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Bargaining Power in Relational Contracts: An Experimental Study
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Bargaining Power in Relational Contracts: An Experimental Study ^{*†}

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Paula Cordero Salas[‡]

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Abstract

This paper provides experimental evidence of the economic impact from shifting bargaining power in relational contracts. I implement an experimental design that adjusts the bargaining power of sellers (agents) and the enforceability of the contract. I find that the vast majority of contracts take the form of efficiency wage contracts instead of contingent performance contracts when enforcement is partially incomplete and sellers have more bargaining power than buyers. The total contracted and actual compensation increase with the bargaining power of the sellers. However, sellers' profits are found to increase only if a part of the total payment is third-party enforceable. In this case, observed surplus and efficiency are lower than predictions. When no part of a contract is third-party enforceable, more cooperative relationships emerge, exhibiting higher quality provision resulting in higher surplus and efficiency while rent sharing is lower. The result is explained by the stronger buyer's deviation, confirming predictions derived in Cordero Salas (2010). The results here provide insight into the economic consequences of enacting policies that improve the bargaining conditions of weaker parties in market settings relying on self-enforcement from underdeveloped legal institutions.

Key words: contracts, incomplete enforcement, bargaining, experiments, distribution, institutions.

JEL Codes: D86, K12, L14, O12, Q13.

1 Introduction

Contracts are a common way to coordinate economic relationships. However, contracts are often difficult to enforce because some contract terms (e.g., quality, effort) are difficult for a court to verify and, in some places, courts don't exist or won't intervene in privately negotiated contracts. Consequently, contracts can be enforced only by the parties involved via the threat of ending the relationship. This leaves room for significant opportunism, which is enhanced when one of the parties has more market power because that party can extract more of the contract's benefits.

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This research explores the consequences for efficiency, cooperation and distribution of trade surplus of shifting power in relational contracts with different enforcement regimes through interventions such as the formation of a bargaining group for the side with less power (sellers) in a market where a group (buyers) has market power.

Theory previously developed in Cordero Salas (2010) suggests that, depending on the enforcement regime, a shift in bargaining power may not achieve better economic results for the weaker party because the stronger counterparty may no longer want to continue contracting. The group who lost power may now find the short-term benefits of renegeing on contractual promises is larger than the long-term benefits of faithfully executing a contract where they hold less power. However, such a collapse in good-faith execution of contracts in the light of such a power shift may not occur if other changes take place, such as the enforcement of some minimum payment for contract participation. This study explores these theoretical predictions using experimental economics.

I implement four treatments in which subjects played a game with an uncertain number of periods and the parts of the contract (i.e. fixed component of payment, discretionary payment and quality) that were exogenously enforced by the experimenter or the bargaining power that subjects are able to exercise differed.

The observed behavior in the experiments supports many hypothesis derived from Cordero Salas (2010) while it also presents results that contrast with the predictions of that model.

Buyers offer more attractive contracts to sellers when sellers can exercise bargaining power. This is specially true when contract enforcement is completely absent. When contracts are not enforceable at all and bargaining is in place, subjects trade using contracts that create the highest level of surplus, suggesting that parties find informal incentives to maintain a higher efficiency in the absence of enforcement, which supports the strategic ambiguity theory of Bernheim and Whinston (1998).

When partial enforcement is in place subjects use more efficiency wage contracts when bargaining is in place and more performance contracts when bargaining is not possible as predicted. Efficiency wage contracts are not only used to avoid shirking but to minimize the use of bargaining, while in the absence of bargaining, contracts are only structured to provide incentives to avoid deviations. Furthermore, contract acceptance rates are lower when bargaining is allows, suggesting that parties use counteroffers when they have the option and they feel that the contract offered is not giving them enough rents. However, sellers use more counteroffers when enforcement is in place supporting the argument that participants are more comfortable exercising bargaining power when they have part of the payment enforced.

The observations also present unexpected results regarding cooperation. Surprisingly, subjects achieved the highest level of cooperation among all treatments when contract enforcement was completely lacking and bargaining was an option which contradicts the model predictions. This result suggests that sellers exercised less bargaining power than was available in this treatment. Although a higher efficiency and total payments were observed under these conditions, sellers did not get a significantly higher payoff or significantly greater share of the surplus. This is explained by the stronger buyer's deviation and lower seller's deviation observed when cooperation was not the outcome. This behavior was deeper when contracts were reached through counteroffers suggesting that buyers also punish sellers for exercising their bargaining power.

In contrast, when partial enforcement was in place bargaining allowed sellers to achieve higher payoffs and a greater share of the surplus. Although efficiency outcomes were not significantly different relative to other treatments, they were the lowest in absolute terms suggesting that there might be a trade-off between distributional and efficiency outcomes.

The distributional outcomes suggest that if the goal of improving bargaining position of the weaker party is to increase their share of the surplus, then shifting bargaining power needs to be complemented by the implementation of formal enforcement at least the base price. However, if the goal is to improve efficiency when contract enforcement is incomplete, the results give evidence that implementing bargaining increases efficiency if contract enforcement is lacking.

2 Experimental Design

I implement four treatment conditions in order to examine how bargaining affects the formation of self-enforcing agreements and parties' reciprocal actions in the marketplace. Each experiment is a repeated game of indefinite duration mimicking the infinitely repeated game in the theoretical model developed in Cordero Salas (2010). The experiments were programmed using the Z-TREE software (Fischbacher, 1999) and took place on networked computers.

The treatments differ in the parts of the contract (i.e. fixed component of payment, discretionary payment and quality) that are exogenously enforced by the experimenter or the bargaining power that subjects are able to exercise. The continuation probability and matching protocol were identical across treatments and the efficient outcome can be supported as an equilibrium in all treatments except in one (the NEBP treatment, to be described momentarily). The subjects were matched into pairs and interacted anonymously with each partner through the computer terminals. There was no possibility of contagion

effects among treatments because subjects play one single game with different partners. A commonly known probability of continuation controlled for subjects' belief about the possibility of future interaction. The subjects earned a show-up fee plus additional earnings that were proportional to the points earned during the experiment. The exchange rate was 50 experimental points per \$1 which ensured that subjects had incentives to increase their points earnings.

The supergame: The basic experimental platform is based on the design of Brown, Falk, and Fehr (2004) and Wu and Roe (2007a,b) and each treatment implements a particular specification of the theoretical model in Cordero Salas (2010). The supergame consists of an infinite market interaction between sellers and buyers achieved by the implementation of a random continuation rule. Buyers and sellers use contracts to establish the terms of trade for one unit of a good of quality Q that is exchange for a total payment that may include a base price, p , and a discretionary payment (bonus) that depends on the quality delivered, $b(Q)$. Buyer earnings are increasing in quality and decreasing in the total payment; the opposite occurs to sellers' earnings. In each trading period, subjects can only trade one unit of a good. The price and quality of the good traded determine how much money each trading party makes during a trading period.

Matching procedure: Subjects were matched into pairs by using a rotation matching scheme. In each session, subjects were randomly divided into two groups: buyers and sellers. In each match, every buyer subject was paired with seller subject and subjects were not paired with each other in more than one match. Moreover, the pairing was done in such a way that the decisions made by one subjects in one match could not affect in any way the pairs' decisions that she or he meet in the future. These features were explained to the subjects. Because subjects were matched with each other only once, the total number of possible matches per session is $N/2$, where N is the number of subjects attending a session.

Infinite Repeated Games: In each treatment, a random termination rule was used to induce infinitely repeated games. The probability of continuation used was $\delta = 4/5$ and was the same for all treatments. In each trading period the supergame is expected to go on for 5 additional periods.¹ This was done by having the computer drawing a number between 0 and 1, using a uniform distribution. The supergame terminated if the computer drawn was 0.81 or a higher number. This randomization mechanism generates a infinitely repeated game because there is always a possibility of interacting with the same subject in the next future round. The probability of continuation allows us to control for the subjects' beliefs regarding the probability of continuation as subjects played a game with an uncertain number of trading periods. Because of the random termination rule, each supergame may have different number of periods but all supergames have

¹The expected number of periods of a game with a continuation probability of δ is equal to $T = \frac{1}{1-\delta}$. Therefore, with $\delta = 4/5$ the expected number of periods each pair interacts equals 5 periods.

the same expected duration of five rounds. Then, each experimental session may be formed of one long-duration supergame or various short-duration supergames of the same treatment depending on the random termination rule. In addition, the computer drawn number could serve as a public randomization device as in all sessions participants observed the same drawn number.

Implementation of the bargaining: To implement the difference in bargaining power in the experiment, the design included two different conditions. The first condition was treatments in which buyer made a take-it-or-leave-it offer to the seller who could only accept or reject— in essence an ultimatum game. In the second conditions, the seller was able to make a counteroffer if rejected the buyer’s offer—an alternating offer game with two offers and a asymmetric cost for delaying trade for each party.

Treatments: I implemented two enforcement conditions and two bargaining conditions. The first condition, which I call partial contract enforcement condition with no bargaining (PENBP), implements an ultimatum game in which the buyer makes take-it-or-leave it offers to the seller and the seller, upon acceptance, could choose any feasible quality irrespective of the contractually agreed upon level. The buyer could also choose any feasible level of bonus but he has to pay a base payment that is exogenously enforced by the experimenter. The second condition, which I call partial contract enforcement condition with bargaining (PB), implements an alternating offer game with two offers in which the seller is able to counteroffer the buyer one time after he has made the first offer. The base payment is also exogenously enforced by the experimenter while all other variables in the contract are not enforced. The third and fourth conditions, which I call the fully incomplete contract condition with no bargaining (NN) and the fully incomplete contract condition with bargaining (NB), implement the ultimatum game and the alternating offer game from the PN and PB conditions respectively, but in these two treatments the base payment is not exogenously enforced by the experimenter either, therefore the buyer has the latitude to adjust the total payment to zero. That is the total payment is discretionary and contingent on quality delivered.

	Treatments			
Treatment Variable	PN	PB	NN	NB
Bargaining	Take-it-or leave-it offers	Counteroffers	Take-it-or leave-it offers	Counteroffers
Enforced terms	Price	Price	None	None

Figure 1: Summary of treatment conditions

Stage Game: The stage game in all treatments have two phases: a negotiation phase and a trading

phase. In the negotiation phase parties negotiate to reach an agreement about the terms of the contract including a desired quality of the good, Q ; a price for the good, P , and a bonus, i.e. a payment contingent on quality delivered $b(Q)$. The set of feasible quality levels is given by $\{1, 2, \dots, 10\}$ and prices and bonus can be in the set given by $\{1, 2, 3, \dots, 100\}$. In the trading phase parties make choices about some or all contract terms ex-post and the choices may differ from the contract terms previously agreed depending on the contract enforcement treatment.

In the negotiation phase of the treatments with no bargaining, buyers have all bargaining power and each buyer makes a take-it-or-leave-it-offer to his matched seller. The seller decides to accept or reject the contract. If the seller accepts, the pair moves to the trading phase. If the seller rejects, the pair does not trade in that period. In contrast, in the treatments with bargaining, if the seller subject rejects the offer, she can offer a contract (counteroffer) to the matched buyer. In this case, the buyer gets to accept or reject. If the buyer accepts, the pair moves to the trading phase. If the buyer rejects, the pair does not trade in that period.

The trading phase is divided in two additional sub phases: quality determination and payment determination. Quality is discretionary in all treatments, then the quality determination phase is the same for all partial enforcement (PE) and fully incomplete enforcement (NE) treatments and sellers can choose ex post any quality from 1 to 10. The payment determination phase differs from the PE to the NE treatments. In the PE treatments, price, P , is binding and the computer ensures that the price specified in the contract is paid, which ranges between 0 and 100. In the NE treatments the computer does not enforce P ; however, in both treatments buyers can choose any bonus ranging from 0 to 100 after observing the quality. Therefore, a subject buyer in the NE treatments can adjust the total payment to zero while in the PE treatments have to pay the contracted price. Once all decisions are made, payments are made and each party receives payoffs. Figure 2 summarizes the sequence of the stage game.

Stage Game Payoffs: The stage game payoffs differ among bargaining and no bargaining treatments. In the bargaining treatments, I include in the payoff functions the parameter β from the model in Cordero Salas (2010). The parameter reflects the bargaining power which in the traditional alternating offer game is the cost of delaying trade. In the experiments it serves as a way to transfer bargaining power between players by not only giving the opportunity to the seller to counteroffer but also by inflicting an asymmetric cost of delay for parties. I consider the following stage game payoff functions for the no bargaining treatments (PN and NN).

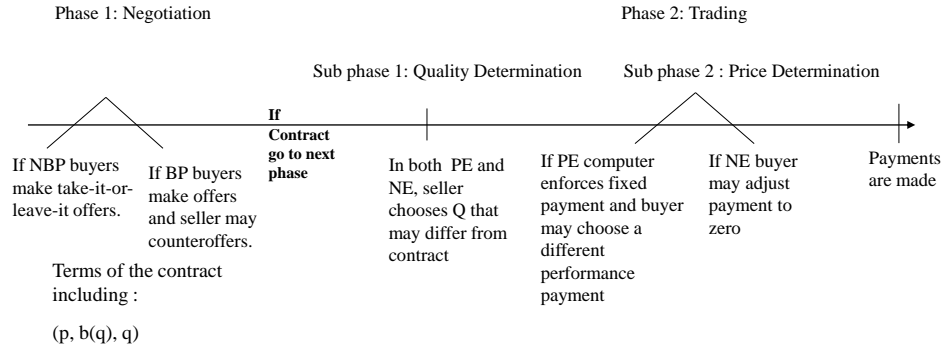


Figure 2: Stage game by phases for all treatments

Buyer's payoffs:

$$\pi_B = \begin{cases} 10Q - p - b(Q) & \text{if contract was concluded} \\ 0 & \text{if contract was not concluded} \end{cases}$$

Seller's payoffs:

$$\pi_S = \begin{cases} p + b(Q) - 5Q & \text{if contract was concluded} \\ 5 & \text{if contract was not concluded} \end{cases}$$

In the bargaining treatments (PB and NB), payoff functions include a $\beta = 0.9$, which is equivalent to the discount factor in the alternating offer game with two potential offers (original offer and one counteroffer), and it reflects the level of impatience or cost of delay for the player who makes a counteroffer (seller). If a buyer gets a counteroffer, he can accept but he only receives the profits multiplied by 0.1. However, he can reject this counteroffer and receive the outside payoff of zero. The payoffs are given by:

Buyer's payoffs:

$$\pi_B = \begin{cases} 10Q - p - b(Q) & \text{if contract was concluded when first offered} \\ (0.1)(10Q - p - b(Q)) & \text{if contract was concluded under a counteroffer} \\ 0 & \text{if contract was not concluded} \end{cases}$$

Seller's payoffs:

$$\pi_S = \begin{cases} p + b(Q) - 5Q & \text{if contract was concluded when first offered} \\ 0.9(p + b(Q) - 5Q) & \text{if contract was concluded under a counteroffer} \\ 5 & \text{if contract was not concluded} \end{cases}$$

The outside option of a seller who does not trade is 5 while for the buyer it is zero. The cost schedule for all sellers is given by $5Q$. All buyers and sellers in the same treatments face the same payoff parameters in all experimental sessions.

Payoff functions, the cost schedule and the termination rule were common knowledge. However, only the pair of traders involved in each transaction were informed about the actual payoffs and quality level delivered. Therefore, parties could only build a reputation with the partner with whom they were trading.

At the end of each trading period, each participant is informed about the contract $(p, b(q), q)$ he had concluded, the actual quality delivered, q , the payment made, his own payment, as well as about his trading partner's payoff and ID number.

Subjects' total earnings: All payoffs were in points. At the end of each session, the points earned by each subject were converted into dollars at the exchange rate of 50 points= \$1. Subjects were paid privately the equivalent of points earned plus the money resulting from a pre-experimental gamble that the subjects had the option to play by using their show-up fee of \$8. Note the resolution of this gamble did not occur until the end of the session.

Order of Treatments: Subjects could participate in only one session and each subject played only a single treatment with one or more different partners. Therefore, there was no possibility of spillover effects from one treatment to another.

Sessions and Procedures: At the beginning of each session participants were randomly assigned to the role of either a buyer or a seller. These roles were fixed for the duration of the session. Each buyer was paired randomly with a seller. Each pair played an uncertain number of trading games. Then I could observe $R = T * N/2$ trades per game, where N is the number of subjects participating in the session and T is the number of periods played in each game.

The experiment consisted of sessions with one single treatment run per session and different groups of subjects participating in each session. Each treatment was run in four sessions except the PB treatment, which was run in five sessions. Each session consisted of a trial unpaid game, two surveys, a control questionnaire and the paid treatment. The treatment was run one to six times, where the number of times depended

on the results of the random termination rule and the time left after each termination. Each match consisted of as many rounds as the continuation rule indicated. All sessions last between one and half and two hours depending on the random termination rule.

Each participant participated in one session only, and at check in subjects were assigned a random ID number to preserve anonymity. Each subject was randomly assigned to a networked computer and was told that they will participate in a computerized trading experiment.

Throughout the pre-experimental activities subjects neither received feedback about their decisions nor information about other subjects' decisions. They were not informed about their own payoffs until the end of the experiment. Subjects were informed about these procedures, and they were also aware that their decisions in the pre-experimental activities were completely independent of the trading game.

After the pre-experimental activities, instructions for the main treatment were read aloud for both buyers and sellers and each subject was given a printed copy for reference. When instructions were read, subjects did not know whether they had been assigned to be buyers or sellers. Reading instructions took approximately ten minutes. In addition, subjects answered a computerized control questionnaire formulated to test understanding of the treatment. In order to help the subjects to understand the game structure, the questionnaire contained hypothetical situations in the game from the perspective of both roles, buyers and sellers, and the correct answers were provided afterwards. The trading game did not start until all subjects understood the game.

To ensure that all subjects understood the game, after completing the control questionnaire, subjects were assigned randomly to be sellers or buyers, and participated in two practice rounds. The practice rounds were identical to normal rounds with the exception that no money was earned. Practice rounds had the purpose of familiarizing subjects with the computer controls and screens. Subjects were not able to see actual choices or payments in order to avoid possible deception.

Once the practice periods were over, the real periods of the game started. Each subject received a \$5 balance in their account (250 experimental points). Because of the random termination rule, some experiments were longer than others and if the experiment ended prior to the allotted time for the evening's session, then additional games were played until the allotted time expired. For each new game, subjects were matched with a different partner.

Each subject had an identification number for the role (IDR), e.g. buyer 1, seller 5 which was fixed during each contracting game allowing subjects to keep track of trading partners. In this way, participants could observe that they traded with a different partner after termination and rematching. This information

was available only in the main treatment and not in the practice rounds.

Once all games were over, subjects were asked to complete an exit survey while experimenters determined payouts. Finally, subjects were paid privately.

3 Theoretical Predictions and Hypothesis

The theoretical predictions are derived from the model developed in Cordero Salas (2010). The analysis is based on the assumption that market participants are self-interested, risk-neutral utility maximizers and that this is common knowledge. Additionally, contract enforcement is assumed to be either partially or fully incomplete. Incomplete means that some (partial) or all (fully) contract terms are not verifiable by a third-party (e.g. courts).

In all conditions, the probability of trading for one more period with the same partner is 80 per cent or $\delta = 4/5$; the expected number of periods that each pair interacts is 5. Furthermore, given the parameters chosen, the socially efficient level of quality is $Q = 10$ because marginal revenue (10) is greater than marginal cost (5) for all quality levels. Finally, I define cooperation as both parties fulfilling the contract, the seller supplying the contracted quality and the buyer paying the contracted payment. The degree of cooperation in each treatment is defined as the proportion of pairs that cooperated.

3.1 First Best Prediction

When contracts are fully enforceable and a third-party can verify quality, parties can explicitly contract on quality. When the buyer holds all bargaining power, the first-best outcome in each period is for the buyer to offer a contract (55, 10) and for the seller to accept the contract and supply the highest possible quality, 10, in exchange of a payment of 55. This contract generates the maximum joint surplus of 50, which is allocated among the parties according to the contract. That is the seller gets profits of 5 (equal to his outside option) and the buyer collects the rest of the surplus with profits of 45.

When bargaining occurs such that the seller holds a bargaining power of 0.9, the first-best outcome in each period is for the buyer to offer a contract (95, 10) and the seller to accept the contract. This contract also generates the maximum surplus but in this case the buyer gets profits of 5 and the seller gets the rest of the surplus.

3.2 Prediction for the PN Treatment

In the PN treatment, there is no bargaining and contracts are partially incomplete, e.g. the experimenter only enforces the price. Therefore, for the single-stage game the buyer can guarantee the seller will receive the price. As a consequence the seller only supplies the minimum quality, $q = 1$ and the buyer pays a price just high enough to induce seller's participation: $p = 10$. In this equilibrium the joint surplus created is 5, where the buyer earns 0 and the seller earns 5 (equal to the outside option).

In the repeated game, the model predicts that players care not only about the single-stage game outcome but the stream of future payoffs they can achieve with the same partner. Therefore, in a repeated interaction with incomplete enforcement, players cooperate for several periods contingent on the satisfactory performance of the present trade. Cooperation is the desirable action and it is defined as both parties fulfilling the contract. A deviation from the desirable outcome is followed by a sanction which translates into breaking-off trade forever. In these experiments, this grim trigger strategy translates into buyers choosing to not offer contracts to sellers after observing a deviation or sellers rejecting contracts after observing a buyer's deviation. This strategy is extreme and could be substituted in the experiment by participants continuing to trade under less favorable conditions. In this case, players behave as in the single-stage game in which the buyer pays 10 points, the seller supplies a quality of 1 and the total surplus created is 5.

Because of the ongoing interaction the buyer can promise a payment contingent on quality as parties will likely trade again in the next period. Following the model in Cordero Salas (2010), a discount factor equal to $1/2$ or higher sustains cooperation under this regime. Therefore, the efficient outcome can be sustained as a sequential equilibrium in the PN treatment because the continuation probability implemented in the experiments mimics a discount factor higher than the threshold for cooperation, ($\delta = 4/5 > 1/2$).

The efficient outcome in each period is for the buyer to offer a contract requesting the highest quality 10, in exchange of a price of 10 and a bonus of 45. Both parties cooperate, the seller by supplying the highest quality and the buyer by paying the bonus. Parties cooperate because the payoffs from cooperative behavior are greater than or equal to the payoff from deviation (from the dynamic incentive compatibility constraint: $225 \geq 90$ for the buyer and $25 \geq 25$ for the seller). These results are summarize in the following predictions.

Prediction 1. *In the PN treatment, the buyer offers a contract including a quality of 10, a price of 10 and a bonus of 45 with a total payment of 55.*

Prediction 2. *In each period, the efficient outcome is sustained through cooperative actions. The actual quality equals 10 and the maximum surplus of 50 is achieved. The buyer receives a payoff of 45 while the*

sellers' payoff equals the outside option of 5.

Prediction 3. *Cooperation is observed in every period.*

3.3 Prediction for the PB Treatment

In the PB treatment, contracts are also partially incomplete but sellers can counteroffer. In the single-stage game, the buyer can only promise the price and because the seller can counteroffer and demand a higher price ($p \geq 9.5Q^2$). However, because for any price the seller maximizes her income by providing the lowest quality, $q = 1$, the buyer offers only a contract for the minimum quality and pays a price just enough to induce seller's participation. The buyer offers a price of 9.5 in exchange for a quality of 1. Given this quality, the seller's outside option of 5 is greater than the seller's bargained share of the surplus of 4.5. Therefore, exchange does not take place in the one shot game.

In the repeated game, players cooperate to maximize the stream of payoffs. As in the PENBP treatments, cooperation is sustainable for discount factors greater than or equal to $1/2$. Therefore, the prediction for the PEBP treatments is that in each period the efficient outcome is sustained given the continuation probability of $4/5$ implemented in the experiments. The buyer offers a contract that takes into account the bargaining power that the seller can exercise. The optimal contract includes the highest quality of 10 in exchange of a price of 95 and a bonus of 0. Given the seller's bargaining power, the seller is the residual claimant of the surplus. The dynamic incentive compatibility constraint shows that even though the seller has the opportunity for deviation given the payment structure, she is better off by cooperating than deviating as $225 > 110$. Although the buyer does not have much room for deviation, he is better off by cooperating as he gets a higher payoff by cooperating than deviating as $25 > 5$. The results are summarized in the following predictions.

Prediction 4. *In the PB treatment, the buyer offers a contract in which the requested quality equals 10, the price equals 95, the bonus equals 0 and the total payment is 95.*

Prediction 5. *In each period, the efficient outcome is sustained through cooperative actions. The actual quality equals 10 and the maximum surplus of 50 is achieved. The buyer receives a payoff of 5 while the sellers' payoff equals 45 as a result of the distribution of bargaining power.*

Prediction 6. *Cooperation is observed in every period.*

²In the one-shot game, the buyer can only promise the fixed price. This reduces the seller's participation constraint to $p - 5Q \geq 0.9(10Q - 5Q)$. Then, solving for p , it results in $p \geq 9.5Q$

3.4 Prediction for the NN Treatment

In the NN treatments, the experimenter does not enforce any of the terms of the contracts, including the price. In this case, buyers can adjust the total payment to zero after observing the quality delivered while the sellers can choose any quality they desire. For the single-stage game, a buyer cannot promise any payment to the seller. As a consequence, for any quality the seller supplies, the buyer maximizes payoffs by choosing a total payment equal to zero. The seller anticipates this action and realizes that regardless of the contract, for any quality she supplies, she earns less than her outside option, $U = P(Q) - 5Q = 0 - 5Q < 5$. Therefore the seller would not accept any contract and trade does not occur.

In the repeated game, the ongoing interaction sustains the efficient outcome for discount factors equal to or greater than $\delta = 11/20 = 0.55$. Given the probability of continuation in the experiments of $\delta = 4/5$, cooperation is sustainable in every period.

The equilibrium contract offered by a buyer subject includes the highest possible quality, 10 and a total payment of 55; the contract generates the highest surplus of 50. Note that because neither of the components of a payment are enforceable the structure of contracts can vary substantially. However, given that the subjects are given the option to structure a payment with price and bonus, the theoretical structure may be similar to the one in the PN with a price of 10 and the bonus of 45. The buyer's per period payoff equals 45 and the seller's payoff equals 5. Finally, participants should find cooperation to be more profitable than deviation as these parameters result in the following relationships from the dynamic incentive compatibility constraint, $225 > 100$ for the buyer and $25 > 15$ for the seller. The results are summarized in the following predictions.

Prediction 7. *In the NN treatments, the buyer offers a contract where the total payment equals 55 and the requested quality equals 10.*

Prediction 8. *In each period, the efficient outcome is sustained through cooperative actions. The actual quality equals 10 and the maximum surplus of 50 is achieved. The buyer receives a stage payoff of 45 while the sellers' stage payoff equals the outside option of 5.*

Prediction 9. *Cooperation is observed in every period.*

3.5 Prediction for the NB Treatment

In the NB treatment, a seller can exercise bargaining power by using counteroffers while none of the terms of the contract are enforced by the experimenter. In the single-stage game there is no trade following the same

intuition as in the stage game of the NN treatment. In this case, even with the sellers exercising bargaining power and requesting higher prices, the buyer always maximizes his payoffs by withholding the full payment. Therefore, the seller rejects any contract and no trade takes place.

Given the parameters used in the experiment, cooperation sustains the efficient outcome if the discount factor is equal or greater than $\delta = 19/20$. Therefore, the continuation probability of $\delta = 4/5$ implemented in the NB treatment does not sustain cooperation if the sellers exercise all their bargaining power. If sellers exercise all their bargaining power, the buyers have to offer a contract where the total payment is such that $P(Q) \geq 9.5Q$. For example, for the efficient quality of 10, the buyer has to propose a contract where he offers to pay a total payment of 95. In this case, the buyer's discounted payoff from cooperation equals 25 while the discounted payoff from deviation equals 100. Therefore, the buyer shirks and takes short-term profits instead of staying the long term relationship. This situation happens for any given quality if the seller claims a payment such that $P(Q) \geq 9.5Q$ because the buyer's dynamic incentive compatibility constraint reduces to $\frac{10Q-9.5Q}{0.2} \geq 10Q + 0 \Rightarrow 0.5Q \geq 2Q$ which is not possible. Then, for any given quality, the buyer gets a higher payoff from deviating.

If sellers do not exercise all bargaining power, cooperation can be sustained by increasing the buyer's stage payoff from cooperating. Increasing the buyer's payoff from cooperation can be done by the seller accepting a lower price which is equivalent to exercising less bargaining power. That is the seller claims less of the surplus that he could. I derive the bargaining power exercised threshold by using the buyer's DICC from Cordero Salas (2010), which translates to $\frac{10Q-5Q-\beta 5Q}{0.2} \geq 10Q \Rightarrow 3/5 \leq \beta$. Then, if the seller only exercises a bargaining power equivalent to 0.6 by accepting a contract with a total payment of $P(Q) = 8Q$, then cooperation is sustained and the efficient outcome is achievable. Optimal contracts offer a payment of 80 in exchange for a quality of 10. The buyer's stage payoff equals 20 and the seller's stage payoff equals 30.

Prediction 10. *In the NBP treatment, if the sellers exercise all available bargaining power the efficient outcome is not sustained. The buyers take short term profits and deviation is observed in every period.*

Prediction 11. *If sellers exercise bargaining power of 0.6 or less (by accepting lower prices), the efficient outcome is sustainable. The seller accepts a contract where the total payment equals 80 and the requested quality equals 10. The efficient outcome is sustained through cooperative actions, the actual quality equals 10, and the maximum surplus of 50 is achieved. The buyer receives a stage payoff of 20 while the sellers' stage payoff equals 30.*

Prediction 12. *Cooperation is observed in every period when sellers exercise a bargaining power of $\beta \leq 0.6$.*

3.6 Hypothesis

Comparing the above predictions, I forward testable hypotheses with respect to efficiency, distribution and cooperation. The model describes efficiency as maximizing the social surplus by trading the highest level of quality. Then, the efficient outcome is defined as $q = 10$ and surplus equal to 50. Furthermore, in equilibrium in the no bargaining treatments sellers accept the offer and both parties cooperate while in the bargaining treatments the buyer offer the equilibrium contract of the alternating offer game such that the seller does not have an incentive to counteroffer. Then, sellers accept the first offer and cooperate unless the seller exercises bargaining power greater than 0.6 in the NB treatment.

All treatments have the same expected relationship length (same probability of continuing with the same partner in the following period), therefore the effect of the termination rule should be the same across treatments except when sellers exercise a high bargaining power in the NB treatment. In the latter case, the expected length of the relationship given by the termination rule should have a negative impact on cooperation.

Buyers maximize profits by requesting the efficient level of quality in all treatments. In the no bargaining treatments (PN and NN) the buyer is the potential residual claimant of the surplus while in the bargaining treatments (PB and NB) the seller is. Then, in all treatments at least one party has the incentive to maximize surplus. Therefore, the contracted quality should be 10 in all offered contracts. Furthermore, the same level of quality and total surplus maximizes participant discounted profits in all treatments as the expected length of the relationship is the same. The only expected difference across treatments is in the NB treatment where surplus declines if the seller desires to exercise maximal bargaining power. In this case, the buyer would maximize profits by withholding payments for any quality, therefore no exchange is expected. Then, contracts offering a total payment higher than 80 should be rejected in the NB treatment.

Moreover, the offered payments are the same for both no bargaining treatments but these differ from the payments offered in the bargaining treatments. Within the bargaining treatments the contracted total payment is higher in the partial enforcement condition than in the fully incomplete enforcement condition. The explanation is that in the NB treatment the seller is better off exercising only enough bargaining power to reap the highest possible surplus while sustaining long-term cooperation instead of exercising full bargaining power and triggering opportunistic behavior by the buyer, which results in short-term gains and reservation payoff thereafter. Finally, the offered bonus decreases as the seller's bargaining power increases. Therefore, the structure of the contracted payment is indeterminate in the full incomplete enforcement conditions while it differs within the partial enforcement treatments with a higher contracted bonus and a lower contracted

base price under no bargaining and the opposite under bargaining. The following hypothesis summarize these observations with respect to contract terms.

Hypothesis 1. *Contracted quality should reach maximal levels under all treatments.*

Hypothesis 2. *The total contracted p will follow: $PB \geq NB > PN = NN$.*

Hypothesis 3. *The contracted base price is greater in PB than PN and the opposite is true for the contracted bonus. If sellers exercise a high bargaining power in the $NEBP$, any contract is offered and rejected.*

Once the buyers have made their offers, sellers are more likely to accept buyers' offers in the no bargaining treatments because those are take-it-or-leave-it contracts. In the bargaining treatments, the sellers have the option of using a counteroffer, then the acceptance rate is expected to be lower. Moreover, within the bargaining treatments, sellers are able to exercise more bargaining power in the partial enforcement condition than under the fully incomplete condition because the base payment is enforced by the experimenter so that it is secure for the seller. Then, the sellers counteroffer more in the $PEBP$ treatment than in the $NEBP$ treatment.

Hypothesis 4. *The acceptance rate of contracts is higher in no bargaining treatments (NN and PN) than in the bargaining treatments (NB and PB).*

Hypothesis 5. *Sellers counteroffer more in the partial enforcement (PB) than in the fully incomplete (NB) condition.*

As soon as parties agree on the contract, the seller has to decide on the level of quality to supply and the buyer, after observing the quality supplied, has to make decisions about payments. The outcomes of efficiency and distribution of surplus depend on these decisions and the level of cooperation in the experimental economies. However, cooperation or deviation is triggered initially by the contracted terms of trade. Under the parameters in the experiment, the model predicts that a buyer should offer the minimum payment for participation to the seller in the no bargaining treatments. Under these conditions participants have sufficient incentives to cooperate and achieve the efficient outcome. Furthermore, cooperation and full efficiency are achievable under $PEBP$ treatments even when the seller demands the maximum payment to collect all surplus. In this case, the incentives are such that both participants also cooperate and achieve the efficient outcome. This outcome is also observed in the $NEBP$ treatment if the seller accepts a lower payment than the necessary to extract all the surplus.

As the seller's bargaining power increases, the buyers' ability to induce high quality through the discretionary payment decreases because it is bounded by his limited gains from trade. But in this case the sellers are less sensitive to the performance payment, as through higher bargaining power they become residual claimants of the surplus. As a consequence, the level of quality that sellers provide increases and seller deviation from contracted quality decreases with sellers' bargaining power. Then, actual quality should be higher and seller deviation should be lower in the bargaining treatments than in the no bargaining treatments. Furthermore, in the bargaining treatments, the gains from trade (private surplus) differ from the social surplus more in the partial enforcement treatment than in the fully incomplete condition. The explanation for this is that sellers feel more comfortable in using counteroffers in the partial enforcement condition because the base price is enforced by the computer. In addition, because the base payment is enforced by the experimenter, sellers shirk more in partial enforcement treatments than in the fully incomplete enforcement treatments.

The model also predicts that in all treatments, buyers find incentives to cooperate given the parameters implemented in the experiment. The model only predicts that buyers deviate in the NEBP treatment if the seller attempts to extract all surplus. The exercise of bargaining power in this condition can erode market efficiency because a buyer's long-run gains to trade shrink and short-term opportunistic behavior becomes more appealing for the buyer, then the buyer deviates and trade is more likely to break down. Furthermore, buyer deviation from the contracted payment is increasing with the seller's exercise of bargaining power because his payoffs decrease. Therefore, buyers shirk more under the bargaining treatments than in the no bargaining treatments and buyer deviation is always observed for contracts offering a payment higher than 80 in the NB treatment. In addition, because buyers have more means to deviate in the fully incomplete enforcement treatments (by adjusting the full payment to zero), then buyers shirk more under this condition than when partial enforcement is in place. Following this analysis I draw the following hypothesis with respect to efficiency, surplus and cooperation:

Hypothesis 6. *More cooperative outcomes are observed in PEBP, PENBP and NENBP treatments than in the NEBP treatment.*

Hypothesis 7. *Actual quality chosen and social surplus should follow $NB \geq PB > NN > PN$ if sellers only exercise the bargaining power that allows parties to trade in the NB treatment. If sellers exercise too much bargaining power actual quality and surplus in the NB is the lowest.*

Hypothesis 8. *Total payments follow $PB > NB > PN \geq NN$ and the actual base payments are greater*

in PB than PN while the opposite is true for the bonus.

Hypothesis 9. *There is a higher loss of private efficiency in PB than NB.*

Following parties' decisions, payments are made. In the no bargaining treatments, seller rents are closer to their reservation payoffs while buyers extract all surplus. As sellers bargaining power increases, sellers and buyers share rents more equally. If sellers use all bargaining power, they extract all rents leaving buyers with a payoff of zero in the PEBP condition. The next hypothesis summarizes this.

Hypothesis 10. *Seller rents are close to reservation payoffs in the no bargaining treatments and their share of the surplus is close to zero. Seller rents and the share of the surplus follow $PB \geq NB > PN \geq NN$.*

Finally, cooperation breaks down when either participant deviates from the relational contract. After either party's deviation, parties can punish their partners by terminating the relationship (no exchange even when contract terms are favorable) or by continuing trading on less favorable terms. The model predicts that participants cooperate in all periods in all treatments except in the NB treatment when the seller exercises all bargaining power. But after any deviation, the model predicts that parties go back to play the one-shot game, in which trading the lowest quality for a minimum payment is the equilibrium for the PENBP treatment and no exchange is the equilibrium for all other treatments. The last hypothesis states this.

Hypothesis 11. *After any deviation, parties trade under less favorable terms in the PN treatment while no exchange takes place in all other treatments.*

4 Results

To date I have run 17 sessions. Table 4 summarizes information about the experimental sessions. Subjects were OSU undergraduate and graduate students from a variety of majors that were recruited by email and earned an average of \$16.61 with a maximum \$32 and a minimum of \$6. There were 297 distinct pairs that interacted in the experiments with a maximum of 87 in the NN treatment and a minimum of 56 in the PN treatment. Table 4 presents the average number of periods per match. Mann-Whitney tests give evidence that the number of periods played per match is significantly different among some treatments. Because of this difference I control for the length of the relationship in the econometric analysis.

Tests for learning effects. Because the experiments mimic the infinite repetition of the theoretical model, the realized durations varied considerably. Past literature has shown that subjects learn through-

Session	Treatment (Date)	Number of Subjects	Number of games	Number of pairs	Total number of periods
1	NEBP (09 27 10)	6	3	9	11
2	NENBP (09 29 10)	6	3	9	13
3	PEBP (10 05 10)	8	1	4	9
4	PENBP (10 11 10)	8	1	4	16
5	NEBP (10 12 10)	12	3	18	10
6	PEBP (10 13 10)	10	5	25	16
7	NEBP (10 26 10)	10	5	25	18
8	NENBP (10 26 10)	10	5	25	19
9	PENBP (10 28 10)	8	3	12	25
10	NENBP (11 02 10)	10	5	25	22
11	PEBP (11 02 10)	10	5	25	20
12	PENBP (11 03 10)	8	4	16	18
13	NEBP (11 03 10)	12	3	18	17
14	PEBP (11 09 10)	12	3	18	14
15	PENBP (11 09 10)	12	4	24	22
16	PEBP (11 10 10)	12	2	12	19
17	NENBP (11 10 10)	14	4	28	26
Total		168	56	297	295
Average		9.88	3.29	17.47	17.35

Table 1: Experimental Sessions

NB	NN	PB	PN
3.86 ^a	4.71 ^b	4.88 ^{a,b}	6.75

Notes: Different letter superscripts indicate that numbers are statistically distinct.

Table 2: Average number of periods per match

out the experiment. In this case, subjects' behavior may be substantially different from the theoretical equilibrium in earlier periods, however, over time subjects adjust their choices and converge to the theoretical equilibrium. As a consequence potential differences across treatments may be due to learning effects, especially between those that have significantly different length.

To explore if this is an issue, I perform some test for learning effects. First, I test learning effects by comparing subjects' decisions across the games played in each single session across treatments. I aggregated pairs from all treatments by game number, where game number describes the order in which a specific game that included a unique pair was played ³. Table 4 shows the mean values per game across treatments for the most relevant variables including contracted and delivered quality and payment, profits, cooperation and surplus. A Kruskal-Wallis test indicates that there is a statistically significant difference across games

³Because the use of a random termination rule, one or more games were played in each sessions. Then, the game number represents the order in which the game was played in a session(first, second, third, etc.).

Variable	Game 1	Game 2	Game 3	Game 4	Game 5
Av. contracted quality	7.53 ^a	7.58 ^{a,b}	8.37 ^c	8.58 ^{c,d}	7.89 ^{b,c,d}
Av. actual quality	6.08 ^a	5.53 ^{a,b}	6.89 ^c	7.68 ^d	6.63 ^{c,d}
Av. contractual payment	58.09 ^a	59.05 ^{a,b}	63.83 ^c	63.88 ^{c,d}	64.43 ^{c,d}
Av. actual payment	44.33 ^a	40.34 ^{a,b}	49.75 ^c	55.21 ^d	50.84 ^{c,d}
Av. seller's payoffs	13.89 ^a	12.46 ^{a,b}	15.17 ^{a,c}	16.77 ^{c,d}	17.66 ^{c,d}
Av. buyer's payoffs	15.02 ^a	13.66 ^{a,b}	17.34 ^{a,c}	21.38 ^d	12.78 ^{b,c}
Cooperation rate	0.36 ^a	0.32 ^{a,b}	0.44 ^{a,c}	0.53 ^{c,d}	0.40 ^{b,c,d}
Av. Surplus	30.40 ^a	27.63 ^{a,b}	34.47 ^c	38.42 ^d	33.13 ^{c,d}

Notes: Numbers within a row with different letter superscripts are statistically distinct. Differences among games are statistically significant at 1% or 5% levels.

Table 3: Mean values per game across treatments

for at least one game for all variables in table 4. A Mann-Whitney test of pairwise differences identifies no significant difference among game 1 and game 2 for any of the variables. However, the same test gives evidence of a significant difference between some of the other games (superscripts in Table 4). This evidence suggests that subjects' earlier behavior differs somewhat to later behavior. Therefore, learning and outcomes trends may be important in analyzing the data.

The figures in table 4 suggest that subjects became more familiar with the incentive structure of the indefinite repetition across games in the same sessions, and they responded by increasing efficiency and cooperation. Figure 4 shows the learning trend in cooperation between games across treatments. Participants increase cooperation from the first two games to the later games. Even though cooperation is lower in game 5, it is not statistically different than cooperation in game 4. However, the difference in cooperation among games is only significant at 5% level.

I also test each individual treatment for learning effects. Only the fully incomplete enforcement treatments present some significant increasing differences among games for desired quality, actual quality, desired total payment, cooperation and surplus. This evidence suggests that the small learning trend observed in the overall analysis is driven by the no enforcement treatments, especially by the NN treatment where learning trends are significant at the 1% level for almost all variables.

To test more consistently the presence of learning effects, I compare the means of the variables of interest among early and later periods across treatments and for each treatment. If learning effects are present, then subjects learn the incentives in the game and respond better in later periods. Because each game has a potentially different number of periods that each match plays, I define an "effective period" variable which is the number of actual periods that each subject plays in a full session across games and

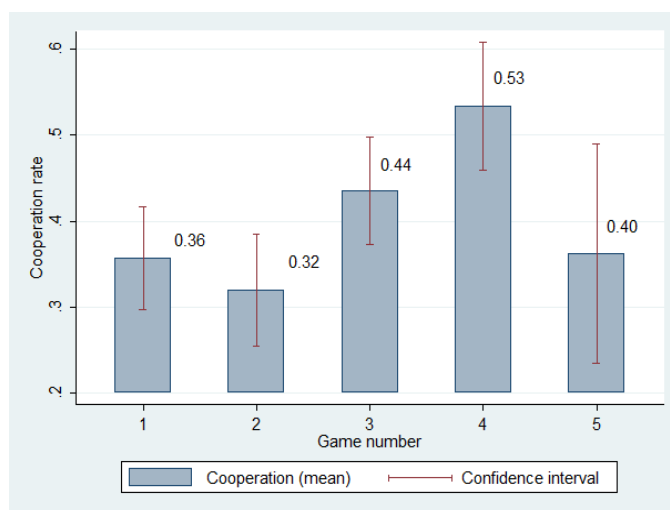


Figure 3: Average cooperation across games in all treatments

across partners. I analyze learning effects by comparing subjects' earlier decisions to later decisions within a single session. For each treatment, the data was partitioned into two groups by using three different definitions of "early periods" and "late periods". For that I created three learning variables. The first, "learning5", defines early periods as the first 5 periods of a session and later periods as all other periods. That is "learning5" equals 0 if period ≤ 5 and equals 1 otherwise. In the same way, "learning4", equals 0 if period ≤ 4 and equals 1 otherwise. And finally, "learning9" defines early periods up to the ninth period.

The analysis gives evidence of learning trends in subject behavior. As in the previous analysis of learning effects, the presence of learning effects is stronger in the N treatments than in the P treatments, especially under "learning9". Therefore, I control for learning effects in econometric analyses.

A final consideration is the difference in the number of periods played among games. In the NB treatment the longest game had 9 periods while in the NN, PB and PN treatments the longest game had 17, 12 and 20 periods respectively. I test for potential differences among treatments because of the presence of longer games. I created a variable called "laterperiods" that takes the value of 0 if the period played was between 1 and 9 (taking as reference the longest game in the treatment that had the shorter longest game (NB)), and 1 if the period was 10 or beyond. By using the pooled data for all treatments, I find a significant difference in the total payment (MW test $p=0.0410$), sellers' profits (MW test $p=0.0604$) and cooperation (MW test $p=0.0102$). When I analyze the differences among sessions for individual treatments, I only find significant differences in the NN treatment. Therefore, I include all observations in the analysis and I control

for potential differences due to longer games by including dummy variables for each period.

Summary statistics. Table 4 presents the summary statistics by treatment. The unit of analysis is a pair per period. There were 1493 possible interactions, of which 934 resulted in exchange. There were 1669 contracts proposed (1450 offers, 219 counteroffers). *Offer %* shows the proportion of possible interactions in which a buyer made an offer. *Acceptance rate %* shows the proportion of those offers accepted by the seller. *Counteroffer* shows the proportion of all possible interactions that resulted in a counteroffer and *counteroffer after rejection* shows the proportion of rejected offers that were followed by a counteroffer. *Counteroffer acceptance rate* shows the proportion of those counteroffers accepted by buyers. *Number of pairs* shows the number of distinct subjects pairs. *Average length of the relationship* shows how many periods each pair interacted. *Pairs used offer %* and *Pairs used counteroffer %* show the proportion of pairs that used offers and counteroffers respectively while *Pairs contracted by offer %* and *Pairs contracted by counteroffer %* show the proportion of pairs that agreed on a contract by using offers or counteroffers respectively.

The remaining variables in Table 4 are restricted to the actual contracts that were accepted including offers and counteroffers. *Average contracted quality* and *Average contracted payment* show the averages specified in the accepted offers and counteroffers, while *Average actual quality* and *Average actual payment* show the averages actual delivered by both the seller and buyer respectively. *Average buyer payoffs* and *Average seller payoffs* and *Median seller payoffs* are the average and median seller earnings in points per period. *Overall seller share* and *Overall seller share (median)* show the mean and median proportion of the private surplus (sum of parties' payoffs) captured by the seller including all contracts respectively, while *Seller share if offer* and *Seller share if counteroffer* show the proportion of the surplus captured by the seller when the contract was reached by an offer or counteroffer respectively. *Trunc. seller share* is similar to overall seller share but it truncates the ratio of payoffs to total available private surplus to the unit interval. In this case, if the payoff of either party is negative, the share is set to 0 and the other party's share is set to one. *Payoffs relative spread* presents another way of looking at surplus distribution. It is the ratio of the spread between buyers' and sellers' payoffs to the total available private surplus. Finally, the *Cooperation rate* shows the overall average cooperation while *Cooperation rate if offer* and *Cooperation rate if counteroffer* show the average cooperation when the contract was achieved through an offer and counteroffer respectively.

The descriptive statistics in Table 4 give a general idea of the overall results. The data show that buyers used almost all opportunities to make offers to their sellers. In addition, only around 50% of sellers that rejected an offer used a counteroffer in the NB treatment while close to 80% of sellers used counteroffers after rejection in the partial enforcement treatments.

	NB	NN	PB	PN
<hr/> All possible interactions <hr/>				
Possible interactions	285	426	414	368
Offer fraction	0.98	0.97	0.98	0.95
Acceptance rate fraction	0.53	0.60	0.53	0.69
Counteroffer	0.24	na	0.37	na
Counteroffer after rejection	0.32	na	0.50	na
Counteroffer acceptance rate	0.18	na	0.18	na
Number of pairs	70	87	84	56
Av. Length of relationship	4	4.7	4.9	6.75
Pairs used offer fraction	1	0.99	0.94	1
Pairs used counteroffer fraction	0.50	na	0.73	na
Pairs contracted by offer fraction	0.80	0.86	0.95	0.96
Pairs contracted by counteroffer fraction	0.63	na	0.56	na
<hr/> Completed exchanges <hr/>				
Av. contracted quality	8.57	8	7.71	7.79
Av. actual quality	7.51	6.41	6.05	6.33
Av. contractual payment	66.64	61.71	60.49	57.94
Av. actual payment	49.94	44.57	48.77	46.58
Av. buyer's payoffs	20.90	19.57	9.63	16.75
Av. seller's payoffs	12.39	12.50	18.15	14.91
Median seller's payoffs	20	15	18	15
Av. Surplus	37.53	32.07	30.26	31.67
Priv. surplus	32.29		27.79	
Overall seller's share	0.24	0.54	1.19	0.84
Overall seller's share (median)	0.50	0.43	0.61	0.50
Seller's share if offer	0.31	0.54	1.30	0.84
Seller's share if counteroffer	-0.16	na	0.75	na
Truc. Seller's share	0.43	0.38	0.64	0.50
Payoffs relative spread	0.16	0.30	-0.97	-0.60
Cooperation rate	0.49	0.36	0.38	0.41
Cooperation rate if offer	0.54	0.36	0.39	0.41
Cooperation rate if counteroffer	0.26	na	0.35	na
<hr/> Treatment Effects <hr/>				
Bargaining	Yes	No	Yes	No
Enforcement	None	None	p	p

Table 4: Summary data

Table 5 presents the averages by treatment for the variables of interest and the non parametric analysis for key pair-wise treatment differences. The significance is measured by the p-values of the two-sided Mann-Whitney tests using each partnership-period as an independent observations. I examine the results in more detail by using hypothesis tests and regression analyses in the following sections and account for potential clustering of unobservables at the partnership level.

4.1 Contracts terms

Hypothesis 1 predicts that all contracts should specify the same level of contracted quality, and that this quality should be the efficient and highest allowable level (10) under all treatments. Comparing the treatments I find that the contracted quality is significantly higher in the NB treatment compared to the NN and PB treatments contradicting hypothesis 1. However, I cannot reject that $Q_{NN} = Q_{PB} = Q_{PN}$ which supports hypothesis 1. These results suggest that the NB contracts aim to create a higher level of surplus than the other treatments by specifying a higher desired quality. However, a Wilcoxon test rejects the null hypothesis that Q_{NB} is significantly different from the highest quality, 10 ($p < 0.0000$). I test $Q_{NB} = 10$ separately from the other treatments as the earlier non-parametric analysis rejected equality in the contracted quality between NB and the other treatments. I pool data from the other three treatments as their contracted quality means are not significantly different from each other from the previous non-parametric analysis. The Wilcoxon test also yield a p-value < 0.0000 , therefore the contracted quality is lower than the efficient level in all treatments. By the same token, the average quality contracted is much higher than the predictions of low quality in the one shot game ($p=0.0000$).

Although these results do not support the theoretical predictions about contracted quality, they are consistent with previous experimental results. For example, Wu and Roe (2007b) found in their experiments that buyers did not ask sellers to provide the efficient quality level. In their case, the lower level of contracted quality might be a consequence of the finite horizon of the games implemented. The current experiment simulates an infinitely repeated game, via an uncertain ending period. This suggests the existence of a final period is not necessary to generate contracted quality levels below optimal.

Hypothesis 1 also states that the contracted total payment should be higher in the bargaining treatments (PB and NB) because sellers can bargain. Moreover, the contracted total payment should be greater in the PB treatment than in the NB because the base price is enforced, which gives sellers a chance to request a higher payment. Although the average contracted total payment in the bargaining treatments are higher than the ones in the corresponding no bargaining treatment as predicted in Hypothesis 1, the non-parametric

	Means				Mann-Whitney (p-values)			
	NB	NN	PB	PN	NB vs. NN	NB vs. PB	NN vs. PN	PB vs. PN
Offer Acceptance rate fraction	0.53	0.60	0.53	0.69	0.0647*	0.8701	0.0086**	< 0.000***
Overall acceptance rate fraction	0.51	0.60	0.48	0.69	0.0082**	0.3590	0.0086**	< 0.000***
Av. contracted quality	8.57	8	7.71	7.79	0.004***	0.002***	0.690	0.834
Av. actual quality	7.51	6.41	6.05	6.33	0.001***	< 0.000***	0.8089	0.3201
Av. contractual payment	66.64	61.71	60.49	57.94	0.0013***	0.0001***	0.1115	0.3934
Av. actual payment	49.94	44.57	48.77	46.58	0.03210**	0.0918*	0.6360	0.3991
Av. contracted price	43.98	43.73	39.63	31.59	0.8796	0.02091**	0.000***	0.000***
Av. actual price	34.00	31.79	39.63	31.59	0.2387	0.0178**	0.8496	0.000***
Av. contracted bonus	22.66	17.99	20.87	26.35	0.0002***	0.0143**	< 0.000***	< 0.000***
Av. actual bonus	15.94	12.78	9.15	14.99	0.0304**	< 0.000***	0.4667	0.0001***
Av. buyer's payoffs	20.90	19.57	9.63	16.75	0.2292	< 0.000***	0.0551*	< 0.000***
Av. seller's payoffs	12.39	12.50	18.15	14.91	0.103	0.4935	0.0874*	0.0918*
Av. Surplus	37.53	32.07	30.26	31.67	0.0005***	< 0.000***	0.809	0.3201
Overall seller's share	0.24	0.54	1.19	0.84	0.0278**	< 0.000***	< 0.000***	< 0.000***
Truc. Seller's share	0.43	0.38	0.64	0.50	0.0133**	< 0.000***	< 0.000***	< 0.000***
Payoffs relative spread	0.16	0.30	-0.97	-0.60	< 0.000***	< 0.000***	< 0.000***	< 0.000***
Cooperation rate	0.49	0.36	0.38	0.41	0.0063***	0.0172**	0.2952	0.5230
Treatment Effects								
Bargaining	Yes	No	Yes	No				
Enforcement	None	None	p	p				

Notes: Median values for overall seller share and seller payoffs are in table 4 for reference.

Table 5: Hypothesis test for treatment effects

	Quality	Total Payment
No Bargaining	7.90	59.85
Bargaining	8.05	62.94
PB	7.71	60.49
NB	8.57	66.64
Offers-Bargaining treatments only		
PE & NE	8.24	63.62
PB	7.85	61.91
NB	8.81	66.09
Counteroffers-Bargaining treatments only		
PE & NE	7.18	59.79
PB	7.15	54.67
NB	7.22	69.63

Table 6: Contract terms in accepted contracts

analysis gives evidence of a significant difference only among the fully incomplete enforcement conditions. In addition, I find that the total contracted payment in the NB treatment is greater than in the PB, which contradicts the predicted direction. Finally, the average of the total contracted payment differs from the predicted equilibrium values in all treatments (NB, 66.64 vs. 80; NN, 61.71 vs. 55; PB 60.49 vs. 95; PN, 57.94 vs. 55).

Result 1. *Contract terms are different in the NB treatment when comparing to the other treatments. However, the contracted quality and total contracted payment differ significantly from the predicted values.*

One explanation for these deviations from predictions is that buyers offer contracts with more attractive average payments in the bargaining treatments to avoid a possible counteroffer from the seller, especially in the NB in which buyer credibility is a more important issue because of the lack of enforcement. If bargaining explains the higher contracted payments there should be no difference in the contracts offered or counteroffered across enforcement conditions. Table 6 shows the average contracting terms by bargaining and no bargaining treatments and by offers and counteroffers in the bargaining treatments.

Comparing the contract terms in the bargaining treatments with the ones in the no bargaining conditions I find that the contracted total payment is significantly higher under bargaining at the 5% level (MW $p=0.0258$) while the contracted quality is not significantly different (MW $p=0.1629$). Furthermore, the contracted quality and total payment were significantly higher in the fully incomplete enforcement condition than in the partial enforcement condition when bargaining was in place (MW test $p=0.0015$ and $p=0.0001$, respectively). This evidence suggests that the difference in the contract terms between the NEBP condition and the other treatments is not driven by only the presence of bargaining but the combination of bargaining

and the level of enforcement.

To explore further if bargaining drives significantly higher contract terms, I compare terms presented in offers and in counteroffers by using the pooled data of the bargaining treatments. A Mann-Whitney test finds that the average quality requested and the contracted total payment in the offers were significantly higher than in the counter offers ($p=0.0007$ and $p=0.0228$, respectively). Furthermore, both terms are significantly higher in the NB treatment than in the PB treatment ($p=0.0037$ and $p=0.0011$ respectively) but only the contracted payment was somewhat different in the counteroffers ($p=0.0206$ for contracted payment and $p=0.9369$ for contracted quality) between enforcement conditions.

The difference in contracted quality among offers and counteroffers in the data from both bargaining treatments is driven mostly by the difference in the NB treatment (MW $p=0.0026$) and not that much by the difference in the PB treatment (MW $p=0.0768$). The the difference in the contracted total payment is driven exclusively by differences in PB (MW $p=0.0103$) as there is no difference in the contracted payment between offers and counteroffers in the NB treatment (MW $p=0.8113$). The difference in contract terms across the PB and NB conditions in both offers and counteroffers supports the observation made above: it is the combination of bargaining and the lack of formal enforcement together that explain higher contracted quality and higher contracted payments. In the NB treatment, buyers may feel the need to trade by using more attractive contracts to overcome not only seller bargaining but also the threat of shirking. The more attractive the contracts are, the lower are the incentives for deviation. These results are confirmed by the econometric analysis in Table 7.

In addition, hypothesis 1 states that contracted prices will be greater in the PB than in the PN treatment and the opposite is true for the contracted bonus. I examine the difference in contracted payment structure by comparing them among bargaining treatments within the same enforcement conditions (PEBP and PENBP treatments). In the fully incomplete treatments (NE), subjects had the same options about payment structure in terms of choosing how much to pay as a price and as a bonus, but there were no differences among these choices as neither the price no the bonus were enforced by the computer. Therefore the subjects' choice is ambiguous in the NE treatments because participants could structure contracts in many different ways without any conclusive reason for why a subject chooses one over the other. In contrast, in the partial enforcement treatments the price was enforced by the computer while the bonus was not;

Regressors	Contracted quality Coeff./Std Error	Contracted Total Payment Coeff./Std Error
Constant	7.0512*** (0.4642)	51.7688*** (3.1929)
NB dummy	0.9614** (0.3992)	9.3746*** (3.2124)
NN dummy	0.3176 (0.4314)	4.6166 (2.8245)
PB dummy	0.2710 (0.4295)	4.3997 (2.7761)
Length of relationship	-0.0739 (0.1079)	-0.3520 (0.7606)
Buyer previous earnings	0.0376*** (0.0085)	0.1608** (0.0656)
Seller previous earnings	0.0395*** (0.0096)	0.3767*** (0.0828)
F(1, 720) statistic for equality of NB and NN coefficients	3.51* p=0.0614	2.97* p=0.0855
F(1, 720) statistic for equality of NB and PB coefficients	3.78* p=0.0523	2.97* p=0.0853
F(1, 720) statistic for equality of NN and PB coefficients	0.02 p=0.8980	0.01 p=0.9208
Sigma	2.3245*** (0.0974)	17.6207*** (0.7943)
Observations	735	735
Pseudo R2	0.0264	0.0134
Log pseudolikelihood	-1656.0215	-3149.1848

Notes: Asterisks indicate the significance level of the estimate: * at 10% level, ** at 5% level and *** at 1% level. Both models are Censored estimations. Contracted quality regression had 11 left-censored observations at 1 and Contracted total payment regression had 1 left-censored observation at 2. Sample excluded observations for first period interactions. Additional controls included dummy variables for each period. Standard errors reported are robust and adjusted for clustering on buyer-seller pairs.

Table 7: Censored estimation for actual contract terms

therefore subjects that offered a contract with a higher price are looking for a payment that serves as a more formal incentive and that is more secure than a payment based on informal incentives (dependent on outcomes).

In the partial enforcement conditions, sellers are more willing to accept contracts with higher prices and lower bonuses in comparison to contracts with lower prices and higher bonuses because the price is enforced by the computer. Such contracts give a sense of security about total payment. In contrast, buyers find contracts with a higher bonus and a lower price more appealing because they insure them against defaulting sellers. In the bargaining treatments, however, buyers are more willing to offer contracts with high prices than contracts with large bonuses with the objective to avoid counteroffers from the sellers.

Table 4 shows that for accepted contracts the average contracted price under the PB treatment is significantly higher than the average contracted price under the PN treatment while the opposite is true for the bonus. In the bargaining treatment, 69% of all contracts offered were structured with a higher price than a bonus and 73% of the accepted contracts had also the same payment structure. In contrast, in the no bargaining treatment, only 53% of all offers and 62% of accepted contracts were structured with a higher price than bonus. The use of this structure in the no bargaining treatment was lower than the use in PB, but still higher than the theoretical prediction of 0%. A Mann-Whitney test indicates that the proportion of contracts with a higher price than bonus is significantly higher in the PB treatment than in the PN treatment for all offers and for the sample of accepted offers ($p < 0.000$ and $p = 0.0093$ respectively), supporting the theoretical prediction of the use of this structure when bargaining.

These results reflect how the change in the institutional environment affects the choice of contract structure. Buyers in the bargaining treatment lose full control over the structure of contract offered, as sellers have the opportunity to counteroffer. In this case, the buyers have to anticipate what a seller's counteroffer will be, and offer a contract that provides enough incentives to the seller not only to perform but also to not use a counteroffer.

To further investigate the effect of bargaining on payment structure I analyze the acceptance rate for each type of contract structure. Table 4.1 presents this analysis. If contracts are structured by buyers to have higher prices than bonuses, then sellers are more likely to accept. This holds for both PB (59% vs. 41%) and PN (81% vs. 56%). Among seller's counteroffers the reverse is true; the acceptance rate is higher for contracts where the bonus exceeds the price (33% vs. 43%). Although the difference is not significant.

In addition, Table 4.1 presents the results for comparing within-treatment outcomes for buyers who choose contract structures with higher prices than bonus and those buyers who did not. Table 4.1 also

	Contract with higher price than bonus	Contract with higher bonus than price	Mann-Whitney (p-value)
All offers			
PEBP	0.59	0.41	0.0002
PENBP	0.81	0.56	< 0.000
All counteroffers			
PEBP	0.33	0.42	0.4396
PENBP	NA	NA	NA

Table 8: Acceptance rate by contract structure

		N	Actual Quality	Buyer's Payoff	Seller's Payoff	Surplus
All contracts offered by buyers						
PB	With higher price than bonus	150	6.88	12.7	21.7	34.4
	With higher bonus than price	64	4.09	9.30	11.17	20.47
	Mann-Whitney (p-value)		< 0.000***	0.0009***	< 0.000***	< 0.000***
PN	With higher price than bonus	151	6.64	15.53	17.65	33.18
	With higher bonus than price	92	5.84	18.76	10.42	29.19
	Mann-Whitney (p-value)		0.068	0.9476	< 0.000***	0.0680*
All contracts offered by sellers (counteroffers)						
PB	With higher price than bonus	44	6.48	1.33	17.18	32.39
	With higher bonus than price	8	3.88	0.51	12.83	19.38
	Mann-Whitney		0.0286**	0.1471	0.6648	0.0286**

Table 9: Effects of contract structure

presents the outcomes for contracts established by counteroffers. The p-values show the results of a Mann-Whitney hypothesis test regarding the difference between contracts with these structures within each treatment.

In the PB treatment, contracts that are structured with higher prices than bonuses perform better than contracts where bonuses exceed prices. This latter performance includes greater social surplus and greater payoffs for each party. These differences are statically significant in all case except for buyer and seller payoffs in counteroffers. In the PN, surplus and seller's payoffs are significantly greater for contracts where price exceeds bonus, though buyers are no better off.

A comparison of offers in the bargaining and no bargaining treatments suggests that buyers generally chose the contract structure that would improve their potential payoff. The use of higher price than bonus in the PN and the use of the opposite structure in the PB was greater than what what was predicted. To study this more in detail, an econometric analysis is performed.

Table 10 presents the results of a probit estimation in which the dependent variables are the probability that an accepted contract was structured with a higher base price than a bonus. The sample was restricted to only the partial enforcement treatments as only in those treatments is there a difference in choosing either

contract structure as explained above. The explanatory variables include a dummy variable that takes a value of one if the treatment was a bargaining condition and zero if it was take-it-or-leave-it condition and controls for pair history including length of the relationship and buyer's and seller's past earnings as well as controls for learning effects (with dummies for each period) and session-day dummies.

The bargaining coefficient is significantly positive. The marginal effects imply that subjects participating in bargaining treatments had a 37% higher probability of trading with a contract that was structured with a higher price than a bonus than did treatments without bargaining. These results support the hypothesis that contracts are more likely to take the form of wage contracts than contingent performance contracts in the presence of bargaining.

Result 2. *Contracts observed in the presence of bargaining are more likely to take the form of wage contracts than performance contracts.*

Note that from the estimation in Table 10, it seems that the use of contracts with higher prices than bonuses is decreasing over time. Figure 4.1 pictures the use of this structure over periods for both the PEBP and PENBP treatments. The use of this structure is decreasing in the PEBP treatment, however with exception of period 8 and 12, at least 50% of contracts were structured with a higher price than bonus. In the case of the PENBP treatment, the use of this structure is also decreasing and much lower than in the PEBP treatment. Something interesting to note is that in later periods, the proportion of contracts with higher prices than bonuses is higher, which might be a signal of rent-sharing given relational contracts in the PENBP treatment.

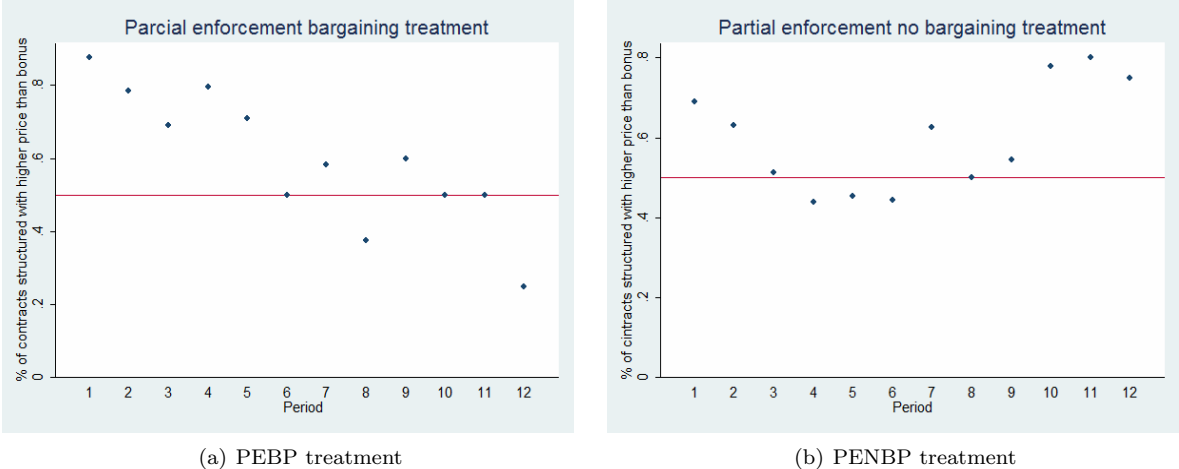


Figure 4: Evolution of contract structure

Regressors	Probit estimation Coeff./Std Error	Marginal Effects Coeff./Std Error
Constant	0.5191* (0.2710)	0.9023 (0.2710)
Bargaining dummy	1.1031*** (0.4178)	0.1991*** (0.0733)
Length of relationship	0.2229** (0.0941)	0.0385 (0.0197)
Bargaining * Length relationship	-0.1740** (0.0730)	-0.0300** (0.0109)
Buyer previous earnings	-0.0183** (0.0082)	-0.0032* (0.0017)
Seller previous earnings	0.0026 (0.0082)	0.0004 (0.0014)
Observations	411	411
Log pseudolikelihood	-140.63662	
Pseudo R2	0.1098	

Notes: The dependent variable takes a value of 1 if the contract structure is such as the price is higher than the bonus and zero otherwise. The sample was restricted to only partial enforcement treatments and excluded observations for first period interactions. Asterisks indicate the significance level of the estimate: * at 10% level, ** at 5% level and *** at 1% level. Estimation is a probit. Standard errors reported are robust and adjusted for clustering on buyer-seller pairs.

Table 10: Probability of accepted contract structures with higher price than bonus

4.2 Acceptance rate, use of counteroffers and cooperative outcomes

Hypothesis 2 states that the acceptance rate of contracts is higher in no bargaining treatments than in the bargaining treatments while sellers counteroffer more in the partial enforcement than in the fully incomplete condition.

The acceptance rate also reflects the parties' willingness to engage in a trading relationship and cooperate. Table 5 shows that the offers acceptance rate among bargaining treatments is not different from each other. However, the acceptance rate in the no bargaining treatments is higher than the corresponding bargaining treatment and in the case of partial enforcement, the difference is significant at the 1 % level while in the case of no enforcement regimes the difference is significant at the 10% level. Yet, by comparing the overall acceptance rate in the fully incomplete conditions (including offers and counteroffers), the difference is more significant (5% level). This evidence gives some support to the idea that no bargaining treatments describe a higher rate of trades relative to the total number of offers made.

Table 4 shows the use of counteroffers in the bargaining treatments. Fifty percent of sellers that rejected an offer sent a counteroffer to the buyer in the PEBP condition while only 32% did in the NB (Mann-Whitney test $p=0.0003$) which supports hypothesis 2.

A probit model estimating the probability of accepting the contract and of the use of counteroffers confirm that bargaining decreases the acceptance rate while enforcement increases the use of counteroffers. More importantly, table 11 presents the determinants of the acceptance rate and the use of counteroffers. Explanatory variables include the terms of contracts in the offers, a dummy variable for bargaining, a dummy variable for enforcement (for the acceptance rate estimation only), controls for parties' previous history and period dummies to control for learning effects.

The higher the base price offered the higher the probability of accepting the buyer's offer and the lower the probability that a counteroffer is observed. The same reasoning applies to the performance bonus however the coefficient is not significant in either estimation. Bargaining decreases the probability of acceptance supporting the non-parametric results and hypothesis 2. Finally, even though the coefficient for enforcement is positive in the use of counteroffer estimation, it is not significant. These results are summarized as follows:

Result 3. *The acceptance rate is lower and the use of counteroffers is higher in the presence of bargaining. However the use of counteroffers is not significantly different across bargaining treatments.*

Regressors	Probability of acceptance	Probability of acceptance	Probability of counteroffer	Probability of counteroffer
	Coeff./Std Error	Coeff./Std Error	Coeff./Std Error	Coeff./Std Error
Constant	-0.0464 (0.1506)	-0.6684*** (0.2104)	-0.8564** (0.4046)	-0.0475 (0.5031)
Bargaining dummy	-0.2802*** (0.0960)	-0.2997*** (0.1029)		
Enforcement dummy	0.0874 (0.1021)	0.2786** (0.1082)	0.4090** (0.1761)	0.3370* (0.1832)
Contracted quality		0.0145 (0.0264)		0.0557 (0.0493)
Contracted price		0.0127*** (0.0041)		-0.0266*** (0.0069)
Contracted bonus		0.0016 (0.0041)		-0.0124** (0.0063)
Length of relationship	-0.0019 (0.0428)	0.0070 (0.0422)	0.1946 (0.1871)	0.1364 (0.2214)
Buyer previous earnings	0.0179*** (0.0032)	0.0140*** (0.0034)	-0.0113** (0.0047)	-0.0046 (0.0049)
Seller's previous earnings	0.0291*** (0.0043)	0.0249*** (0.0044)	-0.0093* (0.0051)	-0.0029 (0.0052)
Observations	1156	1156	534	534
Log pseudolikelihood	-715.72457	-696.72943	-318.71962	-299.74677
Pseudo R2	0.0865	0.1108	0.0481	0.1048

Notes: Estimation are probit models with a dummy that takes value of 1 if the contract was accepted or counteroffer was used respectively and zero otherwise as dependent variables respectively. Asterisks indicate the significance level of the estimate: * at 10% level, ** at 5% level and *** at 1% level. Additional controls are current length of the relationship, buyer's and seller's payoffs and dummies for each period. Standard errors reported are robust and adjusted for clustering on buyer-seller pairs. Both estimations use subdata for only offers made by buyers. Dada excludes observations for first period interactions. In addition, estimation for probability of counteroffers limits data to bargaining treatments.

Table 11: Determinants of contract acceptance and counteroffer use

One possibility is that subjects may learn throughout the experiment and move toward the equilibrium offer. In the bargaining game, the proposer makes an equilibrium offer such that it gives the receiver the same expected payoff as if were to counteroffer. One learning trajectory might be that subjects that use counteroffers more often in the first periods and decrease their use as the offer approaches the equilibrium offer. Figure 5 shows the percentage of pairs per period that used counteroffers and the sellers' potential average profits derived from first offers⁴. The % of counteroffers decreases over time while the potential sellers' profits offered some what increase over time. These trends suggest that sellers get more attractive terms in first offers over time. Buyers offered a potential higher payoff to the seller so that she does not use the counteroffer. Because of these more attractive gains from trade, sellers used counteroffers in a decreasing fashion. This is the mechanism through which bargaining power affects the distribution of surplus. I explore more in detail the use of counteroffers when I analyze opportunistic behavior and punishment.

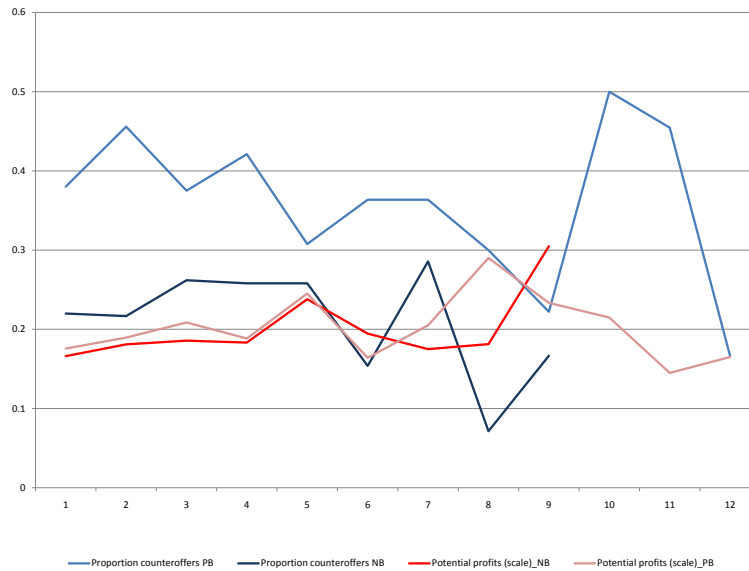


Figure 5: Number of counteroffers and potential sellers' profits in offers

Furthermore, the acceptance rate for offers per period is consistent with the results discussed above. Figure 6 shows the share of offers accepted from period one to period nine in each treatment. The acceptance ratio is not different from the earlier periods (1-5) to later periods (6-9) (Mann Whitney test p-values above

⁴The potential profits are scaled to a range between zero and one such by dividing potential profits by 100, so that they can be plotted in the same graph as the percentage of pairs that used counteroffers.

0.1489). In the first three periods the acceptance rate of the no bargaining treatments is higher than the acceptance rates in the bargaining treatments (0.72 vs. 0.42, MW $p < 0.00$). However, starting in period four acceptance rates decrease in the no bargaining treatments. This may be consistent with the fact that subjects knew that the expected number of periods is five; buyers may have offered less attractive contracts and sellers rejected them if either party had deviated in previous periods.

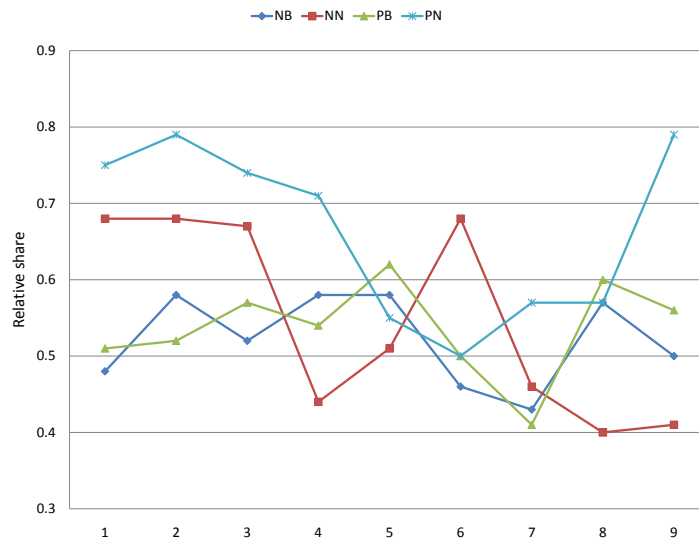


Figure 6: Share of trades accepted per period

The acceptance rate in the bargaining treatments increase slightly from period one to period five, which is consistent with the decrease in the number of counteroffers made in the same periods as shown in figure 6. This result may be explained by the bargaining equilibrium explained above which is also complemented with the low acceptance rate of counteroffers. Figure 6 shows that the counteroffer acceptance rate decreases over time in the NB treatment and is generally lower than the acceptance rate of first offers.

4.3 Efficiency and Welfare

Efficiency is measured by the level of actual quality delivered, which maps directly into the surplus generated. All treatments have the same expected time horizon, therefore, parties should achieve the same surplus and quality levels in all treatments if relational contracts persist in the NB treatment.

Hypothesis 4 states that if relational contracts arise sellers provide higher quality in the bargaining treatments as they become residual claimants of the surplus where as buyers are the residual claimant in the no bargaining treatments. In addition, because in the partial enforcement condition sellers secure the price, sellers exercise a higher bargaining power and are more willing to shirk. Therefore, the average delivered quality is lower in the partial enforcement than in the no enforcement treatments.

Furthermore, the actual quality level and the cost of providing such quality determines the total social surplus and the sum of seller's and buyer's payoffs is defined as total private surplus. In the no bargaining treatments, the sum of seller's and buyer's payoffs equal the total social surplus. However, in the bargaining treatments, because of the possibility of counteroffers, the total social surplus may differ from the total private surplus, i.e. the value of the sum of the parties' payoffs. If the buyer's offer is accepted, bargaining ends and private and social surplus are defined as above. If the buyer's offer is declined, the seller has the opportunity to counteroffer, but the value of the potential payoffs for each party shrinks according to different bargaining factors, which means that total social surplus differs from the sum of parties' payoffs (private surplus).

The predictions for total social surplus follow the same logic as the ones for the actual quality level. If subjects develop relational contracts, sellers supply higher levels of quality in the BP treatments as they become residual claimants of the surplus. As a consequence, a higher level of social surplus is produced in the bargaining treatments relative to the no bargaining treatments. Furthermore, because sellers secure the base price in the partial enforcement treatments, the sellers exercise a higher bargaining power in the PE treatments than in the NE treatments. Then, it is expected that the total social surplus differs more from the total private surplus in the PB treatment than in the NB treatment (hypothesis 5).

Table 4 shows the average actual quality and surplus in all treatments. The non-parametric analysis shows that the actual quality supplied in the NB treatment is significantly higher than all other treatments, which supports Hypothesis 4. However, actual quality is higher in the no bargaining treatment when partial enforcement is in place contradicting hypothesis 4, but a Kruskal-Wallis test did not provide evidence of significant differences ($p=0.4313$) among the average quality provided in the PEBP treatment and the one in the no bargaining treatments (PN and NN). These results suggests that sellers are not exercising too much bargaining power in the NEBP as subjects in this treatment reached a significantly higher quality. These patterns repeat for social surplus. The average social surplus is significantly higher in the NEBP treatment when compared with the other treatments as Hypothesis 4 predicts. In addition, the total social surplus is the lowest in the PEBP treatment but the KW test did not provide evidence of significant differences with

respect to the PENBP and NENBP treatments ($p = 0.4313$).

I further explore these results in table 12, 13 and 14. Table 12 shows results for a censored regression exploring the determinants of actual quality. The explanatory variables include all treatment effects and controls for learning effects and parties' history. All standards errors are clustered at the pair level.

The coefficients for all treatment dummies are significantly different than zero. All control variables affect significantly the actual quality delivered, suggesting that the more the parties have previously earned in the relationship and the longer the relationship the higher the quality delivered. Furthermore, the more periods subjects play the lower the quality provided, suggesting some learning from playing the game.

A Wald test for the equality of coefficients rejects the null hypothesis that the NEBP coefficient equals any of the other treatment dummies coefficients ($p=0.0074$ for NN, $p=0.0046$ for PB and $p=0.0028$ for PN respectively). However, I fail to reject $NN=PB$, $NN=PN$ and $PB=PN$ ($p=0.8525$, $p=0.7175$ and $p=0.8201$, respectively). These estimates confirm the non-parametric test results with respect to actual quality.

Furthermore, Table 13 shows the effect of the presence of bargaining and enforcement separately on the actual quality delivered. The estimation is also a tobit model with actual quality level as dependent variables and the explanatory variables include the presence of bargaining (dummy taking a value of one if PEBP or NEBP and 0 otherwise) and enforcement (dummy takes a value of one if PEBP and PENBP and 0 otherwise) as well as the same control variables as before. The presence of bargaining has a positive effect on the delivery of quality supporting the hypothesis that sellers' provide a higher level of quality in the bargaining treatments because they become residual claimants of the surplus. However, the presence of partial enforcement affects negatively quality provision. The latter result is compatible with the hypothesis that sellers may deviate from contracts more in the presence of partial enforcement because the price is enforced by the computer. This potential behavior may also drive parties to trade at lower levels of quality even when sellers do not deviate. To explore this more in detail, Table 14 shows a summary of average contracted and actual quality as well as the percentage of trades in which actual quality fell short of the contracted quality and the average size of quality deviation across treatments.

Table 14 shows that sellers shirk more in the partial enforcement treatment than in the fully incomplete treatments. More shirking in the PE treatments is consistent with the negative effect that enforcement has on quality provision shown in the actual quality regression in Table 13. The percentage of trades in which actual quality is lower than the contracted quality ranges from 38% in the NB treatment to 47% in the PN treatment; however, a Kruskal-Wallis test cannot reject the null hypothesis that the percentages of trades for which $q < Q$ is the same under all treatments ($p=0.218$).

Regressors	Actual Quality Coefficients/Std Error
NN dummy	2.9624*** (0.7975)
NB dummy	5.1737*** (0.8173)
PB dummy	3.1439*** (0.8238)
PN dummy	2.4196*** (0.8542)
Length of relationship	0.3344** (0.1484)
Buyer previous earnings	0.1286*** (0.0198)
Seller previous earnings	0.1474*** (0.0215)
p3	-0.1570 (0.5263)
p4	-0.7623 (0.6119)
p5	-1.2695* (0.7702)
p6	-2.0479** (0.9253)
p7	-3.0781*** (1.1089)
p8	-3.4827*** (1.2016)
p1	-3.1109** (1.2682)
Sigma	4.5066*** (0.2963)
F(1, 721) statistic for equality of NB and NN coefficients	7.46*** p=0.0065
F(1, 721) statistic for equality of NN and PB coefficients	0.05 0.8195
F(1, 721) statistic for equality of NN and PN coefficients	0.36 p=0.5482
F(1, 721) statistic for equality of NB and PB coefficients	6.93** p=0.0087
F(1, 721) statistic for equality of NB and PB coefficients	10.75** p=0.0011
F(1, 721) statistic for equality of PB and PN coefficients	0.82 p=0.3656
Observations	735
Log pseudolikelihood	-1495.5747

Notes: The estimation for actual quality is a tobit model. Asterisks indicate the significance level of the estimate: * at 10% level, ** at 5% level and *** at 1% level. Standard errors reported are robust and adjusted for clustering on buyer-seller pairs. There were 126 left-censored observations at 1 and 246 right censored observations at 10.

Table 12: Actual quality estimates

Regressors	Actual Quality Coeff./Std Error	Social Surplus Coeff./Std Error	Private Surplus Coeff./Std Error
Constant	-1.5327 (1.7297)	5.8907 (5.1268)	5.8912 (5.1670)
Bargaining dummy	4.2419*** (1.5208)	13.5078*** (4.6709)	10.1526** (4.6378)
Enforcement dummy	-3.1493** (1.4956)	-9.8841** (4.5574)	-7.3918 (4.5364)
Bargaining*enforcement	-3.5786* (1.8468)	-10.7106* (5.7837)	-10.4521* (5.8660)
Length of relationship	0.1511 (0.1175)	0.3427 (0.2419)	0.3173 (0.2361)
Buyer previous earnings	0.1062*** (0.0160)	0.3135*** (0.0451)	0.3444*** (0.0454)
Seller previous earnings	0.1356*** (0.0180)	0.3767*** (0.0454)	0.4005*** (0.0461)
Sigma	4.1128*** (0.2589)		
Observations	735	735	735
Log pseudolikelihood	-1442.6996		
R-squared		0.3551	0.3338

Notes: The estimation for actual quality is a tobit model. There were 108 left-censored observations at 1 and 209 right-censored observations at 10. Estimations for social and private surplus are OLS. Asterisks indicate the significance level of the estimate: * at 10% level, ** at 5% level and *** at 1% level. Additional controls included dummy variables for session-day. Standard errors reported are robust and adjusted for clustering on buyer-seller pairs.

Table 13: Actual quality, social surplus and private surplus estimates

Treatments	Av. contracted quality	Av. actual quality	% of trades where $q < Q$	Av. size of shortfall, $Q-q$
NB	8.57	7.51	0.38	1.06
NN	8	6.41	0.46	1.59
PB	7.71	6.05	0.45	1.66
PN	7.79	6.33	0.47	1.46
All bargaining	8.05	6.63	0.42	1.42
All no bargaining	7.90	6.37	0.47	1.52
All partial enforcement	7.75	6.19	0.46	1.56
All no enforcement	8.24	6.87	0.42	1.37

Table 14: Quality deviation summary statistics

The average size of quality shortfall is the smallest in the NEBP treatment as predicted. Again, a Kruskal-Wallis test cannot reject the null hypothesis that the average size of quality shortfall is the same across treatments ($p=0.1557$). Therefore, the frequency and size of quality deviation characterize all treatments in the same way. Then, even though sellers shirk more in the partial enforcement conditions, shirking is not statistically different among treatments, and therefore shirking does not explain the lower quality provision in the presence of external enforcement.

The results suggest that in the absence of third-party enforceability, even under the pressure of bargaining, repeated interaction achieves an overall higher efficiency. The results support the theory of strategic ambiguity, which suggests that more incomplete contracts are more efficient when barriers to third-party enforcement are high. In the case of our experiments, subjects find more powerful informal incentives when third-party enforcement is not available and when participants have the option to bargain over the terms of the contract.

In addition, Table 13 shows the results of OLS regressions for social surplus and private surplus. Before analyzing these regressions Table 4.3 presents summary statistics on how the average social surplus relates to average buyer's and seller's payoffs and to the average private surplus which is the sum of the private payoffs. Table 4.3 also presents the average loss of private efficiency, which represents the difference between the social surplus and the private surplus. In other words, it represents the private loss that parties incur from bargaining relative to what they could achieve if they were to agree in the first offer.

For both the NN and PN treatments the average social and private surplus are the same as there is no bargaining. However, in the NB and PB treatments the average private surplus is lower than the average social surplus. The average private surplus in the PB treatment is significantly lower than the average private surplus in all other treatments ($MW p = 0.0001$ for NB, $p = 0.0029$ for NN and $p = 0.0070$ for PN) but

Treatments	Av. Social Surplus	Av. Private Surplus	Loss of efficiency due to bargaining	Av. Buyers' payoffs	Av. Sellers' payoffs
Only completed contracts					
NB	37.53	33.29	-0.113	20.90	12.39
NN	32.07	32.07	0	19.57	12.50
PB	30.26	27.79	-0.082	9.63	18.15
PN	31.67	31.67	0	16.75	14.91
All contracts proposed					
NB	25.80	22.80	-0.116	13.28	7.87
NN	19.33	19.33	0	11.80	7.54
PB	22.68	20.82	-0.082	6.24	11.75
PN	21.99	21.99	0	11.63	10.35

Table 15: Social and private surplus summary statistics

it is not significantly different among the remaining three treatments (NB, NN and PN). The average social and private surplus in the NB treatment is consistently higher than all other treatments, but only the social surplus is significantly different than the other treatments. By the same token, the average social and private surplus are the lowest for the PEBP condition; however, it is only significantly different than the other treatments for the private surplus. This result suggests that bargaining and enforcement may have different effects on social and private surplus. The OLS estimation of the social and private surplus in Table 13 gives more details about these observations.

Column two is the estimation for social surplus and column three has private surplus as the dependent variable. The explanatory variables include a dummy to account for the effect of bargaining and a dummy variable for the effect of the enforcement level. Controls for the length of the relationship, buyer's and seller's previous earnings, day of session effects and period dummies are included. The base line is no bargaining and no enforcement, which is analogous to the NN treatment. The effects of primary interest are the coefficients for the dummy variables for the presence of bargaining and partial enforcement.

Bargaining has a positive effect on both the social and private surplus, which is consistent with the hypothesis that bargaining power increases the level of efficiency as sellers become residual claimants. However, the effect is not significant in the private surplus estimation. On the other hand, the enforcement coefficient are significant at 1% level; the more enforcement reduces the level of private and social surplus. This result suggests that when parties engage in relationships that may repeat, more incomplete contracts achieve higher social efficiency and private surplus, consistent with the theory of strategic ambiguity. This analysis confirms the non-parametric tests results and leads to the next result.

Result 4. *Efficiency and social surplus are significantly higher in the NB treatment. When third-party*

enforcement is not available and participants have the option to bargain over the terms of the contract, parties find powerful informal incentives that allow for higher efficiency and surplus if they are able to engage in long-term relationships. Then, when bargaining is available, partial formal enforcement is detrimental to efficiency.

Another important observation is that the average loss of private efficiency is higher under the NB treatment than in the PB treatment, reflecting that contracts for which bargaining was exercised were more used in the NB treatment. Then the significant lower private surplus in the PB condition relative to the NB treatment is explained by the trade of lower quality levels and not because of higher loss of efficiency which contradicts hypotheses 5. The next result follows:

Result 5. *There is a higher loss of private efficiency in NB than in the PB treatment.*

Moreover, the counteroffer acceptance rate was 40% in the NB treatment and 34% in the PB as the summary statistics show in table 4. However, the exercise of bargaining did not translate to higher seller payoffs as on average sellers got higher payoffs under the PB treatments. The lower seller payoffs in the NB treatment may be a reflection of buyers' payment decisions and opportunistic behavior. That is, buyers renege more in the NEBP treatment than in the PEBP treatment. I explore this in the next section.

4.4 Payment behavior and distribution of surplus

After observing the quality provided, buyers decide to pay according to the contract or to pay something different. If sellers provide a higher quality than the one in the contract, buyers could pay a higher bonus in the partial enforcement condition or could pay a higher total payment in the fully incomplete contracts. If the seller supplies a lower quality than the one in the contract or if the buyer decides to deviate from the contract, the buyer can pay a lower bonus in the PE conditions and adjust the total payment to zero in the NE conditions.

Hypothesis 4 states that buyers' total payments are greatest in the bargaining treatments. Furthermore, the total payment is greatest in the partial enforcement condition because the buyer can only adjust downwards the bonus. In addition, the prices are greater in the PB condition than in the PN condition, and the opposite is true for the bonus.

Table 4 shows that the actual total payment is the highest in the NB treatment and the non-parametric analysis gives evidence that it is significantly higher than the total payment in the PB and NN treatments (at the 10% and 5% levels, respectively). The econometric analysis is shown in table 16 shows that all

treatments have a significant effect on the payment outcomes. This analysis confirms the difference between the NB and NN treatments (Wald test $p=0.0306$), but gives no evidence for a significant difference among PB and NB treatments (Wald test $p=0.9406$). It also gives evidence that PN and PB coefficients are significantly different (Wald test $p=0.0104$). This evidence confirms that bargaining treatments lead to higher total payments relative to the corresponding no bargaining treatments as hypothesis 4 states. Note that the total payment made decreases with the number of periods subjects play.

To investigate further the effects of bargaining on actual payments I ran censored models for total payment, price and bonus as dependent variables. The explanatory variables include a dummy for bargaining, a dummy for the enforcement and controls for pairs' history such as current length of the relationship, buyer's lagged earnings and seller's lagged earning. I also control for learning effects by including dummy variables for each period. Table 17 shows the results.

Bargaining has a positive and significant effect on actual total payment and price. This evidence supports hypothesis 4 with respect of the effect of bargaining on payment behavior. Bargaining increases the total payment made and the price paid. Although not significant bargaining has a negative effect on bonuses paid.

Result 6. *Total payments and prices were higher in the bargaining conditions.*

In addition to the efficiency and surplus produced, it is important to analyze the division of the gains from trade between the buyer and the seller. Hypothesis 6 states that in the no bargaining treatments the buyer captures the entire surplus, leaving the seller with only her reservation payoff in each period. In contrast, hypothesis 6 also states that in the bargaining treatments the seller is able to extract the entire surplus through bargaining. Although, in experimental settings, it is common to see that subjects share the surplus to a greater degree than the predicted outcomes derived from a model of rational profit-maximizing agents. In the case of this experiment, buyers should get a higher proportion of the surplus in the no bargaining treatments and sellers in the bargaining treatments. However, in the NB treatment sellers get lower rents than in the PB treatment because if they exercise all bargaining power by extracting all surplus trade breaks down. Then, they are better off by getting lower rents per period but accumulating rents through trade in the long-term.

I measure share of surplus three ways: raw share, truncated share and payoff relative spread. Table 4 shows each of these for the seller. Note that in this experiment, the seller's share of the surplus in the no bargaining treatments (Table 4) is more than the reservation payoff, which contradicts hypothesis 6. These values are consistent with reports from the literature where some sharing occurs in similar situations.

Regressors	Total payment Coefficients/Std Error
NB dummy	34.0903*** (4.0260)
NN dummy	24.6634*** (3.7520)
PB dummy	34.3844*** (3.0906)
PN dummy	26.1379*** (3.2308)
Length of relationship	1.0218** (0.4155)
Buyer previous earnings	0.4892*** (0.0854)
Seller previous earnings	0.8717*** (0.1012)
p3	-2.5365 (2.4148)
p4	-3.4121 (2.5749)
p5	-5.8881* (3.4230)
p6	-10.3953** (4.4203)
p7	-10.7013** (4.5391)
p8	-9.4057* (4.7955)
p1	-8.4115* (4.4910)
Sigma	22.6719*** (0.8155)
Observations	735
Log pseudolikelihood	-3225.0957

Notes: The estimation for actual total payment is a tobit model. Asterisks indicate the significance level of the estimate: * at 10% level, ** at 5% level and *** at 1% level. Standard errors reported are robust and adjusted for clustering on buyer-seller pairs.

Table 16: Total payment

Regressors	Total payment	Price	Bonus
	Coeff./Std Error	Coeff./Std Error	Coeff./Std Error
Constant	24.6634*** (3.7520)	24.8533*** (2.9196)	1.3186 (3.6497)
Bargaining dummy	9.4269** (4.3521)	10.2931*** (2.8731)	-4.0900 (3.5686)
Enforcement dummy	1.4745 (3.7649)		
Bargaining*enforcement	-1.1804 (5.3853)		
Length of relationship	1.0218** (0.4155)	1.1579* (0.5950)	0.1746 (0.6466)
Buyer previous earnings	0.4892*** (0.0854)	0.2307** (0.0903)	0.4591*** (0.1349)
Seller previous earnings	0.8717*** (0.1012)	0.3740*** (0.1048)	0.3248*** (0.1239)
p3	-2.5365 (2.4148)	-6.8210*** (2.0966)	-0.9315 (2.9068)
p4	-3.4121 (2.5749)	-6.5769*** (2.4940)	-1.0035 (2.9148)
p5	-5.8881* (3.4230)	-6.3447* (3.6656)	-2.0598 (4.0867)
p6	-10.3953** (4.4203)	-15.1703*** (3.7461)	-7.1378 (4.8519)
p7	-10.7013** (4.5391)	-13.4672** (5.4322)	-0.7246 (5.6905)
p8	-9.4057* (4.7955)	-18.7800*** (6.1096)	-4.5912 (7.5364)
p1	-8.4115* (4.4910)	-16.3411** (6.6756)	-3.7638 (8.2166)
Sigma	22.6719*** (0.8155)	17.2426*** (0.8636)	18.9888*** (2.1278)
Observations	735	411	411
Log pseudolikelihood	-3225.0957	-1744.4882	-1256.6361
Pseudo R2	0.0326	0.0203	0.0269

Notes: The estimations are tobit models and used observations from period 2 and above. Total payment regression used data from all treatments and had 34 left-censored observations at 0; price and bonus regressions used data only from partial enforcement treatments and have 3 and 149 left-censored observations at 0 respectively. Asterisks indicate the significance level of the estimate: * at 10% level, ** at 5% level and *** at 1% level. Standard errors reported are robust and adjusted for clustering on buyer-seller pairs.

Table 17: Bargaining effect in payments

The truncated seller's share censors the raw share to be in the unit interval. That is, if the payoff of either party is negative, that party's share is set to 0 and the other party's share is set to one. This limits the influence of outliers, which are large in some treatments. This measure of seller's share suggests that sellers receive a lower proportion of the surplus in the no bargaining treatments: 38% and 50% in the NN and PN treatments versus 43% and 64% for the NB and PB. Furthermore, according with this measure sellers also received a lower proportion of the surplus in the NEBP treatment, 43%, while in the PEBP treatment the sellers received a 64% share of the surplus. The sharing amount seems to be correlated with the possibility of bargaining as the truncated sellers' share of the surplus is significantly higher in both bargaining treatments relative to the corresponding no bargaining treatment (Table 4). However, the truncated measure loses additional information due to censoring.

When considering the raw share, the seller's share of the surplus is still greater in the PB condition than in the PN condition, supporting the hypothesis that the presence of bargaining increases the seller's share of surplus. But this is not the case in the fully incomplete conditions: the seller's share is significantly lower in the NB than in the NN. In the absence of any enforcement, bargaining does not increase seller's share of the surplus. But the payoffs relative spread is significantly smaller in the NB than in the NN. The latter result suggests that bargaining does not increase the seller's share of the surplus in the NB but it does decrease the difference in the sellers' and buyers' payoffs. These observations seem contradictory as efficiency is higher in the NB treatment and therefore if the relative spread between parties' payoffs gets smaller, then seller's share of the surplus should increase. A possible explanation may come from differences in the parties' share of the surplus after cooperation and deviation under the NB. As a consequence the enforcement level may have an important effect on how surplus is distributed.

The enforcement level affects positively the share of the surplus that the seller is able to accrue. A MW test gives evidence to reject the hypothesis that the sellers' share in the PB treatment equals the share in the NB treatment ($p = < 0.0000$), and that the share in the NN equals PN ($p = < 0.0000$). In the no bargaining treatments, it seems that the smaller payment deviation that buyers can exercise may explain the difference in sellers' share of the surplus. By the same token, the difference in the sellers' share of surplus among NB and PB may also be explained by the availability of third party enforcement.

Furthermore, the lower sellers' share of surplus in the NB treatment relative to the PB treatment contrasts with the higher proportion of counteroffers that were accepted by buyers, 40% in the NB treatment and 34% in the PB treatment. This evidence is consistent with the fact that a transfer of bargaining power to the seller when formal contract enforcement is non-existent or too costly does not achieve the objective

	PB	NB	Mann-Whitney (p-value)
Offers=363			
Desired quality	7.85	8.81	0.0011***
Desired total payment	61.91	66.09	0.0037***
Actual quality	6.05	7.71	< 0.0001***
Actual Payment	48.79	52.99	0.0086**
Payment shortfall	13.12	13.11	0.0507*
Payment shortfall (median)	5.5	0	
Buyer's payoff	11.68	24.13	< 0.0001***
Seller's payoff	18.55	14.43	0.7899
Social surplus	30.23	38.56	< 0.0001***
Private surplus	30.23	38.56	< 0.0001***
Counteroffers=79			
Desired quality	7.15	7.22	0.9369
Desired total payment	54.67	69.63	0.021**
Actual quality	6.07	6.37	0.6423
Actual Payment	48.73	33.11	0.0224**
Payment shortfall	5.94	36.52	0.0001***
Buyer's payoff	1.20	3.06	0.0535*
Seller's payoff	16.51	1.13	0.0045**
Social surplus	30.39	31.85	0.6423
Private surplus	17.72	4.19	0.0058**

Table 18: Test for enforcement effects

of a greater sellers' share of the surplus.

These results contradicts the achievement of higher efficiency and lower seller's share in the NEBP treatment. The question is how the NB causes higher social and private surplus but sellers were not able to capture a significantly greater share of the surplus. Perhaps, sellers were more timid in using aggressive counteroffers in the NB treatment because of fear of opportunistic behavior by the buyers. Table 4 presents the percentage of counteroffers per treatment. Sellers use counteroffers in only in 24% and 37% of the possible interactions in the NB and PB treatments respectively, while in 51% and 79 % of the times that sellers rejected an offer,they couteroffered in the NB and PB treatments respectively.

In order to control for the effect of enforcement on the sellers' share of the surplus, I compare contracts offered by buyers (first offers) and counteroffers from sellers in the bargaining treatments that resulted in trade. The results are presented in Table 18.

First offers include a higher desired quality than counteroffers in both treatments, but the desired quality is only different between offers and counteroffers in the PB treatment ($p = 0.0026$). In addition, the desired quality level in both offers and counteroffers were higher in the NB than in the PB treatment, however, they are only significantly different for first offers ($p = 0.0011$). In addition, desired total payment

	PB			NB		
	Accepted	Not Accepted	MW (p-value)	Accepted	Not Accepted	MW (p-value)
Offers						
Desired quality	7.85	6.54	0.0001***	8.81	8.33	0.0272**
Desired total payment	61.91	49.19	< 0.0001***	66.09	56.72	0.0004***
Buyer's payoff (Potential)	11.68	16.25	0.0263**	24.13	26.64	0.3937
Seller's payoff (Potential)	18.55	16.479	0.100*	14.43	15.04	0.9053
Social surplus (Potential)	30.23	32.72	0.0871	38.56	41.68	0.103
Private surplus (Potential)	30.23	32.72		38.56	41.68	
Counteroffers						
Desired quality	7.15	6.75	0.4816	7.22	7.63	0.8051
Desired total payment	54.67	58.79	0.1157	69.63	65.98	0.5553
Buyer's payoff (Potential)	1.20	0.871	0.0529*	3.06	1.03	0.0164**
Seller's payoff (Potential)	16.51	22.54	0.0003***	1.13	25.07	< 0.000***
Social surplus (Potential)	30.39	33.75	0.7106	31.85	38.13	0.2021
Private surplus (Potential)	17.72	23.41		4.19	26.082	
<hr/>						
	PN			NN		
	Accepted	Not Accepted	MW (p-value)	Accepted	Not Accepted	MW (p-value)
Offers						
Desired quality	7.80	6.63	0.0012***	8.00	7.52	0.0368**
Desired total payment	57.94	49.54	< 0.0056**	61.72	59.15	0.0757
Buyer's payoff (Potential)	16.75	16.71	0.9225	19.57	16.09	0.034**
Seller's payoff (Potential)	14.91	16.41	0.5341	12.50	21.53	< 0.0000***
Social surplus (Potential)	31.67	33.13	0.4361	32.07	37.62	0.0010***

Table 19: Bargaining effect in all offers

was significantly different among treatments in both offers and counteroffers. However, sellers included a higher desired price only in the NB, but it is not different among offers and counter offers ($p = 0.8133$). Meanwhile the desired total payment is significantly higher for first offers than for counteroffers in the PB treatment ($p = 0.0103$). Consequently, counteroffers in the NB seem to reflect a stronger exercise of bargaining power because for the same level of quality, sellers ask for a higher price relative to the PB treatment. However, the payment shortfall is much higher and significantly different in the NB than in the PB, causing bargaining power to not have much effect on seller's payoffs as sellers earn an average of 14.43 experimental points when the contracts were reached through a first offer relative to 1.13 experimental points when the contracts were made through counteroffers ($p = 0.0002$). In the PB, sellers also got higher payoff through first offers, but they are not significantly different to payoffs made through counteroffers ($p = 0.0951$). Therefore, in the PEBP, the level of enforcement seems to complement the exercise of bargaining power by sellers.

In addition, in Table 19 I examine the difference between contracts that were accepted and those that were not accepted for each treatment. I separate contracts by offers and counteroffers in the case of bargaining treatments and present the potential outcomes for sellers' payoffs, buyers' payoffs and social and private surplus from rejected contracts.

When comparing bargaining treatments, the average terms in the rejected first offers were significantly lower than the terms included in accepted first offers in both treatments. Although the terms in the rejected contracts would only make a difference for the potential buyer's payoff in the PEBP treatment, the result gives some evidence that buyers had to offer a relatively higher payment for a higher quality in order to have sellers to accept the contract which may be caused by the potential threat of bargaining. The difference between the desired quality level among accepted and rejected contracts is 1.31, which would cost the seller an additional 6.55 points to supply. The difference in the desired total payment that buyers offer in the accepted contracts is 12.72 points. Then, buyers offered in average more than the cost needed to supply the additional 1.31 units of quality. The same is true for the NEBP treatment. The average difference in the quality level in the contract is 0.48 which would cost the sellers 2.4 additional points to supply while the buyer offered an additional 9.37 points (almost 4 times the additional cost).

When I perform the same comparison between the no bargaining treatments, I find that the quality difference in the PN treatment is 1.17, which would cost 5.85 points and that the additional payment offered is 8.4 points. In the NN treatment, the difference in the quality level is also 0.48 (cost= 2.4 points), but the difference in the total payment offered is 2.57. Then, the difference in the payments offered relative to the average quality requested are bigger in the bargaining treatments, suggesting that bargaining affects the proposed contracts from the buyer.

When contracts were proposed by the sellers (counteroffers), contract terms in the accepted counteroffers were not significantly different to the rejected counteroffers in terms of social surplus generated or the potential surplus. However, assuming that the parties would cooperate in the rejected contracts, the differences in the terms of the contracts, would lead to a significantly different distribution of surplus in which the sellers would get higher payoffs and the buyers would get lower payoffs. It is interesting to note that the difference in the potential sellers' payoffs is much greater in the NB treatment than in the PB treatment, suggesting that the lower sellers' payoff may come from the opportunistic behavior of the buyers. It is easy to see that accepted counteroffers in the NB included a lower quality for a higher total payment but result in higher payoffs for the seller when contracts were made through offers and not through counteroffers. An explanation for this may be that after sellers exercise their bargaining power by making a counteroffer, the buyer withholds the majority of the total payment giving his ability to adjust the total payment to zero in the fully incomplete condition. Then, the seller's payoff is not only significantly reduced by the bargaining factor applied to the payoffs but also for the lack of payments from the buyer. In contrast, in the PB treatment buyers can only withhold part of the total payment, and as Table 4 shows the majority

of the payment is offered as the enforceable base payment. Therefore, the enforcement of the base price insures the seller can exercise bargaining power and avoid opportunistic behavior which is not the case in the NB treatment.

Moreover, the poor effect that bargaining power has in the NB on the sellers' share of the surplus occurs for two reasons. First, buyers may behave more opportunistically after accepting a counteroffer because of the absence of enforcement which gives them opportunity to withhold the full payment. Second, sellers may also be renegeing and after observing this deviation, buyers punish the sellers by withholding the full payment. In contrast, buyers have less incentive to withhold payment in the PB, because the buyer can only punish by withholding the bonus, which decreases the buyer's potential gains from deviation. Then, the enforcement level complements the seller's bargaining power and allows the seller to get a higher share of the surplus.

Estimation results in Table 20 support the idea that enforcement complements the exercise of bargaining power. The presence of bargaining and more enforcement has positive effects on seller payoffs, although only enforcement has a significant effect. The effect of enforcement and bargaining is also positive on the seller's share of the surplus, but in this case, bargaining also has a significant effect. In addition, bargaining and enforcement have a negative and significant effect on the relative difference between buyer's and seller's payoffs.

The experimental results give evidence that parties share rents in all treatments, contradicting the hypothesis that in the no bargaining treatments buyers claim all surplus and sellers only get reservation payoffs. Furthermore, the combination of bargaining and partial enforcement results in higher seller payoffs and share of surplus while only bargaining does not increase significantly seller payoffs. However, bargaining decreases the difference in payoffs between buyers and sellers when enforcement is fully absent. These results are summarized as follows.

Result 7. *Seller payoffs and share of the surplus are higher than the reservation payoff in the no bargaining treatments. Bargaining decreases the difference between buyer and seller payoffs. Greater enforcement increases seller's rents and share of the surplus, and bargaining increases both if enforcement is in place. Seller payoffs and share of the surplus are the highest in the PEBP treatment.*

Regressors	Seller payoffs			Seller share			Spread in payoffs			Quantile (85)		
	OLS Coeff./ Std Error	Robust reg. Coeff./ Std Error	OLS Coeff./ Std Error	Robust reg. Coeff./ Std Error	Quantile (50) Coeff./ Std Error	Quantile (85) Coeff./ Std Error	OLS Coeff./ Std Error	Robust reg. Coeff./ Std Error	Quantile (50) Coeff./ Std Error	Quantile (85) Coeff./ Std Error	735	735
Constant	2.2943 (2.6694)	-3.1721*** (0.9277)	1.3907*** (0.3365)	0.4666*** (0.0376)	0.5420*** (0.0234)	2.9556*** (0.0260)	-2.0347*** (0.6687)	0.0312 (0.0759)	-0.2063*** (0.0293)	0.0759 (0.2145)	735	2.3719*** (0.2145)
Bargaining dummy	1.1232 (2.3729)	3.4486*** (0.7823)	0.0014 (0.1803)	0.1442*** (0.0317)	0.0387** (0.0194)	0.0000 (0.0205)	-0.3233 (0.3465)	-0.3070*** (0.0640)	-0.1352*** (0.0244)	-0.3070*** (0.1549)	735	-0.7597*** (0.1549)
Enforcement dummy	2.1148 (1.6653)	2.4420*** (0.6846)	0.3450** (0.1677)	0.0410 (0.0278)	0.0387** (0.0170)	0.0000 (0.0189)	-0.6897*** (0.3413)	-0.0815 (0.0560)	-0.1352*** (0.0215)	-0.0815 (0.1302)	735	-0.6665*** (0.1302)
Bargaining*enforcement	3.6011 (2.5486)	-0.7058 (1.0160)	0.3063 (0.2247)	0.0492 (0.0412)	0.0924*** (0.0253)	0.1111*** (0.0283)	-0.3004 (0.4353)	-0.0817 (0.0832)	-0.0979*** (0.0318)	-0.0817 (0.1945)	735	0.3974** (0.1945)
Actual quality	0.6810*** (0.2549)	2.1524*** (0.0870)	-0.1718*** (0.0314)	-0.0145*** (0.0035)	-0.0206*** (0.0022)	-0.2463*** (0.0034)	0.3539*** (0.0624)	0.0310*** (0.0071)	0.0571*** (0.0027)	0.0310*** (0.0178)	735	-0.0784*** (0.0178)
Buyer previous earnings	0.0573 (0.0560)	0.0712*** (0.0182)	-0.0002 (0.0049)	0.0002 (0.0007)	-0.0022*** (0.0005)	-0.0074*** (0.0006)	0.0029 (0.0098)	-0.0004 (0.0015)	0.0058*** (0.0006)	-0.0004 (0.0046)	735	-0.0065 (0.0046)
Seller previous earnings	0.3710*** (0.0724)	0.0851*** (0.0206)	0.0217*** (0.0062)	0.0027*** (0.0008)	0.0075*** (0.0005)	0.0111*** (0.0006)	-0.0407*** (0.0124)	-0.0048*** (0.0017)	-0.0151*** (0.0006)	-0.0048*** (0.0047)	735	-0.0169*** (0.0047)
Length of relationship	0.0612 (0.1926)	-0.0710 (0.2131)	0.0225 (0.0212)	-0.0004 (0.0086)	-0.0029 (0.0053)	0.0000 (0.0046)	-0.0551 (0.0435)	0.0000 (0.0174)	0.0018 (0.0068)	0.0018 (0.0395)	735	0.0024 (0.0395)
Observations	735	735	735	735	735	735	735	735	735	735	735	735
R-squared	0.1659		0.1544		0.0223	0.1679	0.1603		0.0237		0.1210	
Pseudo R2												

Notes: Columns one, three and seven are OLS estimations with seller's payoff, seller's share and payoff spread as dependent variables respectively. Columns two, four and eight are robust regressions for the same dependent variables. Columns five, six, nine and ten are median and 85 quantile regressions respectively. Asterisks indicate the significance level of the estimate: * at 10% level, ** at 5% level and *** at 1% level. Additional controls are quality level delivered, the current length of the relationship, buyer and seller payoffs and dummies for each period (not included in output). Standard errors reported are robust and adjusted for clustering on buyer-seller pairs for the OLS estimations.

Table 20: Distributional outcomes

4.5 Cooperation, opportunistic behavior, punishment and bargaining

Hypothesis 3 states that more cooperative outcomes are observed in PB, PN and NN treatments than in the NB treatment. If parties agree to trade, cooperation is defined as both parties meeting their obligations according to the agreed contract. Table 4.5 shows that cooperation is significantly higher in the NB treatment than in the other treatments. Cooperation levels across the other three treatments are not different from one another.

These results contradict hypothesis 3 because as sellers exercise bargaining power in the NB treatment, trade was predicted to break down more often. However, the result is consistent with the fact that if parties use informal incentives to maintain a relationship in which parties share rents more equally, then the rate of cooperation may be higher in the NB treatments than in the other treatments.

Following the theoretical model and the parameters used, cooperation is an equilibrium outcome for all treatments but the NB treatment if sellers exercise maximal bargaining power available. Therefore, an underlying assumption of the theoretical model is that cooperation should occur from the initial period of the partnership in the NN, PB and PN treatments. That means that a greater number of trades relative to total offers should be observed in these three treatments than in the NB treatment as well as more cooperative outcomes with respect to parties meeting contract terms. Furthermore, greater contract acceptance and cooperation should be observed in the no bargaining treatments than in the bargaining treatments as subjects may test the use of bargaining in the initial periods even though theoretically a counteroffer should only be observed off the equilibrium path.

To analyze this I look at initial cooperation by restricting the data to include those partnerships that exhibit cooperation in the first period. Full initial cooperation is defined as the seller accepting the buyer's offer (does not counteroffer in the BP treatments) followed by both parties meeting the contract obligations in the first period of the partnership (regardless of actions in later periods). Only 67 pairs out of 297 pairs in the data met this criterion. Note that this partition of data is shown in Table 4.5 and it includes counteroffers and their outcomes from period two and after.

Among initial cooperators, there is not a significant difference in contract terms and outcomes between the bargaining and the no bargaining treatments within the same enforcement level. However, initial cooperators within the same bargaining conditions obtain significantly different results across enforcement regimes. Although contract terms used by initial cooperators between NB and NN and between PB and PN are not significantly different, all outcomes but buyer payoffs are significantly higher in the no enforcement conditions than in the partial enforcement regimes. The contracted and actual quality levels are still lower

than the theoretical prediction of 10 (Wilcoxon test results in a significant difference at standard levels), however, initial cooperators are able to achieve higher levels of efficiency and a more even distribution of the surplus in the complete absence of third party enforcement than when there is partial third-party enforcement for the same bargaining condition. The higher level of efficiency results in a higher surplus which allows parties to redistribute the gains from trade in way that gives higher payoffs for the sellers without changing buyer payoffs. Furthermore, the difference between social and private surplus in the bargaining treatments is minimal among cooperators, suggesting that sellers that are engage in a cooperative relationship rarely resort to the use of counteroffers.

The achievement of greater efficiency and better outcomes among cooperators in the absence of third party enforcement supports once again the theory of strategic ambiguity. In the absence of formal enforcement, parties use cooperation and good faith (informal incentives) to achieve higher efficiency than when there is some formal enforcement.

In addition, Table 4.5 shows that initial cooperators are able to achieve higher efficiency and average payoffs for sellers and buyers across experimental regimes than those that do not cooperate in the first period of the relationship. The difference between social and private surplus is higher among non-cooperators than among cooperators, which suggests that sellers in pairs that initially did not cooperate exercised greater bargaining power than those sellers in pairs that initially cooperated. The lower average social surplus among non-cooperators reduces the average payoffs for both sellers and buyers. Although the difference in buyer and seller payoffs between cooperators and non-cooperators is significant at standard levels, sellers within the group of subjects that did not initially cooperate, present a higher drop in their average payoffs than the buyers in the no enforcement treatments. This result suggests that buyers in pairs that did not cooperate initially withheld an important proportion of the total payment and that allowed them to keep a greater proportion of the available surplus. Then, absent of third-party enforcement, bargaining did not assure a higher payment for the seller. In fact, regardless of the significantly higher social efficiency in the NB, neither seller or buyer average payoffs were different between the bargaining and no bargaining treatments when contract enforcement was absent and when parties did not initially cooperate. This follows from the fact that private surplus is not different between NB and NN among non-cooperators.

In contrast, in the presence of bargaining and partial enforcement, a higher proportion of the efficiency loss translates into a greater drop in buyer payoffs. Within non-cooperators bargaining insures sellers against a higher drop in payoffs relative to buyers, through achieving a safer payments structure with a higher base payment which is third party enforceable (average contracted price was 37.48 and average contracted bonus

	Means				Mann-Whitney (p-values)			
	NB	NN	PB	PN	NB vs. NN	NB vs. PB	NN vs. PN	PB vs. PN
Initial cooperation								
Av. contracted quality	9.12	8.96	8.79	8.37	0.6990	0.4836	0.0989	0.2462
Av. actual quality	9.10	8.77	7.63	7.92	0.5446	0.0124**	0.0226**	0.7522
Av. contractual payment	70.14	67.74	66.58	62.82	0.6877	0.2123	0.1186	0.5063
Av. actual payment	67.46	64.83	58.33	57.21	0.3030	0.0061**	0.0065**	0.9433
Av. buyer's payoffs	21.42	22.91	17.52	21.99	0.1160	0.3394	0.2006	0.2010
Av. seller's payoffs	22.01	20.96	20.01	17.61	0.7067	0.0167**	0.0437**	0.7473
Av. surplus	45.5	43.87	38.15	39.6	0.5446	0.0274**	0.0226**	0.7522
Av. private surplus	43.42	43.87	37.53	39.6	0.3474	0.0291**	0.0226**	0.5603
No initial cooperation								
Av. contracted quality	8.35	7.74	7.24	7.39	0.0051**	0.0005**	0.4136	0.7186
Av. actual quality	6.87	5.78	5.36	5.22	0.0012***	< 0.000***	0.1020	0.7572
Av. contractual payment	65.24	60.09	57.83	54.53	0.0041***	0.0002***	0.0163**	0.2279
Av. actual payment	42.98	39.09	44.59	39.15	0.1583	0.8834	0.8865	0.0371**
Av. buyer's payoffs	20.69	18.66	6.18	13.09	0.2449	< 0.000***	0.0030***	0.0000***
Av. seller's payoffs	8.57	10.21	17.34	13.03	0.4744	0.0227**	0.1005	0.0132**
Av. surplus	34.37	28.88	26.50	26.12	0.0012***	< 0.000***	0.1020	0.7572
Av. private surplus	29.26	28.88	23.52	26.12	0.3414	0.0005***	0.1020	0.1281
Initial coop vs. No initial coop within treatment								
Av. contracted quality	0.0724	0.0001***	< 0.000***	0.0019***				
Av. actual quality	< 0.000***	< 0.000***	< 0.000***	< 0.000***				
Av. contractual payment	0.3170	0.0002***	< 0.000***	0.0001***				
Av. actual payment	< 0.000***	< 0.000***	< 0.000***	< 0.000***				
Av. buyer's payoffs	0.0192**	0.0069**	< 0.000***	< 0.000***				
Av. seller's payoffs	< 0.000***	< 0.000***	0.0017***	< 0.000***				
Av. surplus	< 0.000***	< 0.000***	< 0.000***	< 0.000***				
Av. private surplus	< 0.000***	< 0.000***	< 0.000***	< 0.000***				

Table 21: Initial cooperation

was 20.35). Then, the seller receives a lower punishment from the buyer if he defects or a lower impact from the buyer's deviation because the buyer was only able to withhold the bonus. This contrasts with the case of partial enforcement and no bargaining, in which non-cooperators achieve a more even distribution of surplus relative to the case of bargaining, where buyers get significantly greater payoffs and sellers get significantly lower payoffs with respect to PB. Despite the more even distribution of surplus, efficiency and payoffs are significantly lower than the same outcomes achieved by initial cooperators.

The pattern of higher efficiency in the no enforcement treatments relative to the partial enforcement treatments is also consistent among the non-cooperators when bargaining is present. However, even though social surplus is significantly higher in the NB treatment than the PB treatment, the distribution of the private surplus is quite different. Among non-cooperators, bargaining affects the distribution of the surplus as buyers get significantly higher payoffs when enforcement is totally absent and sellers get significantly higher payoffs when partial enforcement is in place. A possible explanation is that among non-cooperators bargaining triggers more opportunistic behavior and buyers are able to defect more when enforcement is absent. Furthermore, sellers get higher payoffs than buyers when partial enforcement is in place because sellers are able to renege and suffer a lower possible punishment. The actual total payment in the partial enforcement treatment with bargaining is significantly higher than when there is no bargaining. This again results from the structure of the contract in which the bulk of the payment is allocated to the enforceable base payment. Then, among non-cooperators when bargaining is present, the enforcement level reinforces the opportunities for deviation or punishment, for buyers in the no enforcement treatment and for sellers in the partial enforcement treatment.

Additionally, among non-cooperators in treatments with no enforcement, parties only reach higher efficiency when bargaining is an option. Among no bargaining treatments, there is no difference in efficiency across enforcement regimes. A possible explanation is that non-cooperative parties are obligated to cooperate more when bargaining is an option. Therefore, among non-cooperating parties, the theory of strategic ambiguity holds when bargaining puts pressure on the relationship.

Result 8. *Cooperation is the highest in the NB treatment. Cooperators use informal incentives and achieve higher efficiency and a more even distribution of surplus in the absence of formal enforcement. Among non-cooperators when bargaining is present, the enforcement level reinforces the opportunities for deviation or punishment, for buyers in the no enforcement treatment and for sellers in the partial enforcement treatment. Then, bargaining affects the distribution of the surplus such that buyers get significantly higher payoffs when enforcement is totally absent and sellers get significantly higher payoffs when partial enforcement is in place.*

Parties may not cooperate in several ways. Given the bargaining game in the model, full cooperation is defined as parties agreeing on contract terms through a buyer's offer and both parties meeting contract obligations. Following this definition, parties do not cooperate either if sellers use counteroffers or if either buyer or seller deviates from the relational contract. If the buyer offers the seller a contract which would not give her high enough payoffs, she may reject the contract and not trade in the no bargaining treatments or counteroffer in the bargaining treatments.

Furthermore, subjects deviate from the agreed contract either because they behave opportunistically or because they are punishing the trading partner for previous deviations. If a buyer defects by renegeing on the promised discretionary payment (either bonus or full payment) after the seller has supplied the promised quality, then the seller may punish the opportunistic behavior from the buyer in the subsequent periods. If the seller deviates and supplies a lower quality than promised, then the buyer may punish the seller in the current and subsequent periods. Punishment can take various forms depending on which party is penalizing. If the seller has deviated, the buyer can withhold the bonus in partial enforcement treatments or the full discretionary payment in the no enforcement treatments. This punishment from the buyer's side is predicted in the theoretical model as it is included in dynamic compatibility constraint which allows parties to sustain a relational contract.

In addition, if either party deviates, punishment may be observed as a no exchange in future periods (termination of the relationship) or continuing trading on less favorable terms including more deviation. The theoretical model provides predictions with respect to both forms of punishments. In the full absence of enforcement treatments (NB and NN) and in the PB treatment, any deviation leads to a termination of the relationship and no future trade. Theoretically, after a deviation the buyer cannot promise any payment nor can the seller promise delivery of any quality higher than the minimum level. In the partial enforcement treatment with no bargaining, the model predicts that parties keep trading by using only the base payment as a formal incentive (as it is enforceable). Although the buyer can promise a base price after any deviation, the seller can not promise quality higher than the minimum level, therefore parties trade using less favorable terms, specifically the lowest level of quality and the minimum base payment that meets the seller's participation constraint.

Table 22 presents a comparison of the seller's acceptance rate and counteroffer use following periods in which the seller performed as promised and the buyer either conformed by paying what was promised or deviated by paying less.

The differences among treatments in seller's use of punishments seems to be consistent with the model

	NB	PB	NN	PN
Buyer performed	0.75	0.72	0.85	0.88
Buyer deviated	0.42	0.47	0.60	0.70
Counteroffer Buyer performed	0.13	0.18	na	na
Counteroffer Buyer deviated	0.25	0.31	na	na

Table 22: Seller's Subsequent Acceptance Rates and Use of Counteroffers Indicating Punishment

predictions. In treatments NB and NN, the prediction is no exchange after observing a deviation. The sellers' acceptance rate after a buyer deviation is lower than the acceptance rate after buyer performance. This result is also consistent with the fact that sellers counteroffer more when the buyer deviates in comparison to when the buyer performs. The use of counteroffers after deviation is smaller in the NB treatment than in the PB treatment, which again is consistent with a lower exchange in the fully incomplete contract treatment than in the partial enforcement treatment. That is, parties resort to termination instead of counteroffering and engaging in trade. In contrast, in the PN treatment, the prediction is that parties trade under less favorable terms. In both PN and PB, the difference in seller acceptance rates is smaller which suggests that sellers used termination less in these treatments.

However, this comparison does not include the fact that contracts used after deviation may be less attractive to seller. I estimate a probit model for the probability of the seller accepting a contract and using a counteroffer (when it is possible) in periods after the seller has performed as promised (Table 23). The explanatory variables for the probability of seller acceptance included the terms of the contract offered by the buyer (price, bonus and quality level), dummy variables for treatment effects, seller earnings in the previous period, duration of the relationship at that point and a dummy variable for whether the buyer deviated from the contract in the period before. The effect of primary interest is for the latter variable, which is also interacted with dummy variables for the treatment. The dummy variable for PN is dropped and it becomes the baseline for comparison. In the case of the probability of using a counteroffer, the observations used are limited to the bargaining treatments, and the explanatory variables included were the same as for the probability of seller's acceptance, with the exception that it only included a dummy for the NB treatment and the PB became the baseline for comparison. The variable of interest is a dummy variable indicating whether the buyer deviated in the previous period, which is also interacted with the NB dummy variable. I control for learning effects by including dummy variables for each period from one to eight and thereafter.

Regressors	Probability of accepting contract	Probability of using counteroffer
	Coefficients/Std Error	Coefficients/Std Error
Constant	-0.0022 (0.3383)	0.4334 (0.8482)
Contracted price	0.0418*** (0.0098)	-0.0442*** (0.0154)
Contracted bonus	0.0291*** (0.0100)	-0.0380** (0.0153)
Contracted quality	-0.1520** (0.0676)	0.1265 (0.1034)
NB dummy	-0.7907*** (0.2952)	-0.2293 (0.2767)
Buyer previous deviation	-0.4349 (0.3605)	0.4062 (0.3621)
NB*Buyer deviation	0.2935 (0.6598)	-0.2669 (0.7412)
NN dummy	-0.5343* (0.2975)	
NN*Buyer deviation	0.0977 (0.4470)	
PB dummy	-0.8783*** (0.2522)	
PB*Buyer deviation	0.1915 (0.4332)	
Seller previous earnings	0.0171*** (0.0056)	0.0004 (0.0086)
Length of relationship	0.1127** (0.0483)	0.1420 (0.3620)
Observations	409	194
Log pseudolikelihood	-190.3251	-91.333943
Pseudo R2	0.1973	0.1750

Notes: Estimation are probit models with a dummy that takes value of 1 if the contract was accepted or counteroffer was used respectively and zero otherwise as dependent variables respectively. Asterisks indicate the significance level of the estimate: * at 10% level, ** at 5% level and *** at 1% level. Additional controls are current length of the relationship, seller payoffs and dummies for each period. Standard errors reported are robust and adjusted for clustering on buyer-seller pairs. Both estimations use subdata for only offers made by buyers. In addition, estimation for probability of counteroffers limits data to bargaining treatments.

Table 23: Probability of seller's acceptance

	NB	PB	NN	PN
Seller performed	0.11	0.25	0.33	0.23
Seller deviated	0.93	0.94	0.94	0.93
Seller performed after counteroffer	0.65	0.51	na	na
Seller deviated after counteroffer	1	0.80	na	na

Table 24: Fraction of Buyer's Withholding Payment Indicating Punishment

Higher payment terms increase the probability of the seller accepting the contract and decrease the probability of the seller counteroffering in the bargaining treatments. None of the estimated coefficients for the buyer's deviation were significant and a Wald test did not reject that all coefficients related to this variable in both regressions were jointly equal to zero ($p=0.5707$ and $p=0.5329$ respectively). These results contradict the assumption that sellers use rejection and counteroffers to punish deviating buyers. If rejecting offers or using counteroffers are not a credible threat then buyers have more incentives to withhold payments even after satisfactory seller performances. This behavior weakens the effectiveness of the use of informal incentives to achieve higher quality outcomes. In addition, the opportunity of a counteroffer decreases substantially the probability of the seller accepting a contract offered by a buyer. This result suggests that sellers use rejection to exercise bargaining power more than to punish deviating buyers.

Table 24 compares the buyers' decision to withhold promised payments, depending on whether the seller delivered contracted quality or not and if the contract was made through an offer or a counteroffer.

As expected, buyers withheld discretionary payments more frequently after deviation by the seller than after conforming behavior in all treatments when contracts where offers and counteroffers. However, buyers withheld payments more often when the seller's performance was observed in contracts derived from counteroffers. This result suggests that buyers withheld payments as a mean to punish sellers for exercising bargaining power. Furthermore, the amount of payment withheld was more severe in the fully incomplete treatment than in the partial enforcement treatment. This suggests that seller were more successful in exercising bargaining power in the partial enforcement treatments than in the fully incomplete treatments.

In order to analyze buyer behavior more fully, I estimated a probit model for the probability of the buyer paying less than what was promised. Each buyer should weight his expected payoffs in future periods under the relational contract and compare it to the short-term gains from deviating from the promised payment and then receiving stage payoffs in all other periods.

To estimate this I include as explanatory variables the buyer's value for the quality actually delivered by the seller in the current period, the promised price and bonus, dummy variables for treatment effects,

with PN as the baseline for comparison, a dummy variable for whether the seller shirked and a dummy variable for whether the contract was reached through an offer or not. I also included variables to capture partnership history, such as the buyer's prior period profits and the duration of the relationship. I control for learning effects by using dummy variables for each period.

Table 25 presents the results of this estimation. The estimates for $V(Q)$, price, bonus and seller's previous deviation are all significant and have the expected direction. These coefficients suggest that buyers actually respond to the terms of the contract and that seller performance acts as an indicator for future gains from the relationship. The higher the quality delivered the lower the incentive the buyer has to deviate. In contrast the higher the promised payment the higher the probability that the buyer withhold some of that payment. More importantly, the results indicate that buyers withhold discretionary payments as a response to seller shirking and withhold the payments less often when the seller accepted the offer instead of using a counteroffer. Furthermore, the theoretical predictions suggest that the buyer behaves more opportunistically in the fully incomplete treatments and especially in the NB treatment as cooperation is not an equilibrium for the parameters used if sellers exercise full bargaining power. A Wald test rejects the hypothesis that all the treatment effects were equal ($p=0.0329$). This result is consistent with the findings that indicate that the sellers did not use rejection as a punishment mechanism but more as a bargaining mechanism. If buyers expect that sellers will not increase rejection rates in response to withholding of payment behavior, then there is not much difference in the stage games among treatments. However, withholding payment is consistent with the use of counteroffers from the seller.

Additionally, buyers could punish seller's deviation by terminating the relationship. However, as table 4 shows, buyers offer contracts to sellers in almost all possible interactions. The few times that buyers did not offer contracts to sellers were mostly after no trade was performed. This suggests that buyers do not withhold offers as a response to seller deviation. Therefore, terminating the relationship does not seem to occur as the theoretical model assumes for the NB and NN treatments.

Buyers can also punish sellers for low performance by offering contracts with less attractive terms. In the partial enforcement treatments, after a deviation, parties can only credibly trade the lowest level of quality in exchange for a fixed price that satisfies the seller's participation constraint.

Table 26 compares the terms of offers and counteroffers made in periods following cooperation by both parties and deviation by one or both parties. Note that there were very few observations (37 out of 403, 9%) in which after a seller's deviation that the buyer did not withhold the discretionary payment. This is consistent with the previous observation that buyers withheld payment to punish seller deviations.

Regressors	Probability of buyer withholding payments Coefficients/Std Error
Constant	0.3021 (0.3906)
Buyer's value for Q delivered (V(Q))	-0.0327*** (0.0080)
Contracted price	0.0237** (0.0112)
Contracted bonus	0.0480*** (0.0108)
NB dummy	-0.2357 (0.2442)
NN dummy	0.4549 (0.2801)
PB dummy	-0.0236 (0.2237)
Seller shirked	1.6076*** (0.1685)
Offer dummy	-0.4330 (0.2774)
Buyer's previous earnings	-0.0088* (0.0048)
Length of relationship	0.0136 (0.0486)
Observations	735
Log pseudolikelihood	-259.41373
Pseudo R2	0.4865

Notes: Estimation is a probit model with a dummy that takes value of 1 if buyer withholds payments and zero otherwise as dependent variable. Asterisks indicate the significance level of the estimate: * at 10% level, ** at 5% level and *** at 1% level. Additional controls are current length of the relationship, buyer's payoffs and dummies for each period. Standard errors reported are robust and adjusted for clustering on buyer-seller pairs.

Table 25: Probability that a buyer withhold payment

The subset of data in table 26 shows consistent patterns across treatments. Offered quality and total payment decrease after any deviation compared to contracts offered after periods where cooperation is observed. Across all treatments, quality requests drop the most after sellers conformed but buyers shirked. When only buyers deviate the total payment proposed drops the most in the bargaining treatments, while in the no bargaining treatments total payment drops the most when it is only the seller who deviated. These observations may be the result of the difference in bargaining power. In the no bargaining treatments the buyers, after a seller's deviation, offer the sellers less attractive contracts than when it was the buyer that deviated. This is consistent with punishing the deviating seller by offering contracts with less attractive terms of trade after a deviation. In contrast in the bargaining treatments, after a seller's deviation, the buyer may feel the need to provide more incentives and therefore more attractive contract terms to entice the seller to performing and forgo the use of counter offers. Then, the presence of bargaining power may serve as insurance for deviating sellers against buyer's punishment via less attractive terms.

In the partial enforcement treatments, the structure of compensation also changes depending on previous behavior. In PB and PN, the price decreases and the bonus increases after any deviation. The different balance between price and bonus may be seen as the buyer adjusting payments between formal and informal incentives. After any deviation, then, contracts reflect more informal than formal incentives. This is especially true when both parties have deviated as the price is the lowest and the bonus is the highest, regardless of the bargaining condition.

Table 27 presents an econometric investigation of how offer terms change following buyer or seller deviations. All regressions are tobit estimations for offered quality, offered total payment, offered price and offered bonus respectively. The estimations for offered price and bonus only include observations for the partial enforcement treatments in which the price and bonus have different enforcement levels. In all estimations the regressors included dummy variables for treatment effects (only PB in the offered price and bonus estimations), dummy variables for whether the buyer and the seller shirked in the previous period and deviation dummies interacted with treatment effects. I also control for partnership history by including the length of the relationship, buyer's previous earnings and period dummies.

In general, the results are consistent with the observations made in table 26. The requested quality decreases after a deviation by the buyer while the coefficient for seller deviation is positive but insignificant at standard levels showing no significant correlation with the seller's previous behavior. Variation in the offered total payment does not seem to correlate much with parties' previous behavior, only in the NB treatment when sellers shirk, in which case the payment is higher than in the PN case.

Treatment	Previous Period behavior	n	Q	Price	Contract terms	
					Discretionary payment	Total payment
NB Offer	Cooperation	65	9.11	42.82	24.77	67.59
NB Offer	Only buyer deviates	11	7.55	37.73	13.64	51.36
NB Offer	Only seller deviates	1	10	50	30	80
NB Offer	Both parties deviate	51	8.67	42.78	20.41	63.20
NB Counter	Cooperation	1	4	50	25	75
NB Counter	Only buyer deviates	10	8.40	46.50	21.40	67.90
NB Counter	Only seller deviates	4	4.75	47.50	20.50	68
NB Counter	Both parties deviate	10	7.70	52.50	20.70	73.20
NN Offer	Cooperation	72	9.43	47.64	21.88	69.51
NN Offer	Only buyer deviates	40	7.28	40.13	17.13	57.25
NN Offer	Only seller deviates	5	8	28	24	52
NN Offer	Both parties deviate	83	7.34	44.49	15.17	59.66
PB Offer	Cooperation	82	8.56	45.71	19.05	64.76
PB Offer	Only buyer deviates	35	6.37	26.51	23.46	49.97
PB Offer	Only seller deviates	5	6.8	38	24.20	62.20
PB Offer	Both parties deviate	92	7.14	25.22	31.32	56.53
PB Counter	Cooperation	3	7	48	6.67	54.67
PB Counter	Only buyer deviates	18	7.22	43.78	20.83	64.61
PB Counter	Only seller deviates	15	6.07	37.47	10.73	48.20
PB Counter	Both parties deviate	36	6.67	42.22	15.69	57.92
PN Offer	Cooperation	80	8.49	36.05	25.75	61.80
PN Offer	Only buyer deviates	23	6.30	25.61	26.70	52.30
PN Offer	Only seller deviates	7	7.43	25.71	23.57	49.29
PN Offer	Both parties deviate	94	7.19	24.01	28.80	52.81

Notes: Only buyer deviates means that the buyer pays a lower payment than promised. Only seller deviates means that the seller supplies a lower quality than promised. Both parties deviate means that both parties pay or supply lower payment and quality than promised.

Table 26: Contract terms after deviation and cooperation

Regressors	Offered quality	Offered total payment	Offered price	Offered bonus
	Coeff./Std Error	Coeff./Std Error	Coeff./Std Error	Coeff./Std Error
Constant	7.8674*** (0.7319)	50.8274*** (2.8177)	27.2007*** (2.4049)	24.3385*** (2.6135)
NB dummy	1.9570** (0.7588)	7.8191** (3.6756)		
Seller shirked dummy	0.1451 (0.3611)	-0.6291 (3.0916)	1.3607 (1.9102)	-1.7485 (3.0872)
NB*Seller shirked	-0.3095 (0.5353)	0.0921 (3.8829)		
NN dummy	0.5883 (0.7812)	6.6665* (3.5346)		
NN*Seller shirked	-0.4985 (0.5164)	-0.9440 (3.6102)		
PB dummy	0.1240 (0.7572)	2.9134 (3.6623)	6.6447** (2.9811)	-2.6603 (3.7103)
PB*Seller shirked	0.5310 (0.5027)	3.8293 (3.5491)	-1.7885 (2.3254)	5.8340* (3.4750)
Buyer's previous earnings	0.0604*** (0.0135)	0.2407*** (0.0485)	0.3501*** (0.0848)	0.0318 (0.0707)
Length of relationship	-0.0335 (0.1474)	-0.0978 (0.7025)	0.1704 (0.7614)	-0.7931 (1.0686)
p3	0.0474 (0.3438)	1.7999 (1.5188)	-3.4401* (1.7661)	5.5446*** (1.9564)
p4	-0.1217 (0.4316)	0.8713 (2.0133)	-6.2784*** (2.4251)	2.8637 (2.6824)
p5	0.2457 (0.5965)	5.7368** (2.9189)	-5.9290* (3.3754)	9.7851** (4.5340)
p6	-1.2290 (0.7789)	-3.2902 (3.4238)	-13.3041*** (4.3873)	4.5801 (5.4337)
p7	-0.7591 (0.9400)	-2.0343 (4.2233)	-12.3469** (5.5373)	11.1608 (6.9111)
p8	0.0378 (1.1051)	2.3615 (4.9571)	-13.6689** (5.8068)	19.9566* (10.3600)
p1	0.2804 (1.3828)	3.6600 (6.5377)	-10.6762 (7.2091)	17.3268* (9.9484)
Sigma_cons	4.1392*** (0.2465)	21.2662*** (0.9304)	18.3381*** (0.8295)	22.8275*** (1.6985)
Observations	1156	1156	617	617
Log pseudolikelihood	-2238.8042	-5151.396	-2593.4998	-2705.9213
Pseudo R2	0.0237	0.0084	0.0206	0.0057

Notes: Estimations are tobit models. In the offered quality estimations there were 46 left-censored observations at 1; in the offered total payment, offered price and offered bonus there were 7, 24 and 29 left-censored observations at 0; there was 1 right-censored observation at 170 in the offered total payment estimation. Asterisks indicate the significance level of the estimate: * at 10% level, ** at 5% level and *** at 1% level. Additional controls are current length of the relationship, buyer's payoffs and dummies for each period. Standard errors reported are robust and adjusted for clustering on buyer-seller pairs.

Table 27: Offers terms after deviation

Finally, there is not much evidence either that parties' previous behavior affects the price and bonus offered. Note that a buyer's previous earnings correlates positively with the total payment, quality and price offered in the following period, and these results are statistically significant. It also relates in the same way with the bonus offered but the coefficient is not significant at standard levels.

Table 28 compares the outcomes of parties' exchange in periods after cooperation or deviation behavior. As before, the buyer generally withholds payment if the seller deviated. The actual quality delivered and total payments were lower after periods in which deviation was observed than after periods when parties cooperated. The theoretical model predicts that after any deviation exchange should cease in the fully incomplete treatments. However, subjects manage to keep trading in all treatments after deviation, under less attractive terms and achieving a lower social and private surplus.

Table 29 presents the results of the econometric analysis of the exchange outcomes following cooperation or deviation by one or both parties. The first column shows a tobit estimation for actual quality delivered. The second column shows an OLS estimation for seller share over all treatments. Explanatory variables included dummy variables for treatment effects with PN as a baseline for comparison, variables describing deviation behavior from each party in the previous period and interacted terms. Finally, I include variables related to partnership history such as length of the relationship and seller and buyer earnings in the period before and dummy variables for each period.

The results are consistent with patterns observed in Table 28. Actual quality falls following buyer deviation. Furthermore, a Wald test rejects the null hypotheses that the total effects of buyer deviation on actual quality is zero ($p=0.0001$). Additionally, although seller deviation does not seem to affect the delivery of quality, a Wald test rejects the null hypothesis that the total effect of seller deviation is zero ($p=0.065$).

Moreover, column two gives some evidence about how surplus is distributed between parties after deviation or cooperation. Although the coefficients for dummies indicating previous deviation from the buyer and the seller have the right sign, they are not significant; hence, the results do not support the hypothesis that parties punish by redistributing the surplus away from the deviating party. In fact, in the NB treatment the interaction with these variables tells the opposite story. When the buyer has deviated in the previous period the seller's share of the surplus significantly decreases while if it is the seller who has deviated in the previous period, the seller's share of the surplus increases. These observation may support the argument that deviation may be used by parties as a means to exercise their bargaining power. If the buyer deviated in the period before as a show of bargaining power, in the next period he gets a higher share of the surplus. In contrast, when in the period before the seller deviated, then the buyer shares more

Treatment	Previous Period behavior	n	Exchange	q	Price	Discretionary payment	Total payment	Surplus	Private Surplus	Buyer payoffs	Seller payoffs	Seller share
NB	Cooperation	52	0.69	9.19	41.65	24.69	66.35	45.96	43.44	23.07	20.38	0.49
NB	Only buyer deviates	7	0.47	7.57	20.86	3.71	24.57	37.86	8.44	20.54	-12.1	0.15
NB	Only seller deviates	1	0.50	6	35	20	55	30	30	5	25	0.83
NB	Both parties deviate	31	0.51	6.52	29.19	12.48	41.68	32.58	30.05	20.87	9.18	0.33
NN	Cooperation	60	0.83	9.20	47.22	19.68	66.90	46.00	46.00	25.01	20.90	0.45
NN	Only buyer deviates	26	0.62	6.12	29.61	8.81	38.42	30.58	30.58	22.73	7.85	0.36
NN	Only seller deviates	6	1	3.83	12.67	11.83	24.50	19.17	19.17	13.83	5.33	0.31
NN	Both parties deviate	52	0.62	4.77	27.62	6.37	33.98	21.85	23.85	13.71	10.13	0.33
PB	Cooperation	66	0.66	8.30	48.30	15.52	63.82	41.52	38.90	16.80	22.10	0.53
PB	Only buyer deviates	21	0.42	4.14	29.17	8.71	38.43	20.71	21.21	3.86	17.36	0.63
PB	Only seller deviates	4	0.50	4	26.5	1.5	28	20	216.1	8.18	7.93	0.41
PB	Both parties deviate	53	0.41	4.51	35.85	5.04	40.89	22.55	22.01	3.83	18.17	0.67
PN	Cooperation	70	0.88	8.34	38.53	21.94	60.47	41.71	41.71	22.96	18.76	0.49
PN	Only buyer deviates	16	0.70	5.5	26.06	14.31	40.38	27.50	27.50	14.63	12.88	0.52
PN	Only seller deviates	6	0.86	5.83	28.33	8.33	36.67	29.17	29.17	21.67	7.50	0.36
PN	Both parties deviate	64	0.68	5.28	27.50	12.70	40.20	26.41	26.41	12.61	13.80	0.54

Table 28: Exchange after deviation and cooperation

surplus with the seller so that they exchange and receive the benefits of trading. Note that the effect of buyer deviation is stronger than seller deviation in both magnitude and significance.

The difference between the assumptions used to generate theoretical predictions and the observed subjects' behavior with respect to cooperation and punishment may explain why some predictions of the model did not hold. This is true especially in the case of the NB treatment in which cooperation is observed more often than predicted. One important observation is that neither buyers nor sellers terminate the relationship as a punishment after a deviation in any treatment. Subjects understand that if they terminate the relationship they also punish themselves because they are tied to the same partner until the experiment ends and therefore, they would miss the opportunity to earn additional points during the experimental session. In contrast, parties are more willing to use methods of punishment that do not cost them anything such as withholding payments in the same period. Note that this may be an artifact of the experimental design as parties are forced to keep trading with the same party because of the matching procedure.

Result 9. *After deviation parties trade under less favorable contract terms in all treatments. Buyer withhold payments more often in the NB treatment, which reduces seller's payoffs and seller's share of the surplus.*

5 Conclusion

This paper uses experiment to study how bargaining affects the formation of self-enforcing agreements and parties' reciprocal actions in the marketplace. I implement four treatments in which subjects played a game with an uncertain number of periods and the parts of the contract (i.e. fixed component of payment, discretionary payment and quality) that were exogenously enforced by the experimenter or the bargaining power that subjects are able to exercise differed.

The observed behavior in the experiments supports many hypothesis derived from Cordero Salas (2010) while it also presents results that contrast with the predictions of that model.

Buyers offer more attractive contracts to sellers when sellers can exercise bargaining power. This is specially true when contract enforcement is completely absent. When contracts are not enforceable at all and bargaining is in place, subjects trade using contracts that create the highest level of surplus, suggesting that parties find informal incentives to maintain a higher efficiency in the absence of enforcement, which supports the strategic ambiguity theory of Bernheim and Whinston (1998).

Regressors	Surplus	Seller share
	OLS	Robust reg.
	Coefficients/Std Error	Coefficients/Std Error
Constant	25.3690*** (3.6997)	0.4114*** (0.0468)
NB dummy	6.7538*** (2.5260)	0.0491 (0.0446)
Buyer withheld dummy	-8.2203** (3.4559)	0.1604*** (0.0543)
NB*Buyer withheld	8.1818 (9.4128)	-0.4538*** (0.1307)
Seller shirked dummy	-1.7018 (2.4631)	-0.0995* (0.0547)
NB* Seller shirked	-8.0895 (9.6332)	0.2528* (0.1332)
NN dummy	1.8770 (2.4100)	-0.0310 (0.0392)
NN*Buyer withheld	0.5640 (4.3556)	-0.2048*** (0.0725)
NN* Seller shirked	-4.2438 (3.8722)	0.0140 (0.0739)
PB dummy	1.9716 (2.6700)	0.0432 (0.0411)
PB*Buyer withheld	-3.8203 (5.4798)	0.1725** (0.0776)
PB* Seller shirked	0.6549 (5.1337)	-0.0405 (0.0797)
Buyer's previous earnings	0.3911*** (0.0683)	-0.0006 (0.0008)
Seller's previous earnings	0.3817*** (0.0749)	0.0042*** (0.0009)
Length of relationship	0.0980 (0.2375)	0.0000 (0.0082)
Observations	495	495
R-squared	0.4508	

Notes: Estimations are OLS and robust regression respectively. Asterisks indicate the significance level of the estimate: * at 10% level, ** at 5% level and *** at 1% level. Additional controls are current length of the relationship, buyer and seller payoffs and dummies for each period. Data used excluded observations for first period. Standard errors reported are robust and adjusted for clustering on buyer-seller pairs.

Table 29: Exchange outcomes after deviation

When partial enforcement is in place subjects use more efficiency wage contracts when bargaining is in place and more performance contracts when bargaining is not possible as predicted. Efficiency wage contracts are not only used to avoid shirking but to minimize the use of bargaining, while in the absence of bargaining, contracts are only structured to provide incentives to avoid deviations. Furthermore, contract acceptance rates are lower when bargaining is allowed, suggesting that parties use counteroffers when they have the option and they feel that the contract offered is not giving them enough rents. However, sellers use more counteroffers when enforcement is in place supporting the argument that participants are more comfortable exercising bargaining power when they have part of the payment enforced.

The observations also present unexpected results regarding cooperation. Surprisingly, subjects achieved the highest level of cooperation among all treatments when contract enforcement was completely lacking and bargaining was an option which contradicts the model predictions. This result suggests that sellers exercised less bargaining power than was available in this treatment. Although a higher efficiency and total payments were observed under these conditions, sellers did not get a significantly higher payoff or significantly greater share of the surplus. This is explained by the stronger buyer's deviation and lower seller's deviation observed when cooperation was not the outcome. This behavior was deeper when contracts were reached through counteroffers suggesting that buyers also punish sellers for exercising their bargaining power.

In contrast, when partial enforcement was in place bargaining allowed sellers to achieve higher payoffs and a greater share of the surplus. Although efficiency outcomes were not significantly different relative to other treatments, they were the lowest in absolute terms suggesting that there might be a trade-off between distributional and efficiency outcomes.

The distributional outcomes suggest that if the goal of improving bargaining position of the weaker party is to increase their share of the surplus, then shifting bargaining power needs to be complemented by the implementation of formal enforcement at least the base price. However, if the goal is to improve efficiency when contract enforcement is incomplete, the results give evidence that implementing bargaining increases efficiency if contract enforcement is lacking.

Table 30: Exchange after deviation and cooperation, offers and counteroffers

Treatment	Previous Period behavior	n	Exchange	q	Price	Discretionary payment	Total payment	Surplus	Private Surplus	Buyer's payoffs	Seller's payoffs	Seller's share
NEBP Offer	Cooperation	49	0.75	9.14	41.86	25.39	67.25	45.71	45.71	24.18	21.53	0.50
NEBP Offer	Only buyer deviates	3	0.30	7.33	25	8.33	33.33	36.67	36.67	40	-3.33	0.22
NEBP Offer	Only seller deviates	1	1	6	35	20	55	30	30	5	25	0.83
NEBP Offer	Seller deviated, buyer withholds	27	0.53	7	32.22	14.15	46.37	35	35	23.63	11.37	0.37
NEBP Counter	Cooperation	3	0.30	10	38.33	13.33	51.67	50	6.33	4.83	1.50	0.37
NEBP Counter	Only buyer deviates	4	0.50	7.75	17.75	0.25	18	38.75	-12.73	5.95	-18.68	0.1
NEBP Counter	Only seller deviates	0	0									
NEBP Counter	Seller deviated, buyer withholds	4	0.40	3.25	8.75	1.25	10	16.25	-3.38	2.25	-5.63	0
PEBP Offer	Cooperation	58	0.71	8.38	49.02	15.97	64.98	41.90	41.90	18.81	23.09	0.55
PEBP Offer	Only buyer deviates	17	0.47	4.47	30	9.82	39.82	22.35	22.35	4.88	17.47	0.59
PEBP Offer	Only seller deviates	3	0.60	4	28.67	1	29.67	20	20	10.33	9.67	0.49
PEBP Offer	Seller deviated, buyer withholds	49	0.51	4.43	36.16	4.02	40.18	22.14	22.14	4.10	18.04	0.67
PEBP Counter	Cooperation	8	0.40	7.75	43.13	12.25	55.38	38.75	17.18	2.21	14.96	0.43
PEBP Counter	Only buyer deviates	4	0.5	1.75	28.50	4	32.5	13.75	16.38	-0.5	16.38	0.81
PEBP Counter	Only seller deviates	1	0.33	4	20	3	23	20	4.4	1.7	2.7	0.15
PEBP Counter	Seller deviated, buyer withholds	4	0.20	5.5	32	17.5	49.50	27.50	20.35	0.55	19.80	0.70

Table 31: Exchange after deviation and cooperation

Treatment	Current Period behavior	n	Cont. q	q	q diff	Contra. payment	Total payment	Total payment	P diff	Surplus	Private Surplus	Buyer's payoffs	Seller's payoffs	Seller's share
NEBP	Cooperation	87	8.86	8.94	+0.08	67.24	67.94	44.71	+0.70	43.15	43.15	20.11	23.04	0.55
NEBP	Deviation	89	8.28	6.10	-2.18	66.04	32.34	30.51	-33.71	23.64	23.64	21.67	1.98	-0.07
NE/NBP	Cooperation	90	8.77	8.83	+0.07	66.28	66.76	44.17	+0.48	44.17	44.17	21.58	22.59	0.54
NE/NBP	Deviation	159	7.57	5.04	-2.52	59.13	32.01	25.22	-27.12	25.22	25.22	18.43	6.79	0.55
PEBP	Cooperation	101	8.44	8.50	+0.06	63.51	64.35	42.48	+0.84	38.86	38.86	17.36	21.49	0.62
PEBP	Deviation	165	7.27	4.56	-2.71	58.65	39.24	22.79	-19.41	21.01	21.01	4.90	16.11	1.54
PENBP	Cooperation	99	8.31	8.46	+0.14	61.79	62.03	42.27	+0.24	42.27	42.27	22.52	19.76	0.47
PENBP	Deviation	144	7.44	4.88	-2.56	55.30	35.96	24.38	-19.34	24.38	24.38	12.79	11.58	1.10
NEBP Offer	Cooperation	80	8.90	8.99	+0.09	67.6	68.18	44.94	+0.58	44.94	44.94	21.7	23.24	0.52
NEBP Offer	Deviation	69	8.71	6.23	-2.48	64.35	35.38	31.16	-28.97	31.16	31.16	26.94	4.22	0.07
NEBP Counter	Cooperation	7	8.43	8.43	0	63.14	65.29	42.14	+2.14	22.73	22.73	1.9	20.83	0.91
NEBP Counter	Deviation	20	6.80	5.65	-1.15	71.09	21.85	28.25	-50.05	28.25	-2.30	3.47	-5.76	-0.54
PEBP Offer	Cooperation	83	8.49	8.54	+0.05	64.25	64.74	42.71	+0.48	42.71	42.71	20.69	22.02	0.56
PEBP Offer	Deviation	131	7.44	4.47	-2.97	60.42	38.68	22.33	-21.74	22.33	22.33	5.98	16.35	1.77
PEBP Counter	Cooperation	18	8.17	8.27	+0.11	60.06	62.56	41.39	+2.5	21.07	21.07	2.02	19.05	0.89
PEBP Counter	Deviation	34	6.62	4.91	-1.71	51.82	41.41	24.56	-10.41	15.94	15.94	0.77	15.17	0.67

References

- Bernheim, D., and M. Whinston. 1998. "Incomplete Contracts and Strategic Ambiguity." *American Economic Review* 88:902–32.
- Brown, M., A. Falk, and E. Fehr. 2004. "Relational Contracts and the Nature of Market Interactions." *Econometrica* 72:747–780.
- Cordero Salas, P. 2010. "The Role of Bargaining Power in Agricultural Contracts." Available at SSRN: <http://ssrn.com/abstract=1344550>, pp. .
- Fischbacher, U. 1999. "Z-Tree: Experimental Software." Working paper, University of Zurich.
- Wu, S.Y., and B. Roe. 2007a. "Contract Enforcement, Social Efficiency, and Distribution: Some Experimental Evidence." *American Journal of Agricultural Economics* 89:243–258.
- . 2007b. "Discretionary Latitude and Relational Contracting." Working paper, IZA Discussion Paper No. 2879 Available at SSRN: <http://ssrn.com/abstract=999376>.