the surplus) will increase with communication.

The findings from these additional treatments are as follows. When the seller has the absolute power to decide the allocation of the pie, the seller chooses the highest stipulated damages, suggesting that the more generous behavior observed in the other treatments is triggered by the seller's strategic anticipation of the other players' social preferences. When the buyer is allowed to communicate with the entrant, equitable allocations of the surplus among the three players are more frequent. These results, together with the analysis of the buyers' and the entrants' messages, provide evidence of the importance of social preferences on players' behavior.

The rest of the paper is organized as follows. Section 2 outlines the theoretical model. Section 3 discusses the qualitative hypotheses. Section 4 presents the experimental design. Section 5 examines the results from the experimental sessions. Section 6 presents concluding remarks. Formal proofs of the general version of our model and additional analysis are presented in Appendix A; instructions and software screens are presented in Appendix B.[10]

2 Theoretical Framework

This section outlines our general model and presents the point predictions derived from the numerical examination of the model. For brevity, equilibrium analysis of the general model and detailed description of the construction of our numerical examination are presented in Appendix A, Sections 2.1 and 2.2.

[10]Appendix B is available at http://www.artsrn.ualberta.ca/econweb/landeo/.

2.1 General Model

Our strategic environment involves 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 gross surplus is $v - c_E$,[11] and the net surplus is $c_I - c_E$ (that is, the gross surplus minus the buyer's outside option $v - c_I$). 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 breaches and purchases from E instead (after accepting I's contract offer).

Before proceeding any further, it is important to highlight the strategic role of stipulated damages. Given a contract, $\{p, d\}$, 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. Indeed, by choosing a contract with $p - d = c_E$, they can induce the entrant to lower the price all the way down to cost, $p_E = c_E$.

We consider two information structures: incomplete information (INC, where the entrant's cost is private information) and complete information (C, where the entrant's cost is common knowledge). We also study two contract structures: contracts with no-renegotiation (NR, where renegotiation of the original contract between the buyer and incumbent seller is impossible) and contracts with renegotiation (R, when renegotiation is allowed).

The timing of the game is as follows. Nature 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. 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.[12] In Stage 2, the Entry Stage, after observing $\{p_0, d_0\}$, E decides whether to participate in the

[11] We will use the terms "gross surplus" and "surplus" interchangeably.

[12] Aghion and Bolton (1987) have a similar assumption.

market and offer a price p_E to B.[13] 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). Characterization of equilibria are presented in Propositions A1–A3, Appendix A, Section 2.1.

2.2 Numerical Examination and Point Predictions

Given the complexity of the strategic environment and the fact that ours is the first experimental examination of this three-player bargaining environment, we decided to construct a simple numerical examination of the general model, and implement this environment in the lab.[14] Our numerical examination satisfies the model assumptions. Therefore, the predictions derived from these assumptions hold.[15] Appendix A, Section 2.2 provides a detailed description of the construction of our numerical examination.

The adopted parameter values are as follows. The buyer's valuation of the good is $v = 1600$; the incumbent seller's production cost is $c_I = 1300$; 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 generate behaviorally-relevant divisions of the surplus in equilibrium, and to break payoff indifference for the buyer (no-renegotiation and renegotiation environments) and entrant (no-renegotiation environment) in equilibrium under complete information, we restricted the values for the stipulated damages and the entrant's prices (see Appendix A). We adopted the following sets of possible choices for the players.The set of seller's prices is $p \in \{1100, 1300\}$; the set of stipulated damages is $d \in \{100, 500, 1000\}$; and, the set of entrant's prices is $p_E \in \{200, 400, 600, 700, 1100, 1300\}$. In addition to including the equilibrium choices for the players, these sets also allow for behaviorally-relevant off-equilibrium deviations (see Appendix A). The adopted parameter values and sets of possible choices for the

[13]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.

[14]By reducing computational errors, and hence, unnecessary noise in the data, this design allows us to identify patterns of behavioral deviations from the theoretical point predictions. Heuristics that subjects adopt in more complex environments might not emerge in environments involving a small number of possible choices. We plan to address this potential shortcoming in future work by allowing for off-equilibrium seller's prices and more complex sets of stipulated damages and entrant's prices.

[15]From a behavioral point of view, a numerical examination different from the one presented here might affect the results.

players were used to construct the experimental environment across experimental conditions.

Propositions 1–3 characterize the equilibria under our numerical examination.[16]

PROPOSITION 1. *(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 price* $p_0 = 1300$ *and damages* $d_0 = 1000$ *if* $c_E = 100$*, and a price* $p_0 = 1300$ *and damages* $d_0 = 500$ *if* $c_E = 600$*. The buyer accepts the contract. The 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 market foreclosure.*

Intuitively, when the potential entrant's cost is commonly known, the incumbent seller will tailor the damages to the entrant's cost to reflect this more precise information. The expected payoff for the incumbent seller is 875,[17] which is greater than the expected payoff he can get from any other strategy. There is no inefficient market foreclosure. In equilibrium, there is 67-33 share of the surplus between the incumbent seller and the other two players, when the entrant's cost is low.

PROPOSITION 2. *(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 price* $p_0 = 1300$ *and stipulated damages* $d_0 = 1000$*. 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 market foreclosure.*

Intuitively, when the entrant's cost is private information, the incumbent seller faces two options. First, if the seller offers a price equal to 1300 and damages equal to 1000, then to make a sale the entrant must set a price equal to 200. The entrant would only make such an offer if he has low costs, which happens seventy five percent of the time. The seller's expected payoff from this strategy is 750. Second, if the seller offers a price equal to 1300 and damages equal to 500, then the entrant can raise his price to 700. The entrant would be willing to enter one hundred percent of the time and the incumbent seller's payoff would be 500. The seller will choose the

[16] These propositions are aligned with the more general characterization of the equilibria presented in Propositions A1–A3, Appendix A.

[17] The payoffs for the incumbent seller, the buyer, and the entrant are: (1000, 400, 100), when $c_E = 100$, and (500, 400, 100) when $c_E = 600$. The incumbent seller's expected payoff is $1000(.75) + 500(.25) = 875$.

first option. Social inefficiency occurs in this environment since only the low-cost entrant serves the market.[18] In equilibrium, there is 67-33 share of surplus between the incumbent seller and the other two players, when the entrant's cost is low.[19]

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 in which the incumbent seller offers a price* $p_0 = 1300$ *or a price* $p_0 = 1100$*, and damages* $d_0 \geq 100$*. The entrant participates in the market and offers either* $p_E = 700$ *or* $p_E = 1100$ *(when* $p_0 = 1100$ *and* $p_0 = 1300$*, respectively; both cost types), the buyer breaches the contract, purchases from the entrant, and pays stipulated damages of* $d_1 = 100$ *to the incumbent seller. Renegotiation occurs only if* $d_0 > 100$*. There is no inefficient market foreclosure.*

Intuitively, renegotiation shifts the bargaining power from the incumbent seller to the entrant. The entrant can make an aggressive offer, knowing that the seller will reduce the stipulated damages to 100 in order to induce the buyer to breach. Inefficient market foreclosure is not present in this environment. In equilibrium, there is 67-33 share of the surplus between the entrant and the other two players, when the entrant's cost is low and $p_E = 1100$.[20]

Importantly, as described in the propositions, the seller gets a payoff is equal to 100 in the INC/R and C/R environments. In INC/NR and C/NR settings, on the other hand, the seller's payoff is greater than 100. This latter outcome reflects the rent-extraction power of stipulated damages. In theory, renegotiation reduces dramatically the power of stipulated damages as a rent-extraction mechanism.

Table 1 summarizes the point predictions regarding seller's stipulated damages, entrant's price, the rent-extraction power of stipulated damages, and market foreclosure.

3 Qualitative Hypotheses

HYPOTHESIS 1: *When the entrant's cost is low, renegotiation decreases the seller's final stipulated damages, increases the entrant's price, and decreases the rent extraction power of stipulated*

[18]The high-entrant cost 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.

[19]The payoffs for the incumbent seller, the buyer, and the entrant are: (1000, 400, 100), when $c_E = 100$, and (0, 300, 0) when $c_E = 600$.

[20]The payoffs for the incumbent seller, the buyer, and the entrant are: (100, 800, 600) and (100, 400, 1000) when $c_E = 100$ and $p_E = 700$, and $c_E = 100$ and $p_E = 1100$, respectively; and (100, 800, 100) and (100, 400, 500) when $c_E = 600$ and $p_E = 700$, and $c_E = 600$ and $p_E = 1100$, respectively.

Table 1: Equilibrium Seller's Final Damages, Entrant's Price, Rent-Extraction Power and Market Foreclosure

	Seller's Final Damages	Entrant's Price	Rent-Extraction Power	Market Foreclosure
Low Cost ($c_E = 100$)				
INC/NR	1000	200	Yes	No
INC/R	100	1100, 700	No	No
C/NR	1000	200	Yes	No
C/R	100	1100, 700	No	No
High Cost ($c_E = 600$)				
INC/NR	1000	$\geq 0^a$	No	Yes
INC/R	100	1100, 700	No	No
C/NR	500	700	Yes	No
C/R	100	1100, 700	No	No

Notes: [a]There are multiple equilibrium entrant's price in the INC/NR condition.

damages. When the entrant's cost is high, renegotiation decreases the seller's final stipulated damages, decreases the rent-extraction power of stipulated damages in complete information environments, and decreases market foreclosure in incomplete information environments.

In theory, renegotiation weakens the commitment power of stipulated damages. Suppose the more efficient entrant offers a price just below the incumbent seller's cost. The incumbent seller will have the incentive to induce the buyer to purchase from the entrant, since the entrant's price is smaller than the opportunity cost of producing the product himself. So through Coasian bargaining, the incumbent seller and the buyer will renegotiate the stipulated damages provision to procure from the entrant. As a result, the rent extraction power of stipulated damages will be lower and market foreclosure will not occur.

HYPOTHESIS 2: *When the entrant's cost is high, complete information about the entrant's cost decreases the seller's stipulated damages, increases the rent-extraction power of stipulated damages, and decreases the likelihood of exclusion in no-renegotiation environments.*

Theoretically, when the entrant's cost is common knowledge and renegotiation is not allowed, the incumbent seller tailors the stipulated damages to the entrant's cost. In particular, the seller offers damages equal to 500 when the entrant's cost is high. As a result, the high-cost

Table 2: Qualitative Effects of Renegotiation and Complete Information

	Seller's Final Damages	Entrant's Price	Rent Extraction	Market Foreclosure
Effects of Renegotiation				
Low Cost ($c_E = 100$)				
INC/NR vs. IN/R	Down	Up	Down	No Effect
C/NR vs. C/R	Down	Up	Down	No Effect
High Cost ($c_E = 600$)				
INC/NR vs. IN/R	Down	Ambiguous[a]	No Effect	Down
C/NR vs. C/R	Down	Ambiguous[a]	Down	No Effect
Effects of Complete Information				
Low Cost ($c_E = 100$)				
INC/NR vs. C/NR	No Effect	No Effect	No Effect	No Effect
INC/R vs. C/R	No Effect	Ambiguous[a]	No Effect	No Effect
High Cost ($c_E = 600$)				
INC/NR vs. C/NR	Down	Ambiguous[a]	Up	Down
INC/R vs. C/R	No Effect	Ambiguous[a]	No Effect	No Effect

Notes: [a]There are multiple equilibrium entrant's prices in the INC/R, C/R, and INC/NR conditions. Hence, the effects of renegotiation and complete information on the effect on the entrant's price are ambiguous.

entrant serves the market and the rent extraction power of stipulated damages in case of low-cost entrant increases.

Table 2 summarizes the qualitative effects of renegotiation and complete information about the entrant's cost to be experimentally assessed.

4 Experimental Design

In this section, we describe the design of the four main treatments, while the description of the additional treatments is relegated to Appendix A.

Our study experimentally assesses the effects of renegotiation and complete information about the entrant's cost on the design of stipulated damages, rent extraction and market foreclosure. We specify the experimental setting in a way that satisfies the assumptions of the

Table 3: Experimental Conditions

	Incomplete Information about the Entrant's Cost	Complete Information about the Entrant's Cost
No-Renegotiation	INC/NR [27, 54]	C/NR [27, 54]
Renegotiation	INC/R [24, 48]	C/R [27, 54]

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

theory. We use a free-context environment and human subjects paid according to their performance. Our experimental design encompasses two contract treatments: no-renegotiation (NR, where renegotiation is not allowed) and renegotiation (R, where contract renegotiation between the incumbent seller and the buyer is permitted after observing the entrant's price). We also consider two information treatments: incomplete information (INC, where the entrant's cost is know only by the entrant) and complete information (C, where the entrant's cost is common knowledge). A combination of these treatments generates four experimental conditions. Table 3 summarizes the experimental conditions.

4.1 The Games

The experiment involves 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).[21] Procedural regularity is accomplished by developing a software program that permits subjects to play the game by using networked personal computers.[22] The software consists of 4 versions of the game, reflecting the four experimental conditions.[23]

The benchmark game refers to the incomplete information/no-renegotiation (INC/NR) environment. In the first stage, the seller offers a selling price and stipulated damages (to be paid in case of contract breach) to the buyer. In the second stage, after observing the seller's price

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

[22]See Appendix B for a sample of software screens and instructions.

[23]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 software also includes two additional games related to the two experimental treatments (dictatorial seller and buyer-entrant communication) discussed in Section 5.

and damages, the buyer decides whether to accept or reject the contract offer. If the buyer rejects the offer, then the game ends.[24] 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. If the entrant decides not to participate, then the buyer buys from the incumbent seller and the game ends. In case of participation, the entrant proposes a selling price. Then, the fourth stage starts. The buyer decides whether to buy from the entrant (breach the contract) or to buy from the incumbent seller, and the game ends. Variations of this benchmark game satisfy the other experimental conditions: (1) in the complete information conditions, the entrant's cost is common knowledge; and, (2) in the renegotiation conditions, contract renegotiation might occur (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 originally offered to the buyer. The seller might choose not to revise the original contract. 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).

4.2 The Experimental Sessions

We ran eight 90-minute to 120-minute sessions of 9 to 18 subjects each (two sessions per condition, 105 subjects in total) at experimental laboratories of Yale University.[25] 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.[26]

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

[24] The three players receive their reservation payoffs. See the Theoretical Framework section.

[25] Fifty-seven additional subjects participated in the four sessions related to the two experimental treatments (dictatorial seller and buyer-entrant communication) discussed in Section 5.

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

The experimental sessions encompassed three practice rounds and six actual rounds.[27] After the last practice round, every participant was randomly assigned a role. The role remained the same during the entire session. 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. To ensure comparability across conditions, the entrant's cost was randomly predetermined for each round (following the theoretical likelihoods), and then applied across conditions and sessions. Rounds 1–3 and 4 & 6 involved low-cost entrants, and round 5 involved high-cost entrants. Subjects did not play in the same group in two immediately consecutive rounds.[28] At the end of each round, subjects received information only about their own group's outcomes 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. The average payoff was $45, for a time commitment of approximately 100 minutes.[29] At the end of each experimental session, subjects received their monetary payoffs in cash.

5 Results

5.1 Description of the Data

Tables 4–6 summarize the seller's initial and final stipulated damages, entrant's prices, rent-extraction power rate, and market foreclosure rate. Initial and final stipulated damages are the same in environments where renegotiation is not allow and environments where renegotiation is allowed but the seller does not engage in active renegotiation. Rent extraction power rate refers to the percentage of total cases in which the payoff for the incumbent seller is greater than 100.[30] Market foreclosure rate refers to the percentage of total cases in which the entrant does not serve the market. The information about the cases where the entrant's cost is low (rounds 1-3 and rounds 4 & 6) is presented on the top section of the tables, and the information

[27]The rationale for including three practice rounds is as follows. During the practice rounds, 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. The rationale for including six actual rounds is as follows. Ours is a theory-testing study. Including six actual rounds allows for the subjects' choices to converge to some stable point as they gain more experience playing the actual game.

[28]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.

[29]The participation fee was $17 per hour.

[30]In theory, a seller's payoff greater than 100 occurs only in no-renegotiation conditions.

about the cases where the entrant's cost is high (round 5) is presented in the bottom section of the tables.

Table 4 reports the findings observed in environments where renegotiation is not allowed (No-Renegotiation conditions). Consider the conditions with low-cost entrants (top part of the table). The theory predicts that damages equal to 1,000 will be chosen by the sellers, and a price equal to 200 will be chosen by the entrants in 100 percent of the cases. However, our data suggest that damages equal to 1,000 and an entrant's price equal to 200 were chosen only by a subset of the subjects. In particular, off-equilibrium damages equal to 500 were the modal damages across conditions. This behavior does not vanish with experience. In fact, in the last two rounds, 67 percent of the sellers offered damages equal to 500, and more than 43 percent of the entrants chose a price equal to 700. The unexpected more generous stipulated damages might suggest the seller's own social preferences and/or his strategic anticipation of others' social preferences.

Consider now the conditions with high-entrant's cost (bottom part of the table). In theory, damages equal to 500 will be chosen by the sellers, and a price equal to 700 will be chosen by the entrant in the C/NR condition, and damages equal to 1,000 and no-entrance decision will occur in the INC/R condition. The modal seller's damages and entrant's price are aligned with the theory. In fact, damages equal to 500 and an entrant's price equal to 700 were the modal offers in the C/NR condition. The unexpectedly high rent-extraction power and low market foreclosure observed in the INC/NR environment might be explained by the more generous stipulated damages (500 instead of 1,000). Finally, our data indicate that rent-extraction power rates were lower in high-cost entrant cases (with respect to low-cost entrant cases), and market foreclosure occurred across conditions.

Next, we describe the data corresponding to environments where renegotiation is allowed (Renegotiation conditions). In theory, damages equal to 100 and an entrant's price equal to 1,100 (when the seller's price is equal to 1,300) or 700 (when the seller's price is equal to 1,100) should be chosen in equilibrium. Given that the majority of the sellers offered a price equal to 1,300,[31] the modal entrant's price should be equal to 1,100. Importantly, in theory, contract renegotiation occurs when the initial stipulated damages are greater than 100. The data suggest that active renegotiation occurred in 35 percent of the total cases. When the initial damages were equal to 1,000, the sellers and the buyers engaged in active renegotiation in 45 percent of the cases. Active renegotiation was especially low when the initial damages were equal to 500 (19 percent). In contrast, when the initial damages were equal to 100, active renegotiation

[31] See discussion at the end of this section and Table A1.

Table 4: Frequency of Actions and Outcomes when Renegotiation Is Not Allowed

	Seller's Final Damag.			Entrant's Price[a]						Rent-Extr.	Market
	100	500	1000	NP[b]	200	400	600	700	1100	Power	Foreclos.
Low Cost											
Rounds 1-3											
INC/NR [27]	.00	.59	.41	.08	.24	.12	.08	.40	.08	.70	.22
C/NR [27]	.00	.52	.48	.08	.35	.19	.19	.19	.00	.78	.19
Rounds 4&6											
INC/NR [18]	.00	.67	.33	.06	.13	.06	.19	.56	.00	.78	.11
C/NR [18]	.00	.67	.33	.17	.11	.11	.17	.44	.00	.67	.33
High Cost											
Round 5											
INC/NR [9]	.00	.56	.44	.00	.00	.00	.13	.88	.00	.56	.33
C/NR [9]	.11	.89	.00	.11	.00	.00	.11	.56	.22	.56	.22

Notes: [a]The frequencies of entrant's prices are computed with respect to the total cases in which the buyers accepted the seller's initial contract; [b]NP refers to cases in which the potential entrant decided not to participate; an entrant's price equal to 1,300 was not chosen by any entrant in any condition, and hence, is not included in this table; observations (number of groups) are in brackets.

occurred in 100 percent of the cases.[32] To better understand the patterns of the data where renegotiation is allowed, we describe the active and no-active renegotiation cases separately in Tables 5 and 6. Table A2 in Appendix A presents a summary of the aggregate renegotiation data.

Table 5 outlines the cases where no-active renegotiation was observed. Initial and final damages are identical in those cases. Consider first the low entrant's cost cases (top part of the table). The data suggest that no-active renegotiation was associated with high frequencies of initial damages equal to 500 (45 percent or higher) and a modal entrant's price equal to 700. The behavior of the sellers and the entrants is robust across rounds. These findings indicate that damages equal to 500 protected the sellers from aggressive behavior by the entrants. Anticipating that damages equal to 500 triggered buyers' expectations of equitable outcomes, the strategic entrants chose less aggressive prices to avoid buyers' negative reciprocity.

Consider now the cases with high entrant's cost (bottom part of the table). In theory, damages equal to 100 and entrant's prices equal to 1,100 should be chosen in equilibrium. The data suggest that the modal damages and entrant's price were equal to 500 and 700, respectively. Finally, our data indicate that although the unexpectedly high rent-extraction power of stipulated damages was present in these renegotiation environments, it was generally lower in high-cost entrant environments. Market foreclosure occurred in most environments.

Table 6 summarizes the cases where active renegotiation occurred. Consider first the low-cost entrant cases. The data indicate that active renegotiation was associated with very low frequencies of initial damages equal to 500 (25 percent or lower), and modal entrant's price and final damages equal to 1,100 and 100, respectively. This behavior is accentuated with experience. Our findings suggest that, high initial damages provided the entrants with the power to induce sellers to engage in active renegotiation and lower the damages by offering high prices. Anticipating that damages equal to 1,000 would not trigger buyers' expectations of equitable outcomes, the strategic entrants felt free to choose more aggressive prices.

Consider now the cases with high entrant's cost. When complete information was present, the entrant succeeded to induce low final damages by choosing a modal price equal to 1,100. In fact, final damages equal to 100 were chosen in 100 percent of the cases. In contrast, when incomplete information was present, although the entrants tried to induce low damages by offering a price equal to 1,100 (modal price), the modal final damages was equal to 500. As a result, a high exclusion rate was observed. Finally, our data indicate that the rent-extraction power of stipulated damages was zero in high-cost entrant environments, and market foreclosure

[32] This unanticipated finding is associated with the less aggressive entrant's prices observed in the renegotiation conditions. See discussion below.

Table 5: Frequency of Actions and Outcomes when Renegotiation Is Allowed but Active Renegotiation Does Not Occur

	Seller's Final Damag.			Entrant's Price[a]						Rent-Extr.	Market
	100	500	1000	NP[b]	200	400	600	700	1100	Power	Foreclos.
Low Cost											
Rounds 1-3											
INC/R [16]	.00	.50	.50	.06	.38	.06	.06	.44	.00	.88	.13
C/R [18]	.06	.72	.22	.17	.11	.11	.11	.39	.11	.67	.28
Rounds 4&6											
INC/R [11]	.00	.45	.55	.10	.30	.00	.00	.50	.10	.64	.27
C/R [12]	.00	.83	.17	.00	.17	.17	.00	.67	.00	1.00	.00
High Cost											
Round 5											
IN/R [4]	.00	.50	.50	.50	.00	.00	.00	.25	.25	.25	.75
C/R [6]	.00	.83	.17	.17	.00	.17	.00	.50	.17	.67	.33

Notes: [a]The frequencies of entrant's prices are computed with respect to the total cases in which the buyers accepted the seller's initial contract; [b]NP refers to cases in which the potential entrant decided not to participate; an entrant's price equal to 1300 was not chosen by any entrant in any condition, and hence, is not included in this table; observations (number of groups) are in brackets.

occurred in most environments. As expected, the rent extraction power of stipulated damages in active-renegotiation cases (across entrant's costs) was the lowest (compared with the rates observed in no-active renegotiation environments and environments that do not allow for renegotiation).

Lastly, consider the seller's final prices and buyers' contract acceptance and contract breach. As predicted by the theory, our data suggest that in the majority of cases, the sellers chose a price equal to 1,300 and the buyers accepted the initial seller's contract. (See Table A1 in Appendix A.) Although in the majority of cases, the buyers breached the contract with the incumbent seller and switched to the entrant, buyers' breach was particularly low in the INC/R condition when the entrant's cost was high (only 33 percent of buyers switched to the entrant). These results might reflect the high entrant's prices and the high seller's final damages observed in the active renegotiation with high-cost entrant cases. Remember that, when active renegotiation was present, although the entrants tried to induce low damages by offering a modal price equal to 1,100, the modal final damages was equal to 500.

Overall, our findings suggest subjects' strategic behavior and the importance of social preferences on players' decisions.

5.2 Regression Analysis

In theory, contract renegotiation weakens the commitment power of stipulated damages and shifts the bargaining power from the incumbent seller to the entrant. We first assess whether contract renegotiation increases the likelihood that the seller chooses the lowest possible damages and the entrant chooses the highest possible price, which are the equilibrium choices in the renegotiation conditions.[33] We then assess the overall effects of contract renegotiation by studying the rent extraction power of stipulated damages and market foreclosure in no-renegotiation and renegotiation environments.[34]

Our analysis includes ordered logistic and ordered probit regressions.[35] Each model is estimated using all rounds and the last three rounds. Five covariates are included. The first variable control for the effects of renegotiation: the dummy variable *Renegotiation* takes a value equal to one if the observation pertains to the condition INC/R or C/R, and a value equal to zero if the observation pertains to the condition INC/NR or C/NR. The next two variables

[33] Remember that the modal seller's price is equal to 1,300. Then, an entrant's price equal to 1,100 is the relevant equilibrium price.

[34] Remember that rent extraction and market foreclosure reflect the choices of the three players. Then, this analysis allows us to assess the overall effects of contract renegotiation.

[35] Logistic and probit estimates allow us to assess the robustness of our findings across empirical models.

Table 6: Frequency of Actions and Outcomes when Renegotiation Is Allowed and Active Renegotiation Occurs

	Seller's Initial Damag.			Entrant's Price[a]						Seller's Final Damages			Rent-Extr.	Market
	100	500	1000	NP[b]	200	400	600	700	1100	100	500	1000	Power	Foreclos.
Low Cost														
Round 1-3														
INC/R [8]	.25	.25	.50	.00	.25	.00	.00	.25	.50	.50	.50	.00	.38	.13
C/R [9]	.44	.22	.33	.00	.00	.22	.11	.11	.56	.67	.22	.11	.22	.22
Round 4&6														
INC/R [5]	.20	.00	.80	.00	.00	.00	.00	.40	.60	.60	.20	.20	.20	.40
C/R [6]	.33	.17	.50	.00	.00	.00	.17	.33	.50	.67	.33	.00	.33	.17
High Cost														
Round 5														
INC/R [4]	.00	.50	.50	.00	.00	.00	.00	.25	.75	.25	.50	.25	.00	.75
C/R [3]	.33	.67	.00	.00	.00	.00	.00	.33	.67	1.00	.00	.00	.00	.00

Notes: [a]The frequencies of entrant's prices are computed with respect to the total cases in which the buyers accepted the seller's initial contract; *b*NP refers to cases in which the potential entrant decided not to participate; an entrant's price equal to 1300 was not chosen by any entrant in any condition, and hence, is not included in this table; observations (number of groups) are in brackets.

control for the effects of complete information about the entrant's cost: the dummy variable *Complete Information* takes a value equal to one if the observation pertains to the condition C/NR or C/R, and a value equal to zero if the observation pertains to the condition INC/NR or INC/R; and, the dummy variable *Complete Information/High-Cost Entrant* takes a value equal to one if the observation pertains to the C/NR or C/R with high-cost entrant, and zero otherwise. This last covariate permits us to isolate the effects of complete information in cases where the entrant's cost is high. The last two covariates control for the effects of the entrant's cost (dummy variable equal to one if the entrant's cost is high, zero otherwise) and round. Robust standard errors (using sessions as clusters) and marginal effects are reported. Pooled data across conditions are used.

Seller's Final Stipulated Damages and Entrant's Price

We start our analysis by investigating whether contract renegotiation increases the likelihood that the seller chooses the lowest stipulated damages and the entrant chooses the highest price.

Our findings, reported in Table 7, indicate that contract renegotiation significantly increases the likelihood that the sellers choose the lowest final damages (damages equal to 100) by more than 19 percentage points. These results are mainly driven by the cases in which active renegotiation did occur. In fact, when active-renegotiation was present and the entrant's cost was low, final damages equal to 100 were chosen by the sellers in 60 and 67 percent of the cases (incomplete and complete information, respectively; rounds 4 & 6), while damages equal to 100 were not chosen by any seller in no-renegotiation conditions (rounds 4 & 6). Similarly, our results suggest that contract renegotiation significantly increases the likelihood that the entrant chooses the highest price (a price equal to 1,100) by more than 20 percentage points. When active renegotiation occurred and the entrant's cost was low, a price equal to 1,100 was chosen by the entrants in 60 and 50 percent of the cases (incomplete and complete information, respectively; rounds 4 & 6), while a price equal to 1,100 was not chosen by any entrant in renegotiation conditions (rounds 4 & 6). These results provide support to Hypothesis 1.

RESULT 1: *Contract renegotiation significantly increases the likelihood that the seller chooses the lowest seller's final stipulated damages and significantly increases the likelihood that the entrant chooses the highest entrant's price.*

We also find that, when the entrant cost is high, complete information increases the likelihood that the sellers choose the lowest final damages (damages equal to 100) by more than

Table 7: Likelihood of Seller's Final Stipulated Damages Equal to 100 and Likelihood of Entrant's Price Equal to 1,100 (Probit and Logistic Estimates)

	Seller's Final Damages Equal to 100				Entrant's Price Equal to 1,100			
	Probit Models (M.E.)		Logistic Models (M.E.)		Probit Models (M.E.)		Logistic Models (M.E.)	
	(R 1–6)	(R. 4–6)	(R. 1–6)	(R. 4–6)	(R. 1–6)	(R. 4–6)	(R. 1–6)	(R. 4–6)
Renegotiation	.207**	.201**	.205**	.195*	.231***	.275***	.230***	.272***
	(.101)	(.101)	(.102)	(.102)	(.079)	(.075)	(.078)	(.076)
Compl. Inf./High-Cost Entrant	.151**	.165**	.134**	.151**	.044	.097	.015	.074
	(.071)	(.074)	(.062)	(.068)	(.150)	(.151)	(.145)	(.160)
Complete Information	.034	.017	.035	.019	−.026	−.070	−.016	−.072
	(.095)	(.094)	(.097)	(.098)	(.099)	(.110)	(.104)	(.115)
High-Cost Entrant	−.019*	.014	−.021*	.016	.154	.180*	.177	.187*
	(.011)	(.019)	(.011)	(.020)	(.141)	(.109)	(.137)	(.113)
Round	.050	.096*	.051*	.100*	−.005	.042	.000	.042
	(.031)	(.057)	(.031)	(.057)	(.028)	(.034)	(.027)	(.037)
Observations[a]	210	105	210	105	186	92	186	92
Log Pseudo-Likelihood	−56.41	−29.22	−56.82	−29.45	−67.29	−32.68	−67.43	−32.97
Pseudo R^2	.22	.22	.22	.21	.16	.23	.16	.22

Notes:[a]Regression analysis regarding the entrant's price includes only cases in which the entrant participated in the game; probit and logistic regression analysis using sessions as clusters; marginal effects (M.E.) reported; robust standard errors in parentheses; ***, **, and * denote significance at the 1, 5, and 10% levels, respectively; observations correspond to number of groups.

13 percentage points. Then, as the theory predicts, the sellers tailored the stipulated damages to the entrant's cost in complete information environments. In fact, in no-renegotiation environments, damages equal to 1,000 were chosen by the sellers in zero percent of the cases when complete information and high-cost entrants were present, while damages equal to 1,000 were chosen by sellers in 44 percent of the cases when incomplete information was present. These findings provide support to Hypothesis 2. Similar patters are observed in environments where renegotiation is allowed. In particular, in no-active renegotiation and high-cost entrant cases, damages equal to 1,000 are chosen in 17 and 50 percent of total cases (complete- and incomplete-information conditions, respectively). In active-renegotiation and high-cost entrant cases, damages equal to 1,000 were chosen in zero and 25 percent of the total cases (complete- and incomplete-information conditions, respectively).

RESULT 2: *When the entrant's cost is high, complete information about the entrant's cost significantly increases the likelihood that the seller chooses the lowest final damages.*

Rent Extraction Power and Market Foreclosure

We next assess the effects of renegotiation and complete information about the entrant's cost on the rent extraction power of stipulated damages and market foreclosure. Remember that rent extraction and market foreclosure reflect the decisions of the three players. Then, this analysis allows us to assess the overall effects of the renegotiation and information treatments.

The rent extraction power and exclusion variables are constructed as follows. The rent extraction power variable takes a value equal to one if the payoff for the incumbent seller is greater than 100, and zero otherwise.[36] The market foreclosure variable takes a value equal to one if the entrant does not serve the market.

Table 8 reports the results from our probit and logistic estimations. Our findings suggest that contract renegotiation significantly (but marginally) reduces the likelihood of rent extraction power of stipulated damages by more than 12 percentage points. These effects vanish with experience, however. The unexpectedly high rent extraction power observed in renegotiation environments might explain these results. Remember that, although rent-extraction power rates were lower in active-renegotiation cases (33 or lower versus 63, renegotiation and no-renegotiation environments, low-cost entrant cases, rounds 4 & 6), only a low percentage of sellers and buyers engaged in active renegotiation.

[36]Remember that, in theory, the seller gets a payoff is equal to 100 in the INC/R and C/R environments. In INC/NR and C/NR settings, on the other hand, the seller's payoff is greater than 100. This latter outcome reflects the rent-extraction power of stipulated damages.

Table 8: Likelihood of Rent Extraction Power and Likelihood of Market Foreclosure
(Probit and Logistic Estimates)

	Rent Extraction Power				Market Foreclosure			
	Probit Models (M.E.)		Logistic Models (M.E.)		Probit Models (M.E.)		Logistic Models (M.E.)	
	(R 1–6)	(R. 4–6)	(R. 1–6)	(R. 4–6)	(R. 1–6)	(R. 4–6)	(R. 1–6)	(R. 4–6)
Renegotiation	−.136*	−.138	−.136*	−.140	−.006	−.004	−.004	.000
	(.077)	(.099)	(.077)	(.097)	(.069)	(.106)	(.069)	(.106)
Compl. Inf./High-Cost Entrant	.131	.062	.125	.054	−.189***	−.196**	−.178***	−.187*
	(.091)	(.123)	(.088)	(.124)	(.047)	(.097)	(.046)	(.099)
Complete Information	−.000	.080	−.001	.083	.024	−.013	.024	−.013
	(.082)	(.120)	(.083)	(.122)	(.062)	(.115)	(.063)	(.121)
High-Cost Entrant	−.342***	−.349***	−.339***	−.344***	.389***	.354***	.389***	.351***
	(.104)	(.097)	(.102)	(.096)	(.101)	(.128)	(.102)	(.133)
Round	−.065	−.118	−.065	−.117	−.000	.000	.000	.000
	(.077)	(.087)	(.078)	(.087)	(.119)	(.151)	(.119)	(.154)
Observations	210	105	210	105	210	105	210	105
Log Pseudo-Likelihood	−130.75	−65.17	−130.75	−65.15	−109.65	−57.17	−109.65	−57.17
Pseudo R^2	.05	.08	.05	.08	.05	.08	.05	.08

Notes: Probit and logistic regression analysis using sessions as clusters; marginal effects (M.E.) reported; robust standard errors in parentheses; ***
, **, and * denote significance at the 1, 5, and 10% levels, respectively; observations correspond to number of groups.

RESULT 3: *Contract renegotiation marginally decreases the likelihood of rent extraction. This effect vanishes with experience.*

Our findings might be explained as follows. The data suggest that the generous stipulated damages offered by the sellers in renegotiation environments protected them from the entrant's aggressive behavior. Anticipating that damages equal to 500 might trigger buyer's expectations of equitable outcomes, the entrant avoided the consequences of buyer's negative reciprocity (i.e., a buyer's decision not to breach the contract and switch to the entrant as a retaliation to an entrant's price perceived as unkind) by offering a lower price.[37] This low entrant's price did not induce the seller to engage in active renegotiation and lower the stipulated damages. As a result, high rent-extraction power rates were also observed in renegotiation environments.

Our results are aligned with recent literature on behavioral contract theory. Recent experimental work on contracts as a reference points (Fehr et al., 2015) suggests that contractual reference points are robust to revision opportunities. In particular, this study provides evidence that although revisions are permitted, the parties do not pursue outcomes outside the originalcontract when trade is feasible under that contract. Opportunistic revisions trigger negative reciprocity. Similarly, Hoppe and Schmitz (2011) find that option contracts might serve as reference points and alleviate the hold-up problem.[38] Our study provides evidence that the perception of contracts as reference points also applies to a third-party (the entrant) not involved in the initial contractual agreement.

We also find that, when the entrant cost is high, complete information reduces the likelihood of market foreclosure. These results provide support to Hypothesis 2. Finally, our results suggest that a higher entrant's cost lowers the likelihood of rent extraction power and rises the likelihood of market foreclosure. These findings are aligned with the theory.

RESULT 4: *When the entrant cost is high, complete information about the entrant's cost significantly decreases the likelihood of market foreclosure.*

RESULT 5: *A higher entrant's cost significantly reduces the likelihood of rent extraction and significantly increases the likelihood of market foreclosure.*

[37] Charness and Rabin (2002) find evidence of responder's negative reciprocity in three-player environments. See Dufwenberg and Kirchteiger (2004) for theoretical work on sequential reciprocity and Dufwenberg et al. (2013) for experimental evidence on the effects of negative reciprocity on hold-up behavior in incomplete contract settings that allow for relationship-specific investment.

[38] Bartling and Schmidt (forthcoming) and Iyer and Schoar (2008) provide similar results. See also Fehr et al. (2011, 2009).

5.3 Players' Behavior and Social Preferences

Consistent with the theory, our previous analysis demonstrates that contract renegotiation significantly increases the likelihood that the seller chooses the lowest stipulated damages and significantly increases the likelihood that the entrant chooses the highest price. However, the effects of contract renegotiation are not strong enough to significantly reduce the rent-extraction power of stipulated damages. The more generous stipulated damages offered by the sellers across environments and the less aggressive prices proposed by the entrants in the renegotiation environments explain these results.

The deviations from the theoretical point predictions might reflect the social preferences of the sellers and the entrants. They might also indicate that when the sellers make contract offers and the entrants propose prices, they anticipate that social preferences affect the other players' behavior. Then, learning more about the influence of social preferences on players' behavior is important. To shed some light on these issues, we have conducted two additional experimental treatments: dictatorial seller (where the allocation of the surplus is unilaterally decided by the incumbent seller) and buyer-entrant two-way unstructured communication (where the buyer and the entrant can communicate after observing the seller's offer and before the buyer decides whether to accept the contract). Appendix A presents detailed information regarding the design of the treatments and the analysis of the data.

The dictatorial seller treatment permits us to explore the importance of the seller's own social preferences. In particular, if the main force that triggers the seller's more generous offers is its own social preferences, then we will also observe generous stipulated damages in environments in which the seller has the absolute power to decide the allocation of the pie. The communication treatment promotes bargaining between the buyer and the entrant, and hence, allows us to directly observe the buyers' and entrants' requests and learn more about the influence of social preferences on players' behavior. Importantly, in the communication treatment, the buyer has the chance to directly convey his expectations to the entrant and persuade the entrant to accept his requests. If the buyer's preferred outcome is influenced by social preferences, we expect that the likelihood of an equitable allocation in the case of low-cost entrant (equal split of the surplus) will increase with communication.[39] Table 9 summarizes our results.

Consider the dictatorial seller environment and low-cost entrants. Damages equal to 1,000

[39]See Putnam and Jones (1982) for social psychology work on persuasion and DellaVigna and Gentzkow (2010) for a survey of recent economics studies on persuasion through communication. See Charness et al. (2013) and Charness and Dufwenberg (2011, 2006) for work on communication and promises. See Brandt et al. (forthcoming) for work on communication and contract design.

Table 9: Frequency of Actions and Outcomes – Dictatorial Seller and Communication

	Seller's Final Damag.			Entrant's Price[a]						Rent-Extr.	Market
	100	500	1000	NP[b]	200	400	600	700	1100	Power	Foreclos.
Low Cost											
Rounds 1-3											
C/NR [27]	.00	.52	.48	.08	.35	.19	.19	.19	.00	.78	.19
C/NR-D [30]	.00	.00	1.00	.00	1.00	.00	.00	.00	.00	1.00	.00
C/NR-CO [27]	.00	.89	.11	.00	.04	.09	.70	.17	.00	.81	04
Rounds 4&6											
C/NR [18]	.00	.67	.33	.17	.11	.11	.17	.44	.00	.67	.33
C/NR-D [20]	.00	.00	1.00	.00	1.00	.00	.00	.00	.00	1.00	.00
C/NR-CO [18]	.00	.83	.17	.00	.07	.13	.53	.27	.00	.72	.11
High Cost											
Round 5											
C/NR [9]	.11	.89	.00	.11	.00	.00	.11	.56	.22	.56	.22
C/NR-D [10]	.00	1.00	.00	.00	.00	.00	.30	.70	.00	1.00	.00
C/NR-CO [9]	.44	.44	.11	.00	.00	.00	.00	.71	.29	.33	.00

Notes: [a]The frequencies of entrant's prices are computed with respect to the total cases in which the buyers accepted the seller's initial contract; [b]NP refers to cases in which the potential entrant decided not to participate; an entrant's price equal to 1,300 was not chosen by any entrant in any condition, and hence, is not included in this table; observations (number of groups) are in brackets.

(which represent a 67-33 split of the pie between the incumbent seller and the other two players) were chosen by the sellers in 100 percent of the cases.[40] In contrast, in the C/NR condition, these damages were chosen by 33 percent of the sellers only (rounds 4 & 6). In fact, our analysis indicates that the dictatorial seller environment significantly increases the likelihood that the seller chooses the highest stipulated damages in low-cost entrant cases (p-value = .021).[41] These results suggest that the driving force behind the choice of the seller's stipulated damages equal to 500 in the other treatments was the seller's strategic anticipation of the other players' social preferences.[42]

RESULT 6: *When the entrant's cost is low, the dictatorial seller environment significantly increases the likelihood of the seller's highest stipulated damages.*

Consider now the results observed in the buyer-entrant unstructured communication treatment. By construction, an equitable allocation (equal split of the pie) might occur only in low-cost entrant cases. In particular, when the incumbent seller's damages are equal to 500, the entrant's price is equal to 600, and the buyer accepts the incumbent seller's contract and then breach it, the three players get payoffs equal to 500. Then, only low-cost entrant cases are included in this analysis.

We find that communication increases the likelihood of an equitable allocation (p-value $<$ .001),[43] suggesting that social preferences influenced players' behavior.[44] The analysis of buyers'

[40] Hoffman et al. (1994) report similar split of the pie between the offeror and offeree in two-player dictator game with random entitlement in exchange environments. The modal offers were equal to 30 - 40 percent of the pie.

[41] Given the characteristics of the data, probit or logistic analysis could not be conducted. (See details in Appendix A.) We instead performed Mann-Whitney tests (to preserve independence of observations, only first-round data was used. Hence, our analysis is focused on the low-cost entrant cases. The difference in the frequencies of final damages equal to 1,000 between these two conditions increases with experience.

[42] Hoppe and Schmitz (2013) report similar findings in principal-agent environments with incomplete information. In their study, the principal's anticipation of the agents' social preferences influences contract design. Previous experimental work on bargaining environments suggests that the bargaining context might influence the elicitation of regards-for-others concerns. Hoffman et al. (1994) argue that players' own fairness considerations 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. Fouraker and Siegel (1963) and Brooks et al. (2010) provide experimental evidence of weak fairness considerations in exchange environments.

[43] Table A3 in Appendix A reports the probit and logistic analysis (all rounds and rounds 4 & 6; low-cost entrant cases).

[44] We also find that communication significantly decreases the likelihood of inefficient market foreclosure (p-value $< .05$; probit and logistic analysis; rounds 4 & 6; low-cost entrant cases.)

and entrants' messages provides additional information about the role of social preferences.[45] Although the buyers could request bigger shares of the pie, they preferred to request an equitable allocation of the pie (i..e, an entrant's price equal to 600; 44 percent of total cases). Then, social preferences influenced buyers' decisions (i.e., buyers' own social preferences and/or their anticipation of the entrants' social preferences).[46] Consistent with our results in the other conditions, the entrants initially requested a price equal to 700 (modal request; 31 percent of the cases). However, anticipating the rejection of a price greater than 600 (and persuaded by the buyers' requests), they proposed a price equal to 600 more frequently when communication was present (p-value $< .05$).[47] Finally, our data indicate that the strategic sellers anticipated the effects of communication on accentuating buyers' expectations of fair outcomes. In fact, sellers offered damages equal to 500 more frequently in the communication environment (83 versus 67 percent, under the C/NR-CO and C/NR conditions, rounds 4 & 6).

RESULT 7: *When the entrant's cost is low, unstructured communication between the buyer and the entrant significantly increases the likelihood of an equitable allocation of the surplus.*

6 Summary and Conclusions

This paper experimentally studies stipulated damages as a rent-extraction mechanism. We demonstrate that the sellers choose the lowest stipulated damages and the entrants choose the highest price more frequently in renegotiation environments. We also show that lower exclusion of high-cost entrants occurs in complete-information environments. Important behavioral lessons are derived from our study. First, although the behavior of a small group of sellers is aligned with the theory, the majority of sellers make more generous offers. These results suggest heterogeneity of preferences and underscore the importance of social preferences. Second, our data indicate that the generous initial damages chosen by the sellers in renegotiation environments protect them from the entrants' aggressive behavior. In particular, anticipating that

[45] Table A4 in Appendix A summarizes the initial entrant's prices requested by buyers and entrants per type of message.

[46] Given the random allocation of subjects to experimental sessions, these results also suggest that the strategic sellers and entrants correctly anticipated the influence of social preferences on buyers' decisions in the other treatments.

[47] These results suggest that buyers' threats were credible to the entrants, i.e., the threats satisfied the self-commitment condition (Aumann, 1990; Farrell and Rabin, 1996). We might then 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 hence, offered a price equal to 600 more frequently. Importantly, given that the buyer's decision not to breach involved a monetary loss of 100, we might infer that the entrant believed that the buyer's decisions were influenced by social preferences.

generous damages might trigger buyers' expectations of fair outcomes, the entrants try to avoid the consequences of negative reciprocity by offering lower prices to the buyers. As a result, high rent extraction is also observed in environments that allow for renegotiation. These findings are aligned with recent experimental work on contracts as reference points in renegotiation settings (Fehr et al., 2015). Third, our results from the dictatorial seller and communication treatments suggest the presence of social preferences.

Our findings regarding the rent-extraction power of contracts with stipulated damages provide some insights into how the shareholders of target firms might benefit *ex ante* from merger agreements with deal-protection plans that stipulate termination fees (Marx and Shaffer, 2010).[48] Having such a clause will prompt new bidders to bid aggressively in order to secure a deal. As a result, the target shareholder value will be enhanced. It then follows that the judicial reduction of termination fees may paradoxically harm target shareholders rather than help them.[49] Our results might also apply to employment settings. Many managers of large companies have employment contracts that include golden parachutes which guarantee the managers additional payments conditional upon changes in control (Choi, 2004). Since the golden parachutes are paid when a new buyer acquires control of the company, and are not paid when the original owners remain in control, these contracts raise the total price that the new buyer must pay when they acquire the firm. As a result, these contracts may have the effect of extracting rents from potential acquires of the company, and might inefficiently discourage buyers as a by-product. Our findings suggest that golden parachutes may be in the interest of both the manager and the original owners, and do not necessarily reflect a breach of fiduciary duty by the board.[50]

Future experimental work might study the effects of relationship-specific investment and renegotiation on the efficiency properties of contracts with stipulated damages (Spier and Whinston, 1995). Theoretical extensions might address heterogeneity of players' preferences, incomplete information regarding others' preferences, and players' perception of contractual agreements as reference points. These, and other extensions, may be fruitful topics for future research.

[48] See also Cramton and Schwartz (1991), Klemperer (1986).

[49] Once a second offer had been made by a potential acquirer and accepted by the target management and board, the shareholders of the target firm have an incentive to bring a lawsuit to reduce the termination fees. Although the shareholders would be made better off *ex post* if the fees were reduced, the shareholders would be harmed in an *ex ante* sense. The reason is subtle. Potential acquirers would not need to be as aggressive in a bidding war for the target if everyone rationally expected that the termination fees would be reduced down the road. See *In re Toys "R" Us, Inc. Shareholder Litigation*, 877 A.2d 975 (Del. Ch. 2005), and *In re Compellent Techs., Inc. Shareholder Litigation,* Consol. C A. No. 6084-VCL., 2011 BL 317827 (Del. Ch. Dec. 09, 2011).

[50] See Muehlheusser (2007) for an analysis of not-to-compete clauses in employment contracts.

APPENDIX A

GENERAL MODEL: EQUILIBRIUM CHARACTERIZATION AND PROOFS

Propositions A1–A3, which are general versions of Propositions 1–3, characterize the equilibria of the general model. The proofs follow.

PROPOSITION A1: *(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* $\{p_0, d_0\} = \{c_I, c_I - c_E\}$. *The buyer accepts the contract. The potential entrant participates in the market and offers a price* $p_E = c_E$. *The buyer subsequently breaches and purchases from the entrant. There is no inefficient market foreclosure.*

PROOF: If the buyer rejects the contract in Stage 1, the payoffs of the three players would be $(\pi_I, \pi_B, \pi_E) = (0, v - c_I, c_I - c_E)$. We will show that the incumbent can design a contract $\{p_0, d_0\}$ to fully extract the entrant's net surplus, $c_I - c_E$, while at the same time guaranteeing the buyer a payoff of $v - c_I$.

First, the contract must squeeze E down to cost, $p_E = c_E$. B is (just) willing to breach when $p_E + d_0 \leq p_0$, or $p_E \leq p_0 - d_0$. Therefore a contract with $p_0 - d_0 = c_E$ will force the entrant to lower its price to cost in order to induce the buyer to breach. Second, the contract must squeeze B to the point where he is indifferent between (1) accepting the contract $\{p_0, d_0\}$ and subsequently breaching it and purchasing from E, and (2) rejecting the contract $\{p_0, d_0\}$ in favor of the outside option. In the former case, B gets $v - c_E - d_0$ and in the latter case B gets $v - c_I$. Indifference implies $d_0 = c_I - c_E$.

The preceding argument implies that the incumbent will offer a contract $\{p_0, d_0\} = \{c_I, c_I - c_E\}$. The buyer is (just) willing to accept this contract in Stage 1. The entrant is (just) willing to participate and offer a price $p_E = c_E$ in Stage 2. The buyer is (just) willing breach the contract, pay damages $d_0 = c_I - c_E$ to the incumbent, and purchase from the entrant. There is no inefficient foreclosure from this strategic behavior, since the entrant serves the market. ■

The equilibrium payoffs for the three players are $(\pi_I, \pi_B, \pi_E) = (c_I - c_E, v - c_I, 0)$.

PROPOSITION A2: *(INC/NR) Suppose the potential entrant's cost is private information and the incumbent seller is unable to renegotiate the contract. There are multiple perfect*

Bayesian equilibria. When $\theta < (c_I - c_E^H)/(c_I - c_E^L)$, the incumbent seller offers a contract $\{p_0, d_0\} = \{c_I, c_I - c_E^H\}$. The buyer accepts the contract. Both types of potential entrant participate in the market and offer a price $p_E = c_E^H$. The buyer subsequently breaches and purchases from the entrant. There is no inefficient market foreclosure. The equilibrium (expected) payoffs are $(\pi_I, \pi_B, \pi_E) = \left(c_I - c_E^H, v - c_I, \theta(c_E^H - c_E^L)\right)$. When $\theta > (c_I - c_E^H)/(c_I - c_E^L)$, the incumbent seller offers a contract $\{p_0, d_0\} = \{c_I, c_I - c_E^L\}$. The buyer accepts the contract. Only the low-cost potential entrant participates in the market and offers a price $p_E = c_E^L$. The buyer subsequently breaches and purchases from the entrant. There is inefficient market foreclosure (the high-cost entrant is excluded).

PROOF: We begin by showing that the incumbent will offer either $\{p_0, d_0\} = \{c_I, c_I - c_E^H\}$ or $\{p_0, d_0\} = \{c_I, c_I - c_E^L\}$ in equilibrium.

First, it must be the case that $p_0 - d_0 \in \{c_E^L, c_E^H\}$. If $p_0 - d_0 > c_E^H$ then both entrant types would earn strictly positive profits by charging $p_E = p_0 - d_0 > c_E^H$. In the continuation equilibrium B breaches, pays damages to I, and purchases from E, giving I a payoff of d_0 and B a payoff of $v - p_E - d_0 = v - p_0$. I does strictly better (and B no worse) if I raises the stipulated damages d_0 so that $p_0 - d_0 = c_E^H$. Next, if $c_E^L < p_0 - d_0 < c_E^H$ then the low-cost entrant profitably enters with $p_E = p_0 - d_0 > c_E^L$ and the high-cost entrant is excluded. In this scenario, I gets expected payoff $\theta d_0 + (1-\theta)(p_0 - c_I)$ and B gets payoff $v - p_0$. Again, I is strictly better off (and B no worse off) if I raises d_0 so that $p_0 - d_0 = c_E^L$.

Second, it must be the case that $p_0 = c_I$. To see why, suppose that B accepts a Stage 1 contract, $\{p_0, d_0\}$. If B ultimately purchases from I, then B's payoff is $v - p_0$. This is the buyer's outside option when negotiating with the entrant. Since E has all of the bargaining power vis-a-vis the buyer, the buyer's payoff is also equal to $v - p_0$ in every continuation equilibrium where he buys from from the entrant. Since the buyer's outside option at Stage 1 is $v - c_I$, the incumbent will choose $p_0 = c_I$.

If I offers $\{p_0, d_0\} = \{c_I, c_I - c_E^H\}$ then both types of entrant enter and set $p_E = c_E^H$. B subsequently breaches, buys from E, and pays stipulated damages $c_I - c_E^H$ to I, giving I a payoff of $c_I - c_E^H$. If I offers $\{p_0, d_0\} = \{c_I, c_I - c_E^L\}$ instead, then the low-cost entrant would choose to enter, giving I a payoff $d_0 = c_I - c_E^L$. The high cost entrant would not enter, however, giving I a payoff of $p_0 - c_I = 0$. So the incumbent receives an expected payoff of $\theta(c_I - c_E^L)$. In this latter case, the incumbent chooses a large damage payment in order to extract value from the low-cost entrant type, and that this inefficiently excludes the high-cost entrant. Comparing the incumbent's payoffs from the two scenarios, we see that the incumbent chooses the former offer if and only if $\theta < (c_I - c_E^H)/(c_I - c_E^L)$. ■

The equilibrium (expected) payoffs are $(\pi_I, \pi_B, \pi_E) = (\theta(c_I - c_E^L), v - c_I, 0)$.

PROPOSITION A3: *(INC/R and C/R) Suppose the buyer and the incumbent seller can renegotiate the contract following an offer by the entrant. There are multiple perfect Bayesian (subgame perfect Nash) equilibria. In some equilibria, the buyer accepts a contract $\{p_0, d_0\}$ where $p_0 = c_I$ and $d_0 \geq 0$, and renegotiation occurs if and only if $d_0 > 0$. In other equilibria, the incumbent seller offers an unacceptable contract (or refrains from offering a contract at all). In all equilibria, the entrant supplies the market with $p_E = c_I$. There is no inefficient market foreclosure.*

PROOF: We will first prove that there is no equilibrium contract $\{p_0, d_0\}$ with $p_0 - d_0 > c_I$. Proceeding by contradiction, suppose that this contract was offered and accepted in equilibrium. Suppose that the entrant were to offer $p_E = p_0 - d_0 > c_I > c_E$. The buyer would breach the contract and buy from the entrant, giving the parties payoffs $(\pi_I, \pi_B, \pi_E) = (d_0, v - p_0, p_0 - d_0 - c_E)$. (Notice that the entrant would extract profits in excess of the net surplus in this case, $p_E - c_E > c_I - c_E$.) For this to be an equilibrium, both I and B must be weakly better off here than in the outside option, so $d_0 \geq 0$ and $p_0 \leq c_I$. This implies that $p_0 - d_0 \leq c_I$, a contradiction.

Consider instead a contract $\{p_0, d_0\}$ with $p_0 - d_0 < c_I$. Suppose that the entrant offers $p_E = c_I - \Delta$ where Δ is small enough so that $p_0 - d_0 < p_E < c_I$. Since $p_E + d_0 > p_0$, B would not breach absent renegotiation and so I's payoff would be $p_0 - c_I$. If I offered a modified contract with lower stipulated damages, $\{p_1, d_1\} = \{p_0, p_0 - p_E\}$, then the buyer would be (just) willing to breach since $p_E + d_1 = p_0$. B is no worse off with this modified contract and I's payoff would rise since $d_1 = p_0 - p_E > p_0 - c_I$. Note that the entrant receives the entire net surplus since $p_E - c_E$ is arbitrarily close to $c_I - c_E$ when Δ is small. The continuation equilibrium payoffs must be $(\pi_I, \pi_B, \pi_E) = (p_0 - c_I, v - p_0, c_I - c_E)$. To induce the buyer to accept the contract at Stage 1, I will offer $p_0 = c_I$. We conclude that any contract $\{p_0, d_0\}$ with $p_0 = c_I$ and $d_0 > 0$ is an equilibrium, and renegotiation to $d_1 = 0$ occurs.

There are other equilibria as well. The incumbent seller can write a renegotiation-proof contract with $\{p_0, d_0\} = \{c_I, 0\}$, in which case the entrant will offer $p_E = c_I$ and the buyer will breach. The incumbent can also offer an unacceptable contract at Stage 1, or simply refrain from making a contract offer at all. In this case, the entrant serves the market. Across equilibria, inefficient exclusion does not arise. ■

Across equilibria, the payoffs for the three players are $(\pi_I, \pi_B, \pi_E) = (0, v - c_I, c_I - c_E)$, where $c_E \in \{c_E^L, c_E^H\}$.

NUMERICAL EXAMINATION

This section presents a detailed description of the procedure followed to construct our numerical examination.

Given the complexity of the strategic environments and the fact that ours study provides the first experimental investigation of this three-player bargaining game, we decided to construct a simple numerical examination of our general model, and implement this environment in the lab.

The adopted parameter values are as follows. 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 $1 - \theta = 1/4$. Given these parameter values, the equilibrium choices for I and E under complete information and $c_E = 100$ are: $p = 1300$, $d = 1200$, and $p_E = 100$, in the no-renegotiation environment; and, $p = 1300$, $d = 0$ and $p_E = 1300$, in the renegotiation environment. Then, in the no-renegotiation environment, the seller gets all of the surplus, and the other two players get zero; and, in the renegotiation environment, the entrant gets all of the surplus and the other two players get zero.

To generate behaviorally-relevant divisions of the surplus in equilibrium, and to break payoff indifference for the buyer (no-renegotiation and renegotiation environments) and entrant (no-renegotiation environment) in equilibrium under complete information, we restricted the values for the stipulated damages and the entrant's prices. These restrictions are as follows.

- To generate behaviorally-relevant divisions of the surplus (i.e., to preclude the sellers and the entrants get the entire surplus in no-renegotiation and renegotiation environments), these sets restricted the minimum and maximum possible stipulated damages to 100 and 1000, respectively.

- To break payoff indifference for the buyer (no-renegotiation and renegotiation environments) and for the entrant (no-renegotiation environment), these sets eliminated entrant's prices equal to 100, 300 and 1200. Note that an entrant's price equal to 100, together with seller's damages equal to 1100, would generate a zero price for the entrant. Note also that entrant's prices equal to 300, together with stipulated damages equal to 1000, and entrant's prices equal to 1200, together with stipulated damages equal to 100, would generate zero payoffs for the buyer in the no-renegotiation and renegotiation environments, respectively.

Given the parameter values and the restrictions on the values of stipulated damages and entrant's prices, equilibrium choices for I and E under complete information and $c_E = 100$ are

$p = 1300$, $d = 1000$, and $p_E = 200$ in the no-renegotiation environment; and, $p = 1300$, $d = 100$, and $p_E = 1100$ in the renegotiation environment.[51] Then, in no-renegotiation environments, a 67–33 split of the surplus between the incumbent seller and the other two players occurs in equilibrium; and, in renegotiation environments (under the stated equilibrium), a 67-33 split of the net surplus between the entrant and the other two players occurs in equilibrium. Importantly, the modal splits of the pie in Hoffman et al.'s (1994) seminal work on 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.

We adopted the following sets of possible choices for the players. The set of seller's prices is $p \in \{1100, 1300\}$; the set of stipulated damages is $d \in \{100, 500, 1000\}$; and, the set of entrant's prices is $p_E \in \{200, 400, 600, 700, 1100, 1300\}$. In addition to including the equilibrium choices for the players, the sets of possible choices also allow for behaviorally-relevant off-equilibrium deviations. For instance, an equitable allocation of the surplus occurs in no-renegotiation environments and low-cost entrants when damages are equal to 500 and the entrant's price is 600 (each player gets a payoff equal to 500). The observation of these choices might suggest the presence of social preferences.

The adopted parameter values and sets of possible choices for the players were used to construct the experimental environment across experimental conditions.

A NOTE ON THE EQUILIBRIA IN INC/R AND C/R ENVIRONMENTS

This section extends our discussion of the equilibria described in Proposition 3. In equilibrium, the incumbent seller is indifferent between offering $p = 1300$ and $p = 1100$. Both strategies lead the buyer to breach and pay stipulated damages of 100. To see why this is true, suppose first that $p = 1300$. At Stage 3, the entrant can succeed in capturing the surplus by offering $p_E = 1100$. If the buyer does not breach the contract with the incumbent, the incumbent will net $p - c_I = 1300 - 1300 = 0$. The incumbent would rather reduce the damages to 100 in order to induce breach (and the buyer will certainly breach since $p_E + d = 1100 + 100 < 1300 = p_0$). Suppose instead that $p = 1100$. 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, $d = 100$, the buyer would still prefer to purchase from the incumbent at $p = 1100$. The entrant would instead offer $p_E = 700$ and the buyer would breach and pay 100 in damages. Hence, the

[51] In renegotiation environments, there are multiple equilibria. This analysis considers the equilibrium in renegotiation environments in which the seller's price is equal to 1300 and the entrant's price is equal to 1100.

incumbent seller's expected payoff is 100.[52]

[52] In a more general representation of the binary model, the incumbent seller and the buyer would extract no value at all. This is because the entrant could succeed by setting its price at the incumbent seller's cost. See also the Proposition A3 and its proof.

Table A1: Seller's Final Prices and Buyer's Contract Acceptance and Breach Rates

	Seller's Final Prices		Buyer's Contract	
	1100	1300	Acceptance	Breach
Low Cost				
Rounds 1-3				
INC/NR [27]	.04	.96	.93	.83
INC/R [24]	.17	.83	1.00	.91
C/NR [27]	.19	.81	.96	.88
C/R [27]	.26	.74	1.00	.83
Rounds 4&6				
INC/NR [18]	.00	1.00	.89	.93
INC/R [16]	.25	.75	.94	.71
C/NR [18]	.11	.89	1.00	.80
C/R[18]	.00	1.00	1.00	.94
High Cost				
Round 5				
INC/NR [9]	..00	1.00	.89	.63
INC/R [8]	.13	.88	1.00	.33
C/NR [9]	.22	.78	1.00	.75
C/R [9]	.00	1.00	1.00	.88

Notes: Observations (number of groups) are in brackets.

ADDITIONAL TABLES

This section provides additional information, which complements the information provided in Section 5.1. Specifically, Table A1 reports the seller's final price, and buyer's contract acceptance and contract breach observed across conditions. Table A2 summarizes the seller's initial and final stipulated damages, entrant's price, rent-extraction power, and market foreclosure observed in the renegotiation conditions (when active and no-active renegotiations are present).

Table A2: Frequency of Actions and Outcomes when Renegotiation Is Allowed
(Active and No-Active Renegotiation Cases)

	Seller's Final Damag.			Entrant's Price[a]						Rent- Extr.	Market
	100	500	1000	NP[b]	200	400	600	700	1100	Power	Foreclos.
Low Cost											
Rounds 1-3											
INC/R [24]	.17	.50	.33	.04	.33	.04	.04	.38	.17	.71	.13
C/R [27]	.26	.56	.19	.11	.07	.15	.11	.30	.26	.52	.26
Rounds 4&6											
INC/R [16]	.19	.38	.44	.13	.19	.00	.00	.44	.25	50	.31
C/R [18]	.22	.67	11	.11	.00	.11	.06	.56	.17	.78	.06
High Cost											
Round 5											
IN/R [8]	.12	.50	.38	.25	.00	.00	.00	.25	.50	.13	.75
C/R [9]	.33	.56	.11	.11	.00	.11	.00	.44	.33	44	.22

Notes: [a]The frequencies of entrant's prices are computed with respect to the total cases in which the buyers accepted the seller's initial contract; [b]NP refers to cases in which the potential entrant decided not to participate; an entrant's price equal to 1300 was not chosen by any entrant in any condition, and hence, is not included in this table; observations (number of groups) are in brackets.

ADDITIONAL EXPERIMENTAL TREATMENTS

This section provides additional information on the dictatorial seller and buyer-entrant communication treatments, which complements the discussion presented in Section 5.3.

DICTATOR SELLER TREATMENT

A description of the design of the dictatorial seller treatment and the laboratory implementation follows.

We analyze whether the more-equitable behavior of the sellers reflects their strategic anticipation of other players' social preferences by implementing a dictatorial seller environment in a setting with complete information about the entrant's cost and no-renegotiation (C/NR-D).[53] Our dictatorial seller environment represents an adaptation of Forsythe et al.'s (1994) two-player dictator environment to a contractual setting with three-players. In our dictatorial seller 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.[54] Given the absolute power of the seller to design the stipulated damages, the strategic anticipation of others' social preferences should not influence his decisions. The qualitative hypothesis follows.

HYPOTHESIS A1: *The dictatorial seller environment induces the seller to choose the highest possible level of stipulated damages.*

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 choices follow subgame perfection in the C/NR-D environment, this will indicate that his strategic anticipation of other players' social preferences is the driving force behind his more equitable behavior in the non-dictatorial conditions.

We implemented the dictatorial seller (C/NR-D) environment in the laboratory as follows. The dictatorial seller environment essentially involves individual-decision making. To ensure comparability across conditions, however, 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

[53] We decided to implement the dictatorial seller environment in a complete-information about the entrant' cost and no-renegotiation setting (the simplest possible setting) to minimize noise due to computational errors.

[54] 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.

making decisions, buyers and entrants were asked to state their expectations regarding the sellers' choices.[55]

The instructions indicate 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. 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. The number of subjects and observations (number of three-player groups for the six rounds) are 30 and 60, respectively.[56]

Given the characteristics of the data (i.e., damages different from 500 were not chosen by any seller in the dictatorial seller environment and low-cost entrant, and damages different from 1,000 were not chosen by any seller in the high-cost entrant cases), probit or logistic analysis could not be conducted. We instead performed non-parametric analysis. To preserve independence of observations, only first-round data was used. Hence, our analysis is focused on the low-cost entrant cases (high-cost entrant cases occurred only in round 5). To avoid the t-test normality assumptions, and given the small number of independent observations (9 and 10 independent observations, C/NR and C/NR-D conditions, respectively), we used the non-parametric Mann-Whitney test. The relevant comparisons refer to damages equal to 1,000 chosen in 100 percent of the cases versus 56 percent of the cases, C/NR-D and C/NR conditions, respectively (first round). The difference in the frequencies of final damages equal to 1,000 between these two conditions increases with experience (100 and 33 percent, C/NR-D and C/NR conditions, respectively; last round).

BUYER-ENTRANT COMMUNICATION TREATMENT

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). Communication promotes unstructured bargaining between the buyer and the entrant, and hence, it allows the entrant to know with certainty the buyer's

[55]Given that this information was not central to our study, we are not including the analysis of this information.

[56]This condition encompassed two sessions.

Table A3: Likelihood of an Equitable Allocation in Low-Cost Entrant Cases (Probit and Logistic Estimates)

	Probit Models (M.E.)		Logistics Models (M.E.)	
	(R. 1–4&6)	(R. 4&6)	(R. 1–6&6)	(R. 4&6)
Communication	.355***	.277***	.356***	.278***
	(.100)	(.081)	(.101)	(.081)
Round	−.106	−.052	−.111	−.056
	(.103)	(.130)	(.108)	(.138)
Observations	90	36	90	36
Log Pseudo-Likelihood	−48.38	−18.23	−48.36	−18.23
Pseudo R^2	.13	.10	.13	.10

Notes: Probit and logistic regression analysis using sessions as clusters; marginal effects (M.E.) reported; robust standard errors in parentheses; *** denotes significance at the 1% level; observations correspond to number of groups.

preferred outcome and allows the buyer to persuade the entrant to accept his request. If the buyer's preferred outcome is influenced by social preferences, we expect that the likelihood of equitable allocations in the case of low-cost entrant (equal split of the surplus) will increase with communication. The qualitative hypothesis is as follows.

HYPOTHESIS A2: *When the entrant's cost is low, non-binding two-way unstructured communication between the buyer and potential entrant at the contracting stage increases the likelihood of an equitable outcome.*

The number of subjects and observations (number of three-player groups for the six rounds) are 27 and 54, respectively.[57] The number of observations (groups for the six rounds) involving low-cost entrants is 45.

Table A3 reports 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. We assess the effect of communication by estimating probit and logistic models (all rounds, and rounds 4 & 6). 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

[57] This condition encompassed two sessions.

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. Due to the definition of equitable allocation used in this study, the models are estimated by considering data on low-cost entrants only. Communication significantly increases the likelihood of an equitable allocation of the surplus across empirical models and rounds.

Table A4 summarizes the information regarding initial entrant's price requests made by the buyers and the sellers (low-cost entrant cases), classified by message type.[58] The classification of messages involves two categories: price number and message type. The first category refers to the entrant's price numbers requested by the subjects. Only the initial numerical requests are considered. Five possible price options are included: a N-Pr option (which involves cases in which specific numerical requests were not made by the subjects), a price lower than 600, a price equal to 600, a price equal to 700, and a price greater than 700. Note that an entrant's price equal to 600 and damages equal to 500 generate an equal split of the pie among the three players, and a price equal to 700 is the modal price in the C/NR condition. Then, these prices are important benchmark prices to consider.

The second category refers to the types of messages. Following the literature on communication and strategic environments, we define the types of messages in terms of the presence of comments associated with social preferences, explicit threats, and comments involving explicit persuasion. Five possible types of messages are included: messages with social preferences comments (equal split of the pie or fairness comments), messages with explicit threats (for instance, buyers' threat not to breach the contract), messages with social preferences comments and explicit threats , messages with comments involving explicit persuasion (for instance, entrants' attempts to persuade the buyers to reject the incumbent sellers' contracts by pointing out the negative aspects of those contracts; note that rejection of the contract by the buyer is the option that provides the highest payoff for the entrant), and messages with other comments (comments that are not associated with social preferences, and do not involve explicit threats or persuasion).

The analysis of the messages indicates that the modal entrant's price requested by the buyers and the entrants were equal to 600 (44 percent of the total cases) and 700 (31 percent of the total cases), respectively. The review of the messages sent by the buyers suggests that 24 percent of messages involved social preferences remarks and 16 percent of the messages

[58]A complete set of messages is available upon request.

Table A4: Frequency of Buyes' and Entrants' Messages[a]
(Entrant's Prices Initially Requested per Message Type)

Message Type	Buyer's Initial E's Price Req.[b]					Entrant's Initial E's Price Req.[c]				
	N-Pr.[d]	< 600	600	700	> 700	N-Pr.[d]	< 600	600	700	> 700
Social Preferences Comm.	.02	.00	.22	.00	.00	.00	.00	.11	.02	.00
Explicit Threats	.02	.02	.07	.00	.00	.00	.00	.00	.02	.00
Social Pref. & Expl. Thr.	.00	.00	.04	.00	.00	.00	.00	.00	.00	.00
Explicit Persuasion	.00	.00	.00	.00	.00	.13	.00	.04	.02	.00
Other Comments	.31	.11	.11	.07	.00	.27	.04	.09	.24	.00

Notes: [a]Only low-cost entrant cases are included (all rounds; forty-five groups in total); [b]the number of buyer's messages is forty five; [c]the number of entrant's messages is forty-five; [d]N-Pr. refers to the cases in which specific entrant's price numbers were not requested.

involved explicit threats. The analysis of entrants messages indicates that 13 percent of the messages included social preferences comments and 20 percent of the entrants used explicit persuasion.

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