Let's talk: How communication affects contract design

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Abstract: We study experimentally how communication changes the relative frequency and effectiveness of contract types when sellers choose unenforceable trade quality after observing a post-contractual cost shock. We predict that free-form communication changes the reference points induced by a given formal contract and therefore supports more flexible contract designs that are otherwise prone to conflicting perceptions and costly disagreements. Without communication, we find that rigid contracts (where the price cannot be changed) are slightly more frequent and lead to higher earnings for buyers while seller earnings are unaffected. By contrast, with free-form communication, flexible contracts (where the buyer can voluntarily increase the price paid) are much more frequent and yield higher earnings, both for buyers and sellers. The main effect -- that free-form communication can remove the potential disagreement cost of flexibility -- is robust to making contract type exogenous. Content analysis points to ex ante clarification of post-shock transfers and establishment of a good personal rapport as the key roles of communication underlying this effect. A restricted-communication treatment also favors buyer payoffs from flexible contracting, but the effect is weaker and far smaller.

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1. Introduction

An enduring topic in contract theory is how to motivate the seller of a good to provide high quality when the seller has discretion over quality *after* agreement on trade. Formal (court-enforced) contracts can generate quality incentives by fixing rewards and punishments, but formal contracting is usually imperfect and costly. So trading parties often rely heavily on informal procedures and industry norms (see Macauley, 1963). Traders' subjective perceptions then directly determine how they enforce their (informal) agreements. A clear "mutual understanding of the events that determine contract breach" (MacLeod, 2007) becomes a key factor behind successful trading relationships. Similarly, Gibbons and Henderson (2012) identify the development of shared understandings (clarity) as a key managerial challenge and they call for research on the role of clarity.

Following the insights in Arrow (1974) and Simon (1947) and Williamson (1991), we believe that communication and contract design are inexorably linked by the importance of effectively communicating what exactly is being agreed upon. Consider the formal definition from the *Oxford English Dictionary*, which describes a contract as "a mutual agreement between two or more parties that something shall be done or forborne by one or both." The very fact that parties must reach a *mutual agreement* points to communication playing a critical role in contract formation and design. The type of contract is likely to depend on the available communication technology, which varies widely (see e.g., Bandiera et al., 2012).

Given the practical importance of communication for effective contract design (see e.g., Van de Ven and Walker, 1984), it comes as a surprise that this realm has been largely unexplored experimentally. We break ground by investigating how the choice and effectiveness of contract types (rigid or flexible) varies across experimental environments with no communication, with a form of restricted communication, and with ongoing, free-

form communication. We work in a trade context where adaptation is valuable but is potentially problematic. A buyer and a seller interact once (see MacLeod, 2007, on the parallels between repeated-game and behavioral enforcement of informal agreements) and both observe a non-verifiable shock to the seller's cost after committing to joint trade at a base price. The buyer can potentially respond to the shock with an additional transfer before the seller sets the trade's non-verifiable quality (superior, neutral or inferior), but the simplest plan is to trade at a fixed price. A "rigid contract" commits to such a plan: it fixes a base price and rules out the discretion to make additional transfers later on (see design section for interpretation). By contrast, a "flexible contract" allows the buyer to add an additional transfer after observing the cost shock.

In principle, flexibility is preferable. The buyer can use it to raise joint surplus by adapting the transfer to share in the seller's cost (this insures the seller, reduces inequality and quite possibly encourages seller cooperation). Utility is transferable and rigidity only commits the buyer against being more generous, so one might expect traders to negotiate a flexible agreement. However, flexibility can have a downside. It leaves more room for ongoing disagreement over appropriate actions. Such disagreements are often costly, because disgruntled sellers tend to set inefficiently low quality. This is the essence of Hart and Moore's (2008) theory, discussed in more detail below. Conflicting feelings of entitlement or "reference points" lead to retaliation: the cost of disagreement is inefficiently low quality.

A rigid contract completely pins down the buyer's transfer obligation. So the norm of "living with the consequences of one's choices" (see Hayek's decision-responsibility formulation below) may prevent a seller who accepts a rigid contract from later feeling cheated by the agreed transfer level. By contrast, the flexible contract (absent communication) leaves the transfer plan partially open, with much room for disagreement *ex*

post over the additional transfers that the buyer should pay in each cost state. Business practitioners encourage interacting parties to simplify their plans where communication is difficult. Simple plans are less responsive to events but they limit the risk of misunderstandings and disagreements. Accordingly, without communication we expect traders to select rigid contracting in settings where seller discretion over quality makes such disagreements particularly costly.

Free-form communication greatly changes this prediction. Intuitively, we expect traders with symmetric information to use communication to avoid costly disagreements. Traders can agree on a flexible contract with informal (not court-enforced) commitments to an additional transfer specified for each cost state (by the buyer) and to high quality (by the seller). Such agreements are unambiguous, stating exactly what traders do in each state and leaving no room for subsequent disagreements. Credible communication removes the downside of flexibility by clarifying the buyer's transfer plan.[1] So we predict that having an open communication channel during negotiations will lead traders to shift from rigid to flexible contracting. In essence, communication reduces the need for simple plans and therefore complements flexibility.

Our results strongly confirm these predictions. In our baseline no-communication treatment, we find higher prices, quality and profitability for rigid than for flexible contracts. Buyers (the contract proposers) earn more with rigid contracts than with flexible contracts and seller earnings are essentially unaffected; rigid contracts are chosen 25 percent more often than flexible ones. The results are very different with free-form communication, where we find a dramatic increase in prices and quality and a dramatic decrease in rejections of proposed contracts, with both contracting parties earning considerably more and overall earnings nearly doubling. Buyers earn 34 percent more with flexible contracts, sellers earn

[1] Of course, the buyer (and seller) might breach the informal terms of their agreement, but in our game, the seller's breach temptation (the cost of superior quality) is low and the buyer has a strong incentive to fulfill her transfer commitments to avoid seller retaliation (inferior quality).

26 percent more, overall profits are 30 percent higher, and traders choose flexible three times as often as rigid.

These results are fully consistent with the clarification role of free-form communication discussed above. In addition, free-form communication permits informal quality commitments that can explain some efficiency increase for both contract types; social-preference theories can explain why communication might complement flexible contracting, but they cannot explain why rigid should ever predominate. To shed further light on how communication works, we code the chat data to analyze which chat categories are most closely associated with the relative success of flexible and rigid contracts. Consistent with our main prediction and these complementary effects, we find that clarification (of transfer plans) is significantly associated with successful outcomes when flexible contracts are chosen, while establishing a positive personal rapport is important for good outcomes with both rigid and flexible contracts.

For a different angle on how communication works, we also conducted a treatment where the buyer selecting a flexible contract can only state how much will be added to the base price with and without a positive cost shock. In principle, this impersonal clarification could resolve the ambiguity inherent with a flexible contract, and we do find some support for the value of clarification for buyers using flexible contracts. Nonetheless, the effect is mild. Consistent with previous experimental evidence in Charness and Dufwenberg (2006, 2010) and also Ben-Ner, Putterman, and Ren (2011), we conclude that simple statements about numbers are not nearly as effective as endogenously-chosen words; the personal element and the rapport that emerges from rich communication are very important.

The treatments we have discussed above all involve endogenous contract choice, as the buyer is free to choose a rigid or a flexible contract. This is clearly important for field environments where traders choose between these contract types. However, to compare the

effectiveness of rigid and flexible contracts *per se*, we must control for the possibility of selection effects, where different types of people choose different types of contract. In addition, the voluntary choice of a given contract type could provide the seller with a signal about the buyer's type. We therefore conducted treatments in which only one form of contract was possible (as when imposed by a hierarchy). In fact, we find very little evidence that behavior differs across treatments with exogenous and endogenous contract choice. The only notable difference is that, with communication, seller profits are slightly higher from endogenously-, than from exogenously-, chosen flexible contracts.[2]

This project is related to Hart and Moore (2008) and the Fehr, Hart and Zehnder (2009, 2011A and 2011B) experiments, henceforth denoted HM, FHZb, FHZa and FHZc (where a,b,c reflects the order of writing).[3] The main difference is that only formal and competitively-determined contracts shift the reference points in HM's theory, while in our view informal, as well as formal, agreements affect perceived entitlements and they both do so with or without competition. In our framework, communication leads to informal agreements that enable traders to (get around non-contractibility restrictions on formal contracts and still) avoid the costly disagreements otherwise associated with flexible contracts. By contrast, applying HM directly, neither rigidity nor communication has an impact in a noncompetitive setting like ours. In essence, we adapt HM's theory to capture the idea that bilateral agreements can also affect perceived entitlements. Our predictions follow from the formal model of Hart and Moore (2008) after adapting the process that determines reference points.

Concretely, our results follow from applying the norm of decision responsibility, that people should not feel entitled to get more than the anticipatable consequences of their

[2] A Wilcoxon ranksum test that conservatively uses session-level data (only four independent observations for each treatment) finds the difference to be statistically-significant ($p = 0.029$, one-tailed test).
[3] HM presents the psychological phenomena of self-serving beliefs as a critical problem of flexibility, noting that uncertainty in perceived entitlements can generate the same results.

agreements. Without rich communication, flexible contracts lead to unclear expectations so, unlike rigid contracts, they fail to restrain perceived entitlements. Communication removes this downside because, in our rich-language setting, traders can then clarify, discuss and adapt their plans and expectations until mutually compatible (that is, until their reference points coincide).[4]

The remainder of this paper is structured as follows. We review the existing literature in section 2 and present our experimental design and implementation in section 3. We derive our predictions in section 4, and describe experimental results in section 5. Section 6 offers a discussion of our findings and section 7 concludes.

2. Related literature

Non-binding, free-form communication (*cheap talk*) is ubiquitous in the field. We use a rich message space and permit a continuous two-way flow of information between the buyer and seller. Communication works in different contexts for different reasons. Cheap talk has been shown to improve cooperation or coordination between two parties. For example, Cooper, DeJong, Forsythe, and Ross (1992) find that non-binding pre-play communication is effective in improving the rate of the Pareto-superior (but risk-dominated) outcome.[5] There is a very high rate of coordination on the payoff-dominant equilibrium in Charness (2000), despite the issue of the credibility of the signal. More recently, Charness and Dufwenberg (2006, 2011) demonstrate that free-form communication can be very effective in achieving optimal social outcomes with hidden action or information. Promises (statements of intent) are the key driving force in this process, as they help to raise

[4] In essence, our communication result is a much simpler cousin of the Maskin and Tirole (1999) challenge to the Grossman-Hart-Moore "observable but nonverifiable" modeling strategy. Maskin and Tirole (1999) develop mechanisms that make nonverifiability of (mutually) observable payoff-relevant events irrelevant (if renegotiation is restricted or traders are risk averse), because "message games" (*ex post*) can induce revelation of these events. Our setting only requires informal agreements (*ex ante* communication) that specify complete plans of action.

[5] For a theoretical analysis of the effects of communication in coordination games see Ellingsen and Östling (2010).

expectations and improve the credibility of the signals.

Brandts and Cooper (2007) consider Leontief production in a team of four workers. Coordination failure is rife in a no-communication treatment. In a treatment where a manager can either increase the incentives of each team member or communicate by sending them free-form messages, the chat content reveals that the simple communication strategy of requesting high effort and pointing out the mutual benefits of high effort is very effective. The communication content needed for effective coordination differs from that needed for effectiveness in the Charness and Dufwenberg principal-agent setting. Yet in both cases, communication helps by clarifying intentions and thereby influencing expectations.

Ellman and Pezanis-Christou (2011) examine how the structure of the decision-making process (horizontal or vertical) and communication affect the extent to which a firm chooses to maximize own profits at the expense of a helpless third party. The communication treatment is the same as used here. In the data, communication makes vertical firms more ethical, which leads to notably greater social surplus. The authors infer that voice is a form of involvement that leads actors to feel more responsible for group decisions. Here, we argue that communication improves outcomes, because sellers feel responsible for accepting any clearly-stated agreement.

Without communication, there is some evidence that flexibility has negative consequences. FHZa find that rigid contracts can induce better outcomes for buyers than flexible contracts in an environment with competition between two potential sellers and uncertainty over a potential cost shock.[6] Their main result is that the buyer's average profit is

[6] Two potential buyers are matched with two potential sellers (with random re-matching for 15 periods). Each seller has two units to sell and each buyer can purchase at most one unit. The buyer determines the type of contract (rigid or flexible) and the two sellers compete over price (tied within an exogenous interval to prevent loss-making trades). The state of nature (seller cost shock) is then determined. With a flexible contract, the buyer can then adjust by unilaterally increasing the price to be paid (subject to a no-loss upper bound). After learning the final price, the seller trades *if* the price covers cost; to simplify, the seller does not actually choose here but this assumption captures the "at will" nature of their contracting environment. If trading, the seller then chooses a quality level from normal or low (sabotage). Choosing low/sabotage is costly to the seller, but is much more costly to the buyer.

higher with rigid contracts, because flexible contracts lead to lower quality when controlling for total price. The seller's profit is lower, so total earnings are almost the same.[7] Rigid contracts are chosen 50 percent of the time. Since rigid contracts preclude trade in their bad state of the world, our environment seems more realistic. Field environments generally allow sellers to trade; in particular, sellers may trade at a loss if they consider the contract to be fair on average.

FHZb seek to verify that competition between sellers is the driving force behind FHZa's result. To create a control that eliminates competition between sellers, they impose base prices (randomly selected from the winning seller bids of the competitive treatment) onto the buyer and sellers. Their main result is that rigid contracts are not better for the buyers (rigid contracts are only chosen 18 percent of the time). Buyer profits are slightly (but not significantly) lower with rigid contracts and quality is unaffected by contract type. Notice that our norm of decision responsibility does not apply to the initial contract here, because FHZb's design has no prior agreements; sellers are not responsible for the price, since it is imposed upon them.

FHZc (conducted contemporaneously and independently) does consider a limited form of communication in which buyers announce numerical state-contingent transfers before sellers compete. Here flexible contracts are not more profitable than rigid ones. By contrast, our free-form communication makes flexible contracts sharply more profitable. One explanation for this difference is that restricted and unilateral communication is relatively ineffective. Indeed, a stylized fact emerging from the experimental literature on communication is that simple, exogenous messages are not effective for avoiding inefficient equilibria when these are unique.[8] Additionally, our bilateral communication is more personal and reinforces seller responsibility, whereas the buyer's numerical promises in FHZc are

[7] In our endogenous no-chat treatment, we find that rigid contracts yield higher overall and seller earnings.
[8] Examples include Charness (2000), Andreoni (2005), Charness and Dufwenberg (2010), Ben-Ner, Putterman, and Ren (2011), and Oprea, Charness, and Friedman (2012).

unilateral and directed at both the sellers.[9]

Erlei and Reinhold (2011) note that in FHZa sellers have reason to blame buyers for selecting rigid contracts, since total price is then driven down to a minimum by competition between sellers. Since this could affect sellers' behavior independently of reference points, they investigate the case of exogenous contract types and find that quality is then higher for both contract types. They interpret this in terms of negative reciprocity when rigid contracts are chosen and (fairness) signaling when flexible contracts are chosen.[10] Notice, however, that choosing rigid is *not* necessarily unkind or unfair in our noncompetitive setting because here the buyer can fully compensate (for precluding additional transfers) by raising the base price.

In sum, the existing literature on flexible contracts versus inflexible ones provides some support for the notion that *ex ante* flexibility can lead to *ex post* misunderstandings in a specific context. Our study generalizes into new trade and contract environments and, most importantly, introducing communication paints a substantially less gloomy picture than previously reported.

3. Experimental design and implementation

Our focus is on communication and agreements. Communication is possible in most real-world settings and is typically free-form and personalized. Our no-communication treatment starkly prevents all communication, but we intend it to capture a setting in which traders cannot reach a common understanding on the precise terms of trade because the

[9] The competition in FHZc may also explain the weaker effect. HM's competition-based theory predicts that communication will not resolve the disagreement cost of flexibility to the extent that communication interferes with the impersonal objectivity of competition; in FHZc, each buyer controls her informal commitments - competitive bidding only fixes the base price. In some settings, competition might also affect the credibility of communication.

[10] They also offer a replication treatment of FHZa's endogenous-contract setting. They find more low quality than in FHZa (particularly for rigid) and buyers reveal a preference for flexible contracts (chosen 72.3 percent of the time) in contrast to the 50 percent found in FHZa. Buyer payoffs are again higher for rigid, though not significantly so.

relevant contingencies are difficult to describe in the time available. Our restricted-communication treatment allows the buyer to indicate the precise terms of trade, but nothing else – traders cannot use communication for any other purpose, such as establishing a friendly relationship. Rather than being inspired by any real-world setting, this treatment serves as an experimental control; it is also designed for comparability with the informal-agreement treatment in FHZc.

Before describing our design in detail, we motivate three other major design choices. We chose to study bilateral negotiation (no competition), "specific performance" contracting (that is, contracts that always enforce trade), and costly quality as well as costly quality reduction. Since our predictions do not rely on competition, it is natural to dispense with it.[11] Doing so allows us to focus on a simpler environment and reduces the risk of confusion. Note that the control study of FHZb also removes competitive bidding, but leaves no contract agreement at all since sellers cannot even reject contract offers (buyers only choose contract type); this contrasts sharply with our bilateral negotiation setting. Studying specific performance contracting further simplifies the trading problem: trade is decided once and for all, in stages 1 and 2 ("*ex ante* ").[12] This simplicity is quite valuable. In "at will" contracting environments, as in FHZa,b,c, traders face an *ex post* trade decision as well. FHZa,b,c simplify by restricting these choices: in particular, sellers can only trade when in their *ex post* material interest.[13] However, traders clearly deviate from purely selfish motives in their game, and might wish to do so in the trade decision itself.

[11] We agree with HM's insight that competitive processes can reveal external information and shift views about appropriate shares. However, we believe that simple bilateral agreements alone can have powerful effects on people's views about what is appropriate; their agreements shift their perceived obligations and entitlements.
[12] As in related work such as FHZa,b,c, we do not model explicitly why traders should contract in advance, but long-term contracts, such as specific performance contracts, are often an optimal way to induce trading partners to make non-contractible, relationship-specific investments that are needed before trade can be consummated.
[13] In fact, they must then trade. Also buyers with flexible contracts have to raise price to exceed sellers' total costs.

Finally, costly (higher) quality is the more standard assumption in economics. We allow for both upward and downward deviations from the self-interested benchmark (neutral quality). This adds realism and identification power; it slightly raises complexity but the previous two design features (and our help screen described below) seem to more than compensate.[14]

Participants play the same one-shot basic game in each of 10 periods. Across periods, they are re-matched and no two individuals ever play each other twice nor observe another's behavior in past periods (nor any average outcomes), so there is no opportunity for building a personal reputation. Since the same game is played independently in each period, we can focus our analysis on the basic game, bearing in mind that subjects may learn how to play over time.[15]

3.1 Details and parameters of the basic game

Sample instructions are presented in Appendix A. In the endogenous treatments, the buyer can choose a contract type (rigid or flexible) and a price P to offer to the matched seller; in the exogenous treatments, the buyer can only choose a price offer. The seller then accepts or rejects the offer. If no contract is accepted, the buyer and seller each receive outside option payments (5 each). If the seller accepts a contract offer, the seller provides a good to the buyer. The seller's cost is subject to a shock, C, which is either 0 or 20 with equal probability of each outcome. We chose this relatively large cost shock to make it salient. Both buyer and seller observe the outcome of this cost shock. If a rigid contract was chosen at the initial stage, the price cannot now be changed.[16] However, if a flexible contract was chosen, the buyer can now augment the initial price of P by any amount, which we denote by

[14] Overall, our simple context encouraged us to save on providing feedback on other buyer-seller matches; FHZa,b,c tell buyers the running averages of all buyers' payoffs and usage frequencies for each contract type.
[15] Business relationships between two firms or a firm and an employee are typically repeated over time, but the one-shot model is often relevant when the buyer is a final consumer (see the construction examples in Hart, 1995). In any case, the one-shot setting provides an important benchmark before moving on to analyze repeated interactions.
[16] In practice, such rigidity is more likely enforced by informal commitments, but we simplify (as do FHZa,b,c).

Q. After observing the cost shock and any additional transfer Q from the buyer, the seller chooses the quality of the good.[17]

This quality response (x) can take one of three values: $x = 0$ is normal quality and involves no additional cost, while $x = -1$ and $x = +1$ are respectively inferior and superior quality and each cost the seller one additional unit. This captures a stage-0 contract that gives the seller an incentive to choose normal quality ($x = 0$), from which marginal deviations imply marginal losses on the seller, but first-order effects on the buyer. Concretely, the buyer's payoff increases from 10 to 30 to 45 for quality $x = -1$, 0, and 1, respectively. These increments reflect a natural decreasing marginal return to quality. Both are large relative to the seller's maximal incremental cost, giving buyers a strong incentive to induce sellers to choose high quality.[18]

3.2 Treatments

We conducted seven treatments in all, with four sessions in each. We began with two treatments in which the buyer chose the type of contract. Treatment 1 provided no communication channel, while Treatment 2 permitted free-form communication ("chat") between the buyer and the seller. In our view, this chat setting is the most natural condition, but to better determine why free-form communication proved so effective, we also conducted a restricted-communication treatment (Treatment 7) in which buyers could accompany flexible contracts with a nonbinding structured message indicating additional transfer values with and without a cost shock. Finally, for a clean comparison across contract types that rules out selection effects, we conducted four treatments with an exogenous contract type: exo-rigid and exo-flexible, with no communication (Treatments 3 and 4) and with chat

[17] As in related work, the buyer and seller interact only once (obliging behavioral enforcement of informal agreements) but there are close parallels with repeated game enforcement, as explained in MacLeod (2007).
[18] Formally, buyer and seller respectively earn monetary payoffs of $5 + v(x) - P - Q$ and $5 + P + Q - C - |x|$ if they trade and 5 each if not, where the buyer's trade value $v(x) = 10$, 30, or 45, for $x = -1$, 0, +1.

(Treatments 5 and 6).[19]

3.3 Timing

The sequence of events for endogenous-contract Treatments 1, 2 and 7 is defined by the following five-stage game in which both parties observe the outcomes of all preceding stages:

> *Stage 1: Buyer B chooses whether to offer the seller S a rigid or flexible contract; in each case, the buyer B sets the contract's initial price offer P.*
>
> *Stage 2: Seller S accepts or rejects this offer.*
>
> *Stage 3: The computer randomly determines the seller's base cost C at 0 or 20.*
>
> *Stage 4: If the contract is flexible, buyer B sets an additional transfer Q.*
>
> *Stage 5: Seller S sets the quality level, $x = -1$, $x = 0$ or $x = 1$.*

In the chat treatment, the buyer and seller can additionally engage in free-form communication, sending each other written messages, starting from the moment they are matched and begin negotiating right up until the seller sets quality x in the final stage (stage 5). Our interest is three-fold. We examine whether people use communication to establish informal contracts, we characterize their discussions, and we investigate how these affect behavior.

In the restricted-communication treatment, a buyer who selects a flexible contract can fill in two numbers, in an exogenously-framed message, allowing them to "indicate the additional transfers (Q) to be paid in the events of a high [20] and low [zero] cost shock." Both buyer and seller are made aware that this message is not binding and the buyer cannot add any further explanation. The message is sent as part of the initial price and contract proposal, prior to the seller's acceptance decision (stage 2).

In the four exogenous-contract treatments (3-6), Stage 1 above is replaced by:

[19] For a range of situations, individual buyers may be effectively unable to choose contract type. The exogenous treatments are clearly more relevant when a hierarchy mandates contract type. We thank Mari Rege for this insight.

Stage 1-exogenous: Buyer B can offer the seller S a contract [of the exogenously given type], by setting the contract's initial price offer P.

3.4 Implementation

Our sessions were conducted in Valencia at the LINEEX laboratory. Each session involved groups of 22 people who played 10 periods (and a practice period); no one participated in more than one session. To eliminate income effects, one period was randomly selected for payment at the end of each session. Each payoff unit was worth one euro (1€), and participants received an additional 8€ show-up fee. In all, we ran seven treatments in 28 sessions with 616 participants. Average earnings were approximately 17€ for no-communication sessions, 16€ for restricted-communication sessions and 25€ for the chat sessions, which were respectively about 90, 100, and 120 minutes in duration.

Participant roles (buyer or seller) were fixed for the duration of their session and it was common information that no participants were ever matched together twice. Instructions and a careful explanation were read aloud at the start of each session. An always-available help screen enabled each participant to (privately) compute own and current partner payoffs from any set of feasible choices he or she wishes to consider.

4. Our predictions

We start with some general considerations about the interaction between buyers and sellers in sections 4.1 and 4.2. We present our theoretical predictions for communication, contract choice, and performance in section 4.3. In section 4.4, we make predictions on the role of specific chat categories.

4.1 Transfers and quality levels (general considerations)

If the buyer and seller are rational, self-interested money maximizers, the seller always minimizes cost while the buyer minimizes additional transfers and sets the base price

P to just secure seller acceptance.[20] This holds independent of contract type and communication channel.

A wealth of experimental evidence leads us to expect this prediction to fail; most sellers would reject or retaliate against such a buyer proposal since it shares none of the surplus. Moreover, pro-social preferences, trust and reciprocation may generate higher quality and surplus; the average trade surpluses for qualities x = -1, 0, 1 are 9, 30, 44, respectively. Altruism directly raises transfers and qualities (see Andreoni, 1990) and efficiency concerns have similar effects (see Charness and Rabin, 2002). Trust raises quality and transfers, because sellers can then commit to higher quality in return for higher transfers. Contingent pro-sociality can generate a similar reciprocation, with sellers better disposed towards buyers who pay high transfers (see also the models of intrinsic reciprocity in Sobel, 2005). Finally, inequality-aversion and norms of fairness can generate a positive relationship between price and quality (see Fehr and Schmidt, 1999, or Bolton and Ockenfels, 2000). Any such expected reciprocation gives the buyer an incentive to raise transfers, P and/or Q. High quality is likely in the chat treatment where the buyer can plausibly estimate the seller's requisite transfer. All three perspectives imply a positive causal effect of the total transfer P + Q on quality x.

4.2 Cost sharing (how transfers vary with the cost state)

Cost sharing is only feasible with a flexible contract and is usually then both credible and attractive. Even a self-interested buyer has an incentive to share in the seller's cost if the seller internalizes a sharing norm, or is both risk-averse and able to negotiate an informal-insurance agreement. Negotiating such agreements requires communication; buyers then have strong monetary incentives to fulfill transfer promises because sellers can easily punish non-fulfillment with low quality and reward fulfillment with high quality. The social norm of

[20] So x = Q = 0 and P = 10 + RP for some risk premium (RP) between 0 and 10; even at RP = 10, buyer earnings exceed the buyer's alternative payoff since 5 + v(0) – 20 = 15 > 5.

equal sharing suggests total transfers of 23 and 33 in the low- and high-cost states. So defining dQ = Q(20) - Q(0), we might expect a modal value of dQ = 10, with many lower values from under-insurance.

In the no-communication treatment, we predict less cost sharing, because traders cannot negotiate insurance and because communication enhances social motivations for sharing and trust in insurance. So we predict lower dQ than in chat treatments, both for the endogenous and exogenous contract settings. The restricted-communication treatment permits buyers to propose insurance, but facilitates notably less trust than does free-form communication. So here we might expect slightly higher dQ-values than with no-communication, but clearly lower than with chat.

4.3 Communication, contract choice and performance

It is not obvious why buyers should ever pick rigid contracts. Rigidity is a commitment against paying an additional transfer later on and has no standard strategic advantage.[21] However, as argued above, an accepted rigid contract has the simplicity advantage of leaving no room for later disagreement over what the buyer should do.

HM formalize an advantage of rigidity in settings with seller competition: a reciprocal seller chooses low quality if the buyer transfers less than the seller's reference point or sense of entitlement; furthermore, competition pins down this reference point if it fixes a unique final transfer, since traders are assumed to accept the objectivity of competition. In HM and FHZa, competition does determine a unique final transfer for rigid contracts, but the final transfer depends on buyer discretion for flexible contracts. So competition only pins down the reference point for rigid contracts, doing so at the relatively low, competitive price. Buyers with flexible contracts must pay higher total transfers to induce the same level of quality.

[21] Flexible contracting has the advantage that it permits sharing of the seller's cost shock, which raises social surplus if the seller is risk averse or if either trader is inequality averse; this sharing is usually credible with chat.

We chose to have competition play no role in our bilateral-negotiation setting, so HM is not directly applicable. However, we argue that the underlying intuition – that flexibility may introduce ongoing disagreement costs – still applies. We start out from the idea that clear bilateral agreements can influence subsequent perceived entitlements. More concretely, we apply the general norm that people should take responsibility for anticipatable consequences of their agreements.[22] We posit that *if* the seller accepts a rigid price, he will not later feel entitled to a transfer above that price.[23] The buyer can therefore obtain at least normal quality from any rigid price that gets accepted. By contrast, a flexible contract only benefits from this norm if the buyer can clearly indicate exact transfer consequences *during contract negotiation* so that the seller cannot claim to have accepted in expectation of higher transfers.

So flexible contracts suffer from disagreement costs, unless traders can specify a unique transfer Q for each cost state; this requires communication. The restricted-communication channel is minimally sufficient for buyers to indicate this set of unique transfers. This clarification of Q-values may be ineffective if sellers feel that the credibility of such messages is so low as to merit being ignored. However, with free-form communication, which is sufficient for such clarification, the credibility and thus expectation of these transfers is very high – sellers can promise high quality conditional on transfer fulfillment. Also, free-form communication tends to raise social proximity, which enhances trust and trustworthiness (see e.g., Sally, 1995).

In Conjectures A (below) and A' (further below), we therefore generalize to non-

[22] Captured in the commonplace refrain, "you've made your bed – now lie in it" (Peterson, 2012), this norm applies for consequences that a reasonable person could anticipate at the time of agreement. Similarly, Hayek (1960, pp.76-77) advocates "letting [people] bear the consequences of their decisions" to encourage reasonable behavior.

[23] Peers could tell the seller, "you chose to accept that price, so you cannot complain now!" The seller might try claiming to have only accepted in order to better punish the buyer for an aggressive proposal, but this only makes sense in the unlikely event that the buyer's price is so blatantly low as to merit a worse punishment than rejection yet is still high enough to permit a worse punishment.

competitive, bilateral negotiation settings, HM's prediction that buyers earn higher earnings from rigid than flexible contracts and prefer rigid contracts when, as in our study, quality is important. At the same time, in Conjectures B and B', we sharply reverse this prediction for contexts (Treatment 2) with free-form communication.[24] In Conjectures B-RC and B'-RC, we reverse it more tentatively for the restricted-communication treatment.[25]

> *Conjecture A: In the no-communication treatment, rigid contracts will be more frequent than flexible contracts.*
>
> *Conjecture B: In the chat treatment, flexible contracts will predominate.*
>
> *Conjecture B-RC: With restricted communication, flexible contracts will predominate.*

These conjectures are irrelevant to the exogenous-contract treatments, but all other conjectures, including the following earnings formulations, apply to both the exogenous and endogenous environments. In fact, the earnings conjectures are cleanest for the exogenous treatments, which rule out selection effects (as discussed below).[26] Notice that we also predict higher seller earnings with flexible contracts in the chat treatment, since sellers can then argue for or negotiate a share of the larger pie, perhaps threatening to otherwise withhold cooperation. Absent chat, seller earnings may be higher or lower with flexible contracts depending on whether buyers respond to ambiguity by raising transfers or by lowering them, giving up on superior quality.

> *Conjecture A': In the no-communication treatment, buyer earnings and quality are higher with rigid than flexible.*
>
> *Conjecture B': In the chat treatment, buyer and seller earnings and quality are higher with flexible than rigid contracts.*

[24] The bilateral nature of our free-form communication channel might conceivably complicate clarification, but traders have a strong incentive to avoid disagreements and traders can easily do this by agreeing on a single Q for each state. So in any context where access to a free (bilateral) communication channel allows traders to discuss, fully clarify and adjust their intentions and expectations, we predict that they will find a way to negotiate an adaptive plan that leaves no room for disagreement.

[25] This is more tentative than for the chat treatment, because transfer promises are less credible and therefore less effective with restricted communication.

[26] For the endogenous treatments, the predictions are clear if buyers experiment with selecting the contract type or if they make random miscalculations. Also, our individual-level non-parametric tests partially control for selection, namely for seller fixed effects.

Conjecture B'-RC: In the restricted-communication treatment, buyer earnings and quality are higher with flexible than rigid contracts.

Finally, we make predictions across treatments with different levels of communication. For flexible contracts, the ability to clarify intended Q transfers raises quality (as just explained) and therefore raises transfers and earnings (see 4.1) and cost sharing (see 4.2). These effects apply in attenuated form in the restricted communication treatment. In addition, free-form, but not restricted, communication permits seller promises and enhances mutual consideration (chats tend to be friendly in simple cooperative games like ours).[27] This implies higher quality, transfers and earnings for rigid as well as flexible contracts – a fact used in 4.4 below to distinguish clarification from the other chat categories. Increased concerns for sharing and group efficiency also increase the attractiveness and credibility of cost sharing, so all the predictions for flexible contracts are reinforced.[28] We summarize in Conjectures C and C-RC.

Conjecture C: Relative to the no-communication treatment, free-form communication (chat) raises quality, total transfers, buyer and seller earnings, and (in flexible contracts) the degree of cost sharing.

Conjecture C-RC: (a) For flexible contracts, restricted communication raises quality, total transfers, buyer and seller earnings and cost sharing, but (b) less than for chat.

4.4 The effect of chat categories

If clarification is the driving factor behind the shift to flexible in the chat treatment, we should observe heavy use of clarification in the chats that accompany flexible contracts. As just discussed, we must also pay attention to the social-preference effects of communication. We focus on the effects of clarification of Q and two other chat categories that capture the main social-preference channels described in 4.1 and 4.2. We can distinguish our predictions because friendliness and quality promises benefit rigid as well as flexible

[27] The restricted-communication treatment only allows unilateral numerical messages so the related experiments noted above predict minimal proximity benefits.

[28] Notice that these effects also increase the advantage of flexibility, reinforcing Conjectures B and B'. On the other hand, this social preference channel cannot explain why rigid contracts should be more frequent in the no-chat treatment, as predicted in Conjecture A. So the ambiguity and clarification story is the most parsimonious explanation of any shift from rigid to flexible.

contracts, whereas there is no role for clarification in rigid contracts. In sum, we predict:

Conjecture D: Flexible contracts accompanied by clarification chats are more effective than when chats are not clarifying.

Conjecture E: Both rigid and flexible contracts accompanied by friendly chats are more effective than when chats are not friendly.

Conjecture F: Both rigid and flexible contracts accompanied by seller promises are more effective than chats not accompanied by seller promises.

5. Experimental results

In this section, we first provide descriptive statistics and then non-parametric tests on the outcomes observed in our seven treatments. We focus on the overall effect of introducing a channel for communication and on how this affects the comparison between contract types. We close with regression analysis of the various factors that affect outcomes.

5.1 Descriptive statistics

We present information about the contracts chosen, prices and transfers, rejections, quality levels, and earnings. Table 1 shows the information for the three treatments with no communication and Table 2 for the four treatments that allow some form of communication. We begin with the first two columns of Table 1: rigid and flexible contract choices in the endogenous no-communication treatment. Rigid contracts are chosen 11 percentage points more frequently than flexible contracts. The rejection rate is just under one-third for both contract types. Most sellers choose normal quality given either contract type, with the bulk of the rest sacrificing money to hurt the buyer. The rate of inferior quality is slightly higher with flexible contracts and average quality is a bit higher for rigid than flexible contracts, both with and without a cost shock. Buyer and total earnings (all offers) are also higher for rigid contracts (seller earnings are negligibly lower). In brief, rigid contracts are used somewhat more frequently and lead to higher buyer and total earnings when communication is not feasible and the contract is endogenous.

[Tables 1 and 2 about here]

The third and fourth columns of Table 1 reveal generally similar patterns for the exogenous no-communication treatments. The rejection rates are reasonably similar, but sellers react better to flexible contracts: the rejection rate for flexible contract offers is lower, at 27.2%, than for rigid ones, at 34.9%. Prices are very close across the endogenous and exogenous treatments for rigid contracts, while they are slightly higher for exogenous flexible contracts. Average qualities and earnings also respond little to exogeneity.[29] Overall, behavioral patterns are quite similar across endogenous and exogenous contracts.

Comparing Tables 1 and 2, one can see the impact of free-form communication, as well as restricted communication (discussed below). In both the endogenous and exogenous treatments, the rejection rate with free-form communication (chat) is greatly reduced from the rejection rate without chat for rigid and especially for flexible contracts. In the endogenous chat treatment, the flexible contract is the more frequent choice: the proportion choosing flexible increases from 44.6 percent in the no-communication treatment to 74.7 percent in the chat treatment. Notice the difference of 5.83 units between the transfer made after a (20 unit) cost shock than after no shock, implying an average dQ of 58.3 percent of cost sharing, in contrast to a cost-sharing rate of only 17.7 percent for the endogenous case with no-communication. A similar pattern holds with exogenous flexible contracts, where dQ is a remarkable 74.5 percent cost-sharing, with chat and only 9.7 percent cost-sharing without it. These results suggest that free-form communication facilitates adaptation of transfers (raising Q) in response to a cost shock, which may limit the negative quality effects from disagreements under flexibility.[30]

Quality is much higher with free-form communication for both contract types. The

[29] Average seller and total earnings are slightly higher for exogenous contracts; for exogenous flexible, superior quality is more likely, inferior quality less likely and average quality given no cost shock less negative.
[30] To test whether chat raises dQ, we ran a random-effects GLS regression on data from the exogenous flexible treatments, 4 and 6; this regression reveals a strong significant positive coefficient ($Z = 6.17$) for the influence of chat interacted with cost shock on Q, as well as a strong significant positive coefficient of chat on Q ($Z = 7.05$).

likelihood of inferior quality is greatly reduced, with even more dramatic increases in the likelihood of superior quality. Communication also affects how sensitive quality is to the cost shock, defined as the average quality decrease associated with the cost shock. For endogenous rigid and flexible contracts, respectively, the sensitivities are 0.10 and 0.19 in no-communication, 0.33 and 0.10 with chat, 0.32 and 0.08 with restricted communication. It is natural for flexible contracts to generate low sensitivity, because the buyer can compensate for the seller's loss from suffering a cost shock. However, this only works in the chat treatments, where the buyer is likely to make and fulfill promises to compensate the cost shock. Indeed, over-expectations over the additional transfer or compensation can explain the apparent greater sensitivity of quality to cost for flexible contract choices in the no-communication treatment.

The increase in sensitivity for rigid contracts makes sense in endogenous contracts where chat allows sellers to argue for cost-sharing, which may well encourage them to punish buyers who still refuse to select flexible contracts, especially in the event of a cost-shock which is where the rigid choice has its worst consequences. Looking at exogenous rigid and flexible contracts, the corresponding sensitivities are 0.10 and 0.37 with no-communication and 0.12 and 0.07 with chat. Here the pattern is very different for rigid contracts, probably because sellers can no longer logically blame the buyer for the inability to compensate or share in the cost shock.

Buyer earnings increase slightly with endogenous rigid contracts, while seller earnings more than double; overall earnings increase by 58 percent. With endogenous flexible contracts, these differences are larger, as buyer earnings almost double and seller earnings nearly triple; overall earnings increase by 128 percent. These patterns are similar with exogenous contracts: free-form communication leads to an overall earnings increase of 47 percent for rigid contracts and 72 percent for flexible contracts. The gains from chat are

lower for both exogenous rigid and exogenous flexible contracts. This may reflect easier learning in the exogenous treatments, leaving less need for chat to facilitate effective adaptation of transfers.

Table 2 also provides comparisons, with free-form communication, across exogenous and endogenous contracts. As in the no-communication treatment, the differences are slight. The average price with rigid contracts is almost identical in the endogenous and exogenous contract settings and the average total price with flexible contracts also varies little. For rigid contracts, the only notable difference is that the rejection rate is higher in the endogenous case (18.0% versus 13.9%), suggesting that sellers may react negatively to buyers who *choose* rigid contracts. For flexible contracts, differences are again slight; the lower initial price P in exogenous flexible is partly counter-balanced by a higher added transfer Q, but still leads to slightly more cases of inferior quality. Overall, free-form communication leads to a much higher proportion of flexible contracts, higher prices, higher quality, fewer rejections, and greater earnings for both sides.

Finally, we consider the restricted-communication treatment. This looks much more like the no-communication treatment than the chat treatment. The main apparent differences are that sellers reject rigid contracts (47% of the time) and buyers choose flexible contracts much more often than with no-communication (in fact, flexible contracts are even more frequent than in chat). However, both these differences may reflect experimenter demand effects: the communication channel is clearly designed to support buyers who select flexible contracts.[31] So we pay more attention to the indicated Q-values and the quality and earnings outcomes.

In this treatment, we can observe *indicated* dQ-values for each individual match. The most frequently indicated values of dQ are 0, 5 and 10, with a mean of 5.36. Actual cost

[31] The low average prices offered in rigid contracts here may reflect a stronger selection effect now that the communication structure makes cost-sharing focal, so only less generous buyers select rigid.

sharing is lower, because buyers more often break their promises on Q after a cost shock; in fact, the total transfer is barely higher (0.43 units) after the 20 unit cost shock than after no shock.[32] This low credibility of promises may interfere with insurance, and, along with the substantially lower prices, explain why performance is so much poorer than in chat; in chat, average quality is strongly positive, instead of strongly negative as here. As expected, restricted communication does not raise earnings for buyers who pick rigid contracts and is always less effective than free-form communication. Nonetheless, the mere ability to clarify intended Q-values does seem to raise buyer and total earnings from flexible contracts above those from rigid contracts.

Figures 1 and 2 show the time trends by treatment in the frequency of flexible contract proposals and in average quality levels, respectively. With endogenous contracts and chat, Treatment 2, the increase in the proportion of flexible contracts is substantial, from 60% in the first two periods to 84% in the final two periods, suggesting that traders learn to use flexible contracts as their experience increases. With respect to quality, we find an increasing trend in all of the chat treatments, but not in treatments with restricted or no communication.

[Figures 1 and 2 about here]

5.2 Non-parametric tests

In this section we present the results of statistical tests of the conjectures developed in section 4. We perform non-parametric tests on two levels for the differences we have just highlighted. A conservative testing philosophy treats each session as exactly one observation, and implies that we only have four observations from each treatment; the data for each session is presented in Appendix B. A more powerful but less pure statistical approach is to consider the aggregate behavior and outcomes for each individual. The individual-level tests that we present below are based on seller-level data, that is, for each seller, we average the

[32] Buyers whose offers are accepted fulfill (or exceed) the relevant indicated Q value only 13.3% of the time when there is a cost shock, compared to 33.3% of the time when there is no cost shock. The average gap between the indicated Q and the Q actually chosen was 8.99 with a cost shock, compared to 4.10 without.

values of the relevant variable over that seller's ten active matches with buyers.[33] We begin with the endogenous treatments and then check whether exogenous treatments give similar results.

First, we present results on tests of the conjectures about contract frequencies. Conjecture A posits that in the endogenous no-communication treatment, rigid contracts will be more frequent than flexible contracts, while Conjecture B states that in the endogenous chat treatment flexible contracts will dominate. A Wilcoxon signed-ranks test for a higher proportion of rigid than flexible contracts in the no-communication treatment shows a marginally-significant difference at the individual level ($Z = 1.53$, $p = 0.063$), but no difference at the session level.[34] Thus, despite the support (below) for the earnings predictions that motivate Conjecture A, the support for Conjecture A itself is fairly weak. On the other hand, in the chat treatment, flexible contracts clearly dominate at both the individual and session levels (signed-ranks tests give $Z = 5.51$, $p = 0.000$ with individual data and $p = 0.063$ at the session level). So our tests are fully consistent with Conjecture B and weakly supportive of Conjecture A.

Conjecture A' predicts that endogenous rigid contracts lead to higher quality and buyer earnings, while Conjecture B' predicts the opposite under endogenous chat, with seller earnings also then higher for flexible contracts. Quality is higher with rigid contracts than flexible ones in each session of the no-communication treatment, with the converse holding in each session of the chat treatment ($p = 0.063$ in both signed-ranks tests). Comparing within individuals, we find significantly lower quality for flexible than rigid contracts in the no-

[33] We cannot control for both buyer and seller fixed effects at the same time, since we have no repeated interactions. We expect buyer fixed effects to be less important; even self-interested buyers will share 50:50 if this is needed to get a high quality response, meanwhile sellers move last and variations in their sense of entitlement have large payoff implications for buyers. Indeed, variation among sellers seems to have more impact than buyer variation. The relative standard error (RSE) of quality x (chosen by sellers) is greater than the RSE of total transfer (chosen by buyers) in accepted contracts: for quality, the RSE's are 0.1305 (overall), 0.0977 (no-chat), and 0.0520 (chat); as for total transfers, the RSE's are 0.0180, 0.0445, and 0.0113, respectively. So we control for seller fixed effects by using seller-level data in the signed-rank tests. Buyer-level data give similar results but somewhat less significance.

[34] All tests are one-tailed unless otherwise indicated, in keeping with our directional hypotheses.

communication treatment, $Z = 1.98$, $p = 0.024$, while quality is much higher for flexible contracts than for rigid contracts in the chat treatment, $Z = 3.61$, $p = 0.000$. So the quality tests are highly supportive of A' and B'.

For earnings with endogenous contracts, the results are similar. First, on A', session-level signed-ranks tests in the no-communication treatment are similarly supportive: rigid gives higher buyer earnings than flexible ($p = 0.063$); rigid contracts also generate higher total earnings (again $p = 0.063$), though seller earnings are no higher ($p = 0.312$), consistent with ambiguity in flexible contracts sometimes benefiting sellers by inducing higher transfers from buyers. At the individual-level, signed-rank tests provide marginal support with buyer earnings ($Z = 1.55$, $p = 0.060$), and total earnings ($Z = 1.89$, $p = 0.029$). Second, returning to B', with chat the flexible contract is clearly more profitable for both buyers and sellers. Support for Conjecture B' is moderately strong: individual-level signed-ranks tests show that differences for buyer, seller, and total earnings are all highly significant ($Z = 2.77, 2.93, 3.40$ and $p = 0.003, 0.002, 0.000$, respectively); at the session-level, signed-ranks tests line up perfectly for seller earnings, giving $p = 0.063$, but just fail to line up perfectly for buyer and total earnings, giving $p = 0.125$.

For the exogenous-contract environment, we can test these two conjectures by comparing outcomes between the rigid and flexible treatments using the Wilcoxon-Mann-Whitney rank-sum test. Results are similar to those in the endogenous environment, both for the no-communication and chat environments. With no-communication, the small advantage of rigid contracts under endogeneity is no longer significant, but rigid still has a modest advantage when conditioning on seller acceptance: buyer earnings are higher for accepted contracts in the rigid than in the flexible contract treatment according to individual-level tests only ($Z = 1.62$, $p = 0.052$). Notice that this test speaks more directly to the theory, because rigid contracts only benefit from the decision-responsibility norm when sellers decide to

participate by accepting the contract.

Meanwhile, with free-form communication, we find strong support for the main prediction of conjecture B' that flexible contracts will deliver higher buyer earnings than rigid ones; we also find support for B' in terms of total earnings, but only marginal support in terms of seller earnings. Concretely, comparing exogenous rigid and flexible contracts (Treatments 5 and 6) in terms of buyer, seller and total earnings, the respective *Z*-statistics on rank-sum tests at the individual level are 4.63, 1.60, and 3.88 and *p*-values are 0.000, 0.055, and 0.000,; at the session level, the *p*-values are 0.014, 0.243, and 0.171.

Conjecture C proposes that free-form communication will lead to an increase in quality *x*, total transfers T, buyer and seller earnings, and (for flexible contracts) the degree of cost sharing dQ. Comparing endogenous treatments, rank-sum tests for quality differences between no-communication and chat (Treatments 1 and 2), provide strong support: individual- and session-level averages give $Z = 7.48$, $p = 0.000$ and $p = 0.014$, respectively.[35] These tests give similar results across exogenous rigid-contract Treatments 3 and 5: $Z = 6.49$, $p = 0.000$ and $p = 0.014$ for individual- and session-level rank-sum comparisons of chat versus no-communication, and $Z = 7.71$, $p = 0.000$ and $p = 0.014$ when comparing flexible-contract Treatments 4 and 6.

Total transfers T paid in accepted endogenous rigid contracts are much higher in the chat than in the no-communication treatment ($p = 0.028$ and $Z = 5.12$, $p = 0.000$ for session-level and individual-level tests, respectively).[36] The results are similar for endogenous flexible contracts ($p = 0.014$ and $Z = 7.52$, $p = 0.000$). Comparing the exogenous treatments with communication to the same with no communication, the results have the same flavor. The total transfer is much higher with chat for both rigid contracts and flexible contracts ($p =$

[35] Remarkably, only two of 44 sellers provided positive average quality in the no-communication treatment, while all 44 sellers did so in the chat treatment.

[36] As with the above quality tests, which necessarily exclude rejected contract offers since *x* is unobserved, we study total transfers paid conditional on contract acceptance.

0.014 for both session-level comparisons, and $Z = 7.92$ and $Z = 7.97$, respectively, both $p = 0.000$, with individual-level data).

As for the prediction that communication will raise both buyer and seller earnings, we find strong support. In fact, nearly all sellers in the (endogenous-contracts) chat treatment had higher earnings than in the no-communication treatment; rank-sum tests give $Z = 8.05$, $p = 0.000$ at the individual level and $p = 0.014$ at the session level. The divergence in buyer earnings across treatments is not quite as extreme, but still highly significant: the rank-sum test finds a difference using both individual-level data ($Z = 5.89$, $p = 0.000$) and session-level data ($p = 0.014$) and for total earnings the results are similar (again, $p = 0.014$ at the session-level).

In the exogenous-contract environment, the effect of chat on rigid contracts is again quite positive: session-level rank-sum tests give $p = 0.029$ for sellers and $p = 0.100$ for buyers, while individual-level tests give $Z = 6.28$, $p = 0.000$ for sellers and $Z = 2.68$, $p = 0.004$ for buyers. For flexible contracts, the effects are strong: $p = 0.014$ at the session level for both buyer and seller, with $Z = 6.31$, $p = 0.000$ for buyers and $Z = 6.32$, $p = 0.000$ for sellers at the individual level.

Finally, Conjecture C predicts that chat will raise cost-sharing dQ for flexible contracts. We estimate dQ as the average Q paid after a cost shock minus that paid after no cost shock, conditioning on accepted flexible contracts. So we compare accepted flexible contracts across Treatments 1 and 2 and across Treatments 4 and 6. Session-level tests give $p = 0.014$ for both comparisons, while individual-level tests give $Z = 3.23$, $p = 0.001$ and $Z = 7.45$, $p = 0.000$, respectively. So both endogenous and exogenous data strongly support the prediction that free-form communication encourages and/or facilitates cost sharing.

We now turn to the restricted-communication treatment. Support for Conjecture B-RC, that flexible predominates in the restricted-communication treatment, is easily as strong

as in chat: flexible contracts are used at least 80% of the time in all four sessions, with $Z = 5.81$, $p = 0.000$ for individual-level and the minimum p-value of 0.063 for session-level tests. As for B'-RC, buyer earnings are higher with flexible than rigid contracts in all four sessions, giving $p = 0.063$; total earnings are also higher with flexible in all four sessions though seller earnings are only higher in one of the four sessions. Individual-level signed-ranks tests confirm this significant difference for buyer earnings ($Z = 2.69$, $p = 0.004$) and for total earnings ($Z = 2.51$, $p = 0.006$); by contrast, these do not show any significance for seller earnings ($Z = 0.14$, $p = 0.444$). Average quality is only higher with flexible contracts in one of four sessions, so there is no session-level support here and the individual-level difference has the predicted sign but is far from significant ($Z = 0.61$, $p = 0.271$). It seems flexibility does not improve quality because buyers often fail to fulfill their price indications, particularly after a cost shock.

Conjecture C-RC proposes that, for flexible contracts, restricted communication will have similar, but weaker, effects than chat. So we look for increases in quality x, transfers T, earnings, and cost sharing dQ, on flexible contracts only.[37] At the session level with flexible contracts, both buyer earnings and total earnings are significantly higher with restricted communication than with no-communication according to a rank-sum test ($p = 0.057$); seller earnings are also higher, but not significantly so ($p = 0.243$). Individual-level rank-sum tests give $Z = 1.50$, $p = 0.066$, for buyers, $Z = 1.12$, $p = 0.132$ for sellers, and $Z = 1.70$, $p = 0.045$ for total earnings. Overall, we find weak evidence that earnings with flexible contracts are higher with restricted-communication than with no-communication, with somewhat stronger results for total earnings.

[37] Conjecture C-RC is silent about rigid contracts where the treatment has no difference relative to no-communication except for possible framing effects and shifts in selection and signaling effects. For rigid contracts, we find that quality, total transfers, and seller earnings are insignificantly lower and buyer earnings and total earnings are significantly lower with restricted communication than with no communication. The respective two-tailed rank-sum test statistics (individual-level data) are Z = 1.44 ($p = 0.150$), $Z = 1.13$ ($p = 0.260$), $Z = 0.93$, $p = 0.352$, $Z = 2.47$ ($p = 0.014$) and $Z = 2.26$ ($p = 0.024$).

In sum, there is modest support for Conjecture C-RC. The lower benefits relative to chat predicted in C-RC(b) are strongly supported, but support for C-RC(a) is weaker. More interestingly, restricted communication benefits flexible contracts relative to rigid ones, consistent with the idea that clarifying Q is important for avoiding costly disagreements in flexible-contract relationships. The session-level average buyer, seller, and total earnings are all higher with flexible than with rigid contracts in every single session with restricted communication and are smaller in almost every single session in no-communication.[38] So we find support for the idea that restricted communication complements flexible contracting.

5.3 Regression analysis

In this section, we analyze the determinants of earnings using regression analysis. The results essentially corroborate the non-parametric tests reported above.

[Table 3 about here]

The regressions are shown in Table 3. Specifications (1) and (4) include only Treatments 2–7 as independent variables. These regressions reveal the impact of the different treatments, without controlling for whether trade takes place or for the realization of the cost shock. Buyers and especially sellers earn much more in all chat treatments than in Treatment 1; they do not earn significantly more with restricted-communication than with no-communication. For buyers, there is no difference in earnings between Treatment 1 and Treatments 3 and 4, but exogenously imposing rigid or flexible contracts does significantly raise seller earnings, with a larger point estimate for the coefficient on flexible Treatment 4. However, the chat treatments have much larger effects. Exogeneity may benefit sellers (especially) by simplifying the buyer's problem so that buyers learn to pay higher transfers (which directly benefits sellers).

[38] Seller earnings are higher with flexible contracts in one session of the no-communication treatment.

In specifications (2) and (5), we add a variable for the time period and three dummies that capture whether there has been any trade and, if so, the cost realization. We omit the dummy for the baseline case of no trade.[39] The results show a significantly positive time trend for seller, but not for buyer, earnings. They also show that trading with no cost shock yields much higher earnings for both buyer and seller, while trading when the cost is 20 leads to an earnings increase for buyers and a small decrease for sellers. The reason for the decrease is that the burden of the cost shock falls directly on sellers and makes sellers worse off than from not trading unless the transfer paid is high.[40] As in specifications (1) and (4), the coefficients for Treatments 2, 5 and 6 are significant and positive and the coefficient on Treatment 7 is insignificant for both buyer and seller earnings. Note that for buyer earnings the coefficient for Treatment 5 is no longer significant – exogenous rigid contracts with chat do not yield significantly higher earnings than the baseline treatment – but the coefficient for Treatment 6 continues to be significant. This suggests that exogenous-rigid contracts with chat improve on the endogenous no-communication treatment via chat leading to more trade agreements, but do not significantly improve outcomes conditional on trade (unlike for flexible, where chat improves by permitting clarification).

In specifications (3) and (6), we also add "Flexible", a dummy indicating choice or imposition of the flexible contract, and two interaction terms, "Flexible*Treatment2" and "Flexible*Treatment7", to better understand the endogenous-contract results. Flexible contracts lower buyer earnings in Treatment 1 but not significantly so, consistent with the relative weakness of the earlier support for Conjecture A'. Meanwhile, consistent with

[39] The no-trade variable takes the value 1 if no trade and is 0 otherwise, while the Cost = 0 variable takes the value 1 if there is trade and the cost is zero and is 0 otherwise. The Cost = 20 variable takes the value 1 if there is trade and the cost is 20 and is 0 otherwise. These three variables are mutually exclusive and we omit the no-trade variable.

[40] Notice that given trade occurs, the impact of the cost shock is negative for buyers as well: the difference between the coefficients on Cost = 20 and on Cost = 0 is 4.865. This is because buyers may choose to compensate the seller for the cost shock if the contract is flexible and sellers are less likely to set high quality after suffering a cost shock.

Conjecture B', flexible contracts generate higher earnings for both buyer and seller in the chat treatment (Treatment 2), but not significantly higher buyer earnings in Treatment 7 despite the supportive non-parametric tests of Conjecture B'-RC in section 5.2. The significantly positive buyer-earnings effect of the interaction term for Treatment 2 (Flexible*Treatment) supports the key idea that the advantage of flexible contracts is strongly linked to free-form chat. Along with our non-parametric results, this supports our prediction that chat complements flexible contracting.

There are two new shifts in the significance of the other covariates compared to the previous specifications. For buyer earnings, Treatment 2 is no longer significant, which can be attributed to the Flexible*Treatment 2 term: buyers benefit from chat when they select flexible contracts; if they select rigid, sellers can pressure buyers to pay high transfers and punish sellers for not opting to share in the cost shock. The other shift is that for seller earnings, the coefficient for Treatment 3 loses the marginal significance that it had in specification (5).

We can also compare across treatment pairs by testing for the equality of regression coefficients (see Table 3a in Appendix C). Buyer and seller earnings increase with chat in the exogenous treatments, supporting Conjecture C. Earnings are far higher in Treatment 2 than in Treatment 7 for both roles except for buyers in the third specification, where the interaction term between Treatment 2 and flexible contracts comes into play. Confirming the above remarks, earnings do not differ across Treatments 3 and 4 for buyers (sellers may benefit from flexible), but are significantly higher in Treatment 6 than in Treatment 5, for buyers and marginally for sellers. Earnings are far higher in Treatment 2 than in Treatment 7 for both roles.

The last row in Table 3a tests for differences-in-differences between flexible and rigid contracts among the four exogenous treatments, with and without chat. These are significant

for buyer, but not seller, earnings. This provides strong support for our most important prediction: chat complements the use of flexible contracts by making them more effective for buyers (in terms of earnings). Though we only found support for the modified version of Conjecture A' where we conditioned on contract acceptance, the difference in difference implied by comparing Conjectures A' and B' receives strong support even for exogenous contracts.

In Table 4, we also perform regression analysis only on the exogenous treatments, as this represents the cleanest comparison of the efficacy of rigid and flexible contracts.

[Table 4 about here]

These tests on exogenous contracts confirm the time trend and show at most weak differences in earnings between Treatments 3 and 4, but strong differences between Treatments 3 and 5 (and 3 and 6). In addition, a test for differences in coefficients in Table 4a shows that earnings are higher in Treatment 6 than in Treatment 4. Thus chat raises earnings for buyers and sellers for both exogenous-contract treatments, supporting Conjecture C. Table 4a also shows that buyers and sellers earn more in Treatment 6 than in Treatment 5, supporting Conjecture B' that earnings are higher with flexible than rigid contracts when chat is feasible. Finally, the last row of Table 4a tests for differences-in-differences of chat versus no-communication on flexible versus rigid. The result is strongly positive for buyer, but not seller, earnings. Thus, these results from only the exogenous-contract treatments, are quite consistent with those for the regressions in Table 3.

This regression analysis shows robustly that with chat, flexible contracts lead to higher earnings than rigid contracts and that communication raises the relative advantage of flexible over rigid contracts.[41] The results also show that the advantage of flexible contracts is present with restricted communication though much stronger with free-form communication.

[41] Simple clustered regressions for every treatment show a very strong and significant influence of the price paid on the quality provided, The coefficient on the price paid is significant at $p < 0.01$ in every case.

6. Discussion and analysis of chat data

We have seen that free-form communication leads to a far higher proportion of flexible contracts, and induces much higher prices, quality, and earnings. But which elements in the chat content drive this effect? And how well do the patterns that we observe fit with our theoretical predictions? We discuss these issues descriptively in 6.1 and statistically in 6.2 and 6.3.

6.1 Message content

We coded our free-form messages on the basis of three categories. First, discussion about Q is central to our investigation and very common, so "Q-clarification" is our first category. Second, traders typically seek to establish a personal rapport, so "friendliness" is our second category. Finally, sellers often make promises about the quality that they will choose, so this is our third category.[42] A research assistant independently coded all chats. At no point in the process of developing or implementing the coding scheme was she informed about any of our hypotheses about the messages. The RA was explicitly told that her job was to capture what had been said rather than why it was said or what effect it had. Coding was binary for Q-clarification and promises over quality, but trinary for friendliness. The coder could check as many or as few categories as she deemed appropriate. This was done for all the chat treatments: 2, 5 and 6. We disaggregate Treatment 2 into the subsets where the chosen contract was flexible and rigid, denoting them 2F and 2R, respectively (the figures loosely refer to "Treatments" 2F and 2R).

[Figures 3-5 about here]

Figures 3-5 show the evolution of the frequency of Q-clarification and promises and the average value of friendliness over time. Figure 3 shows that the rate of Q-clarification

[42] We originally coded 18 categories for Treatment 2, but high variance, overlap and correlation led us to code only the three main categories for Treatments 5 and 6. See Brandts, Charness, and Ellman (2012) for more detail.

becomes over 90 percent in 2F (flexible contracts in Treatment 2) and over 80 percent in Treatment 6, while remaining very low for the rigid contracts of 2R and always zero in Treatment 5 (omitted from the Figure). This suggests that participants quickly learn that if they use flexible contracts it is in their interest to clarify aspects of their transfer plans. Figure 4 shows that promises on quality become more frequent over time in Treatments 5 and 6, with the latter having the highest rate (almost 70 percent in the final two periods); the overall rate of promises is 50 percent with flexible contracts in Treatment 2, while the rate with rigid contracts varies, but averages 35 percent. Promises are a natural part of agreements on transfers and quality in both types of contract, possibly being more explicit in flexible contracts where there is more to discuss. The average friendliness in 2F (flexible contracts in Treatment 2) is about as high as in Treatment 5, at about 0.5, while the average in 2R (rigid contracts) is visibly the lowest, at 0.2, consistent with the prediction that in friendly matches, traders will choose to share in the cost shock by using flexible contracts and that sellers often get upset if buyers instead pick rigid contracts.

So we see that Q-clarification, promises over quality, and friendliness are generally highest in the treatments and for the contract types where we see the highest quality and earnings. Given the endogeneity of communication contents, we cannot make clear causal inferences. For instance, a generous transfer from the buyer may cause high quality and cause a friendly chat response by the seller; similarly, the types of buyer who make chats friendly may also tend to pay higher transfers, inducing higher quality. Nonetheless, the associations offer suggestive evidence and we can study which combinations of chat messages are associated with particularly effective outcomes within, as well as across, treatments and contract types; we also explore the timing of chat content with some simple tests in the next subsection.

In the restricted-communication treatment, buyers choosing flexible contracts almost

automatically clarify their plans for Q. While buyers are indeed slightly better off with flexible contracts than rigid ones, they are far better off with flexible contracts in the free-form chat environment. So clarifying numerical Q-values alone does not explain the effectiveness of flexible contracts in the chat environment. Recall that clarification is not effective unless credible: if buyers often deliver Q-values below the values indicated/clarified, this leads to inefficiency because sellers naturally tend to punish deception.[43] We predicted particularly effective Q-clarification when accompanied by chats that are friendly and/or involve promises over quality since buyers then tend to fulfill their clarified Q-plans, as a direct result of friendliness and because seller quality promises raise buyers' own incentives to fulfill their transfer promises. That is, chats enhance the credibility and effectiveness of clarified Q-plans.

Table 5 shows the average quality for all combinations of chat values in the treatments that feature free-form communication.

[Table 5 here]

As expected, friendliness is a sign that the relationship is working well. It is quite clear that unfriendly chats result in very low quality – a weighted average of all unfriendly chats gives an average quality of -0.516, while for neutral and positive friendliness, the respective averages are 0.482 and 0.742, respectively. Moreover, friendliness is associated with higher average quality in 2R, 2F, and Treatments 5 and 6. Similarly, quality promises are also associated with higher average quality in each of these sub-treatments and treatments. A quality promise raises the probability that the seller will provide high quality and, in flexible contracts, also raises the buyer's incentive to fulfill her transfer plan. In sum, friendliness and promises are indeed associated with higher quality for both rigid and flexible contracts. In fact, quality promises help more with rigid contracts than flexible ones, perhaps because with

[43] See Brandts and Charness (2003) for experimental evidence showing that people will punish deception *per se*.

flexible, such promises are often left implicit in plan clarifications (and not picked up by our chat coding).

The value of chat content may depend on content combinations. Since Q-clarification is so pervasive in the chats for flexible contracts, for 2F and Treatment 6, we compare chat combinations with Q-clarification equal to 1 to further probe the effect of positive friendliness. Holding promises over quality constant at 0, the differences in quality from *Friendly* = 1 versus *Friendly* = 0 are 0.348 and 0.468 for 2F (that is, Treatment 2 with flexible contracts) and Treatment 6, respectively. Holding promises constant at 1, these differences are 0.254 and 0.143, respectively. Similarly, we find a bigger effect of a seller quality promise, when holding friendliness fixed at 0 than at 1.[44] So friendliness and promises appear to be substitutes.

A similar comparison to identify the conditional effects of Q-clarification is not so reliable given the rarity of Q-clarification = 0. It is obvious that we should not expect good outcomes when *Friendly* = -1. When both *Friendly* = 1 and *quality promises* =1, the return to Q-clarification is only small (0.069 in 2F and 0.063 in Treatment 6). Moreover, when a chat lacks either quality promises or friendliness, the benefit from clarification seems to disappear (e.g., 0.128 in 6 but only -0.019 in 2F, when Friendly = 0 and quality promise =1; when in addition, no promise has been made, the increase in quality is 0.172 in 2F, and -0.073 in Treatment 6). A possible explanation is that buyers who do not clarify may be the more generous types. Another possibility is that clarification often becomes implicit in later rounds, precisely when players have learned to avoid inefficiencies. Finally, it may be that, while Q-clarification is an important element and is used with high frequency, it may not be sufficient without a more personal element, such as friendliness or promises over quality. This is again consistent with the results in Treatment 7, where impersonal claims are less

[44] The effects equal 0.101 (2F) and 0.325 (in 6) if *Friendly* = 0 and 0.007 (2F) and 0.000 (in 6) if *Friendly* = 1.

credible and less often honored.

6.2 Timing of messages

The timing of chat contents may offer a further handle on the evasive question of causality. For instance, if the seller seems to do well from a friendly chat prior to the cost shock, this cannot stem from a friendly seller reaction to the buyer's additional transfer. Table 6 shows the frequency of both promises over quality and friendliness before and after the cost shock in Treatments 5 and 6 (we do not have the relevant timing data for Treatment 2). We see that in Treatment 5, promises are common before the cost shock, since the buyer has not yet chosen the price. Afterwards, the rigid contract cannot be changed, so there is no strategic reason to make a promise over quality. On the other hand, the rate of promises is substantially lower in Treatment 6 (flexible contracts) before the cost shock, but the rate is more than triple after the cost shock, since a promise could affect the post-shock added transfer, Q.

[Table 6 about here]

The pre-shock rate of friendliness is also higher with exogenous rigid contracts than with exogenous flexible contracts, perhaps since sellers realize that they can only affect the price if they do so before the cost shock. As with promises, the post-shock rate of friendliness is also much higher (more than double) in Treatment 6 than in Treatment 5, again most likely reflecting the seller's possibility of influencing the total price after the shock and perhaps buoyed by the sense of a shared concern when the cost-shock can be shared.

[Table 7 about here]

Table 7 presents regressions showing the effects on quality from promises over quality and friendliness, both pre-shock and post-shock. As there are rather few observations with low quality, we perform a probit regression with high (superior) quality as the dependent variable. Specification (1) shows a very strong relationship between pre-shock promises and

high quality in Treatment 5. These post-shock promises are most likely sincere since there is no strategic benefit in the rigid case where price is already fixed. Perhaps sellers intending to provide high quality after observing the price want to reassure the buyers of their intentions. Specification (2) indicates that friendliness is an important factor, with both coefficients significant and that of pre-shock friendliness larger than that of post-shock friendliness. Specification (3) includes all of these explanatory variables plus two interaction terms combining promises and friendliness. This regression shows that both pre-shock and post-shock promises are very important, while pre-shock friendliness has no explanatory value on its own.

Specification (4) indicates that pre-shock promises by themselves have little effect on high quality in Treatment 6, but that post-shock promises *per se* have a substantial effect. Perhaps promises made after the cost shock is observed (or simply more recent promises) are more credible; these promises can affect the overall price paid. Specification (5) finds that friendliness is an important factor, with both coefficients significant and that post-shock action again being more important than pre-shock action. Finally, specification (6) preserves these patterns and also indicates that there is synergy between promises and friendliness, more so when these are post-shock. In sum, unlike clarification, which has to be pre-shock, promises and friendliness can have beneficial effects *after* the cost shock is observed.

6.3 Support for theoretical conjectures about chat content

Conjectures D, E, and F predict how three different chat categories affect effectiveness, measured as total earnings here. We report below the extent to which the data in Treatments 2, 5, and 6 provide support for the theoretical conjectures about chat content. Table 8 shows total earnings with different values for chat categories, as well as the signed-rank test statistics.

[Table 8]

We see that Q-clarification significantly affects total earnings with flexible contracts (but not with rigid contracts) in Treatment 2; this evidence is consistent with both parts of Conjecture D. Q-clarification (rare in Treatment 5) also has a marginally-significant effect on total earnings in Treatment 6. Thus, we have substantial support for Conjecture D. Friendliness has positive and very significant effects on total earnings in all cases (T2F, T2R, T5, and T6), offering powerful support for Conjecture E. Finally, promises over quality also have significant positive effects on total earnings in all cases. Thus, we have strong support for Conjecture F.

We also perform regression analysis for the effect of each of these chat categories on total earnings, controlling for the price paid and time trends. These regressions are shown below:

[Table 9]

There are some interesting patterns. First, we see that total earnings are increasing over time in each case, with particular significance in Treatments 2 and 6. Second, each chat category is highly significant, with the exception of Q-clarification in Treatment 6 (though Q-clarification had a significant effect on total earnings in the non-parametric tests in Treatment 6). The effect of friendliness is particularly strong in Treatments 2 and 6, with a coefficient of over 10. In Treatment 5, this coefficient is only one-third as large though still significant. Instead, the price paid then drives total earnings to quite a large extent, with nearly eight units of additional earnings when the price paid is increased by 10. Price paid is also strongly significant in Treatment 2, except when friendliness is included. Overall, friendliness explains more of the variation than promises and the regressions with Q-clarification have the lowest R^2.

The relative weakness of Q-clarification in the Treatment 6 regression suggests that its effect is stronger when flexible contracts are chosen, possibly making Q-value plans more

credible. As with restricted communication, clarification alone makes a small difference, but the effects are considerably greater in combination with friendliness or promises.

In sum, our analysis provides evidence that friendliness and promises over quality increase total earnings, with *Q-clarification* helping with endogenous flexible contracts, helping only to a modest extent (in the non-parametric tests) with exogenous flexible contracts, and but not helping at all with rigid contracts. Overall, the data show strong support for our conjectures D, E, and F on the effect of chat categories on total earnings.

7. Conclusion

How does the ability to communicate affect the frequency and effectiveness of different types of contracts where sellers choose unenforceable trade quality after observing a post-contractual cost shock? In principle, flexible contracts should be superior to rigid ones, because traders can adapt the terms of trade to better reflect the state of the world. Yet ambiguity over how to interpret flexible contracts may make it useful for traders to tie their hands. A flexible contract can leave room for disagreement after an event such as a cost shock, and disagreements can result in dissatisfaction, with a concomitant risk of low quality. Recent experimental work has found that rigid contracts can in fact be better than flexible ones (at least for buyers).

Our results without communication qualitatively confirm and generalize these ideas. We show that the advantage of rigid contracts in the absence of communication is robust to a number of design features including a lack of competition, which had been viewed as central to the theory. The fundamental intuition – that flexible contracts leave room for disagreements where sellers feel mistreated and supply inefficiently low quality – appears quite solid. Indeed, our no-communication results provide the first experimental support for the prediction of HM that flexibility can lead to reduced social welfare: we find that total earnings as well as buyer earnings are lower with flexible contracts than with rigid ones.

Furthermore, we find that rigid contracts are more frequent than flexible contracts when the contract choice is endogenous and there is no possible communication.

But is the problem flexibility *per se*, or is it the ambiguity of the situation that drives this result? Not much can be done to achieve better efficiency if the former is the case. However, traders may find ways to credibly ameliorate ambiguity and potentially induce better social outcomes in the latter case. In this paper, our most important contribution is to test for the effect of unrestricted communication on the nature and effectiveness of contracting. We see that matters change dramatically when the contracting parties are able to freely communicate from before trade is agreed until the seller chooses quality. With this natural feature, people can make agreements (that remove the ambiguity of flexible contracts) and promises (which, though unenforceable, tend to be honored); this leads to higher transfers and higher quality.

We find that transfers are higher, quality is higher, and earnings are substantially greater for both sides when free-form communication becomes feasible. Flexible contracts then emerge as the instrument that allows traders to raise efficiency. They become increasingly frequent over time, consistent with the idea that traders learn that flexible contracts work best. In our exogenous-contract treatments, we find that this advantage of flexible over rigid contracts with communication also holds when contract type is imposed exogenously.

In our restricted-communication treatment, where the only possible message is a clarification of additional transfers, flexible contracts are used more frequently than absent communication. In addition, flexible contracts are then associated with higher buyer earnings than rigid contracts (albeit a low-magnitude effect). Thus Q-clarification (the only communication tool available) has a positive effect on earnings with flexible contracts.

We also propose a conceptual approach based on the intuition that free-form communication helps to align expectations and resolve ambiguity. In line with this idea, content analysis of our chat data reveals that clarification of the transfer plan, friendliness, and promises are associated with better quality and earnings outcomes in flexible contracts.[45] In general, we find that it is not flexibility *per se* that causes problems in the contractual environment, but rather the risk of ambiguity over how flexible contract terms are to be adapted to subsequent events. Free-form (but still anonymous) communication appears to largely resolve this ambiguity while preserving the adaptive benefits of flexibility. Overall, our work points to large benefits from informal agreements when traders cannot write complete state-contingent (formal) contracts, and a complementarity between communication and contract flexibility.

In light of these sharp implications for contract design, it is important to know whether the presence or absence of communication channels between buyers and sellers is the more relevant case. Instances in which communication is very limited or simply infeasible do exist, but are not common because of the large efficiency gains permitted by communication. Moreover, our results clearly support the view that traders have strong incentives for finding ways to communicate (exchanging views and clarifying plans – as well as fostering trust).

The fact that communication raises surplus, fully consistent with existing work, serves to underline our view that communication is a natural assumption to make for contractual interactions; the traders have strong incentives for developing communication channels – both sides gain, including the sellers. While the practical cost of communication may differ from the pure time cost in our lab study (and is an empirical matter), we believe

[45] For the decision-responsibility norm to apply, this clarification must occur *ex ante*; we allow communication throughout, but our chat content analysis offers some support for the prediction that it is the *ex-ante* communication captured by *Q-clarification* that enables flexible contracts to work well. We also find that communication improves outcomes for both types of contract when chats show mutual respect and contain promises.

that communication will emerge in many situations. In our context, communication has a value beyond its role in enhancing trust and reward: it permits effective use of flexible contracting for sharing cost shocks and avoiding disagreements. Of course, communication is much more difficult in more complex environments. Traders with different experiences may fail to understand each other's perspectives and/or may be unable to explain their own plans without ambiguity. Such environments are extremely difficult to analyze in a controlled fashion.

We do wish to point out a potential limitation of our study (and the other studies) that is more amenable to investigation. We consider symmetric information, in that both parties observe the cost shock. Yet even small information asymmetries could potentially lead to substantial distortion, limiting the power of communication. Results from Charness and Dufwenberg (2006, 2011) indicate that free-form communication can strongly facilitate efficient outcomes even in asymmetric information environments with moral hazard and adverse selection, but the impact might be different here. We believe this issue calls for future research.

References

Andreoni, James (1990), "Impure Altruism and Donations to Public Goods: A Theory of Warm-Glow Giving?," *Economic Journal*, 100, 464-77.

Andreoni, James (2005), "Trust, Reciprocity, and Contract Enforcement: Experiments on Satisfaction Guaranteed," mimeo.

Arrow, Kenneth (1974), *The Limits of Organization,* Norton.

Aumann, Robert (1990), "Nash-Equilibria are not Self-Enforcing," in *Economic Decision Making: Games, Econometrics and Optimisation* (J. Gabszewicz, J.-F. Richard, and L. Wolsey, Eds.), 201–206. Amsterdam: North-Holland.

Bandiera, Oriana, Andrea Prat, Raffaella Sadun, Julie Wulf (2012) "Span of Control and Span of Activity," STICERD mimeo.

Ben-Ner, Avner, Louis Putterman and Ting Ren (2011), "Lavish Returns on Cheap Talk: Non-binding Communication in a Trust Experiment," *Journal of Socio-Economics*, 40, 1-13.

Bolton, Gary and Axel Ockenfels (2000), "ERC: A Theory of Equity, Reciprocity, and Competition," *American Economic Review*, 90, 166-193.

Brandts, Jordi and Gary Charness (2003), "Truth or Consequences: An Experiment," *Management Science*, 49, 116-130.

Brandts, Jordi and David Cooper (2007),"It's What You Say Not What You Pay: An Experimental Study of Manager-Employee Relationships in Overcoming Coordination Failure," *Journal of the European Economic Association*, 5, 1223-1268.
Charness, Gary (2000), "Self-serving Cheap Talk and Credibility: A Test of Aumann's Conjecture," *Games and Economic Behavior*, 33, 177-194
Charness, Gary and Martin Dufwenberg (2006), "Promises and Partnership," *Econometrica*, 74, 1579-1601.
Charness, Gary and Martin Dufwenberg (2010), "Bare Promises: An Experiment," *Economics Letters*, 107, 281-283.
Charness, Gary and Martin Dufwenberg (2011), "Participation," *American Economic Review*, 101, 1211-1237.
Charness, Gary and Matthew Rabin (2002), "Understanding Social Preferences with Simple Tests," *Quarterly Journal of Economics*, 117, 817-869.
Cooper, Russell W., Douglas V. Dejong, Robert Forsythe and Thomas Ross (1990), "Selection Criteria in Coordination Games: Experimental Results," *American Economic Review*, 80, 218-233.
Cooper, David and John Kagel (2004), "Are Two Heads Better than One? Team vs. Individual Play in Signaling Games," *American Economic Review*, 95, 477-509.
Ellingsen, Tore and Robert Östling (1989), "When Does Communication Improve Coordination?," *American Economic Review*, 100, 1695-1724.
Ellman, Matthew and Paul Pezanis-Christou (2011), "Organizational Structure, Communication and Group Ethics," *American Economic Review*, 100, 2478-2491.
Erlei, Matthias and Christian Reinhold (2011), "To Choose or Not to Choose: Contracts, Reference Points, Reciprocity, and Signaling," working paper.
Fehr, Ernst, Oliver Hart and Christian Zehnder (2009), "Contracts, Reference Points, and Competition - Behavioral Effects of the Fundamental Transformation," *Journal of the European Economic Association*, 7, 561-572.
Fehr, Ernst, Oliver Hart and Christian Zehnder (2011A), "Contracts as Reference Points - Experimental Evidence," *American Economic Review*, 101, 493-525.
Fehr, Ernst, Oliver Hart and Christian Zehnder (2011B), "How Do Informal Agreements and Renegotiation Shape Contractual Reference Points?," working paper.
Fehr, Ernst and Klaus Schmidt (1999), "A Theory of Fairness, Competition, and Cooperation," *Quarterly Journal of Economics*, 114, 817-868.
Gibbons, Robert, and Rebecca Henderson (2012), "Relational Contracts and Organizational Capabilities," *Organization Science*, 23, 1350–1364.
Hart, Oliver (1995),*Firms, Contracts, and Financial Structure*, Clarendon Press, Oxford.
Hart, Oliver and John Moore (2008), "Contracts as Reference Points," *Quarterly Journal of Economics*, 123, 1-48.
Hayek, Friedrich (1960), *The Constitution of Liberty*, University of Chicago Press.
MacLeod, W. Bentley (2007), "Reputations, Relationships, and Contract Enforcement," *Journal of Economic Literature*, 45, 595-628.
Maskin, Eric and Jean Tirole (1999), "Implementation and Renegotiation," *Review of Economic Studies*, 66, 39-56.
Oprea, Ryan, Gary Charness and Daniel Friedman (2012), "Continuous Time and Communication in a Public-goods Experiment," mimeo.
Peterson, Eugene (2012), Proverbs 1:29, *The Message* (www.biblegateway.com).
Sally, David (1995) "Conversation and Cooperation in Social Dilemmas: A Meta-Analysis of Experiments from 1958 to 1992,"*Rationality and Society,* 7, 58-92.
Simon, Herbert (1947) *Administrative Behavior: A Study of Decision-Making Processes in Administrative Organization*, 4th ed.,1997, The Free Press.

Sobel, Joel (2005), "Interdependent Preferences and Reciprocity," *Journal of Economic Literature,* 93, 392-436.
Van de Ven, Andrew, and Walker, Gordon (1984) "The Dynamics of Interorganizational Coordination," *Administrative Science Quarterly*, 29: 598-622.
Williamson, Oliver (1991) "Comparative Economic Organization: The Analysis of Discrete Structural Alternatives," *Administrative Science Quarterly*, Vol. 36, No. 2. pp. 269-296.

Table 1: Behavior in the no-communication treatments

Category	Endogenous Rigid	Endogenous Flexible	Exogenous Rigid	Exogenous Flexible
Frequency* (all offers)	243 (55.4%)^	196 (44.6%)^	436 (100%)	438 (100%)
Rejections (all offers)	79 (32.5%)	65 (33.2%)^	152 (34.9%)	119 (27.2%)
Average P (all offers)	13.28 [0.41]	11.13 [0.37]^	13.91 [0.31]	12.38 [0.28]
Average P (accepted offers)	15.74 [0.43]	12.58 [0.46]^	16.28 [0.33]	14.21 [0.31]
Average Q (with cost shock)	-	3.35 [0.49]	-	4.18 [0.67]
Average Q (with no cost shock)	-	1.58 [0.30]^	-	3.21 [0.37]
Inferior quality	51 (31.1%)	53 (40.5%)^	86 (30.3%)	108 (33.9%)
Normal quality	107 (62.2%)	74 (56.5%)^	183 (64.4%)	174 (54.5%)
Superior quality	6 (3.7%)	4 (3.0%)^	15 (5.3%)	37 (11.6%)
Avg. quality (cost shock)	-0.32 [0.06]	-0.45 [0.06]	-0.31 [0.05]	-0.41 [0.05]
Avg. quality (no cost shock)	-0.22 [0.06]	-0.26 [0.08]^	-0.21 [0.04]	-0.04 [0.05]
Avg. buyer earnings (all offers)	10.80 [0.58]	9.73 [0.63]^	10.46 [0.46]	10.13 [0.48]
Avg. buyer earnings (cost shock)	12.27 [1.06]	10.16 [1.17]	12.45 [1.03]	8.48 [0.96]
Avg. buyer earnings (no cost shock)	15.28 [1.11]	14.91 [1.26]^	14.17 [0.85]	15.48 [0.70]
Avg. seller earnings (all offers)	7.81 [0.59]	6.95 [0.68]^	9.92 [0.47]	10.59 [0.57]
Avg. seller earnings (cost shock)	0.80 [0.61]	0.21 [0.82]	0.73 [0.46]	2.35 [0.80]
Avg. seller earnings (no cost shock)	19.86 [0.62]	19.15 [0.85]^	21.07 [0.47]	22.51 [0.59]
Avg. total earnings (all offers)	18.61 [0.88]	16.68 [0.99]^	20.37 [0.69]	20.73 [0.79]
Avg. total earnings (cost shock)	13.08 [1.14]	10.36 [1.23]	13.18 [1.04]	10.83 [0.96]
Avg. (total earnings (no cost shock)	35.14 [1.14]	34.06 [1.50]^	35.23 [0.78]	37.99 [0.84]

* No contract was offered on one occasion. ^We exclude one case in which the buyer received a very large negative payoff (in the final period). Average buyer, seller, total earnings, and P (all offers) refer to all offered contracts. All other values refer to accepted offers. Standard errors are in bracket

Table 2: Behavior in the communication treatments

Category	Endo Rigid	Endo Flexible	Exo Rigid	Exo Flexible	Restricted Rigid	Restricted Flexible
Frequency*	111 (25.3%)	327 (74.7%)	438 (100%)	440 (100%)	68 (15.5%)	371 (84.5%)
Rejections	20 (18.0%)	12 (3.7%)	61 (13.9%)	18 (4.1%)	32 (47.1%)	110 (29.7%)
Average P (all offers)	22.76 [0.83]	16.91 [0.37]	23.04 [0.46]	13.14 [0.31]	10.79 [0.82]	8.94 [0.31]
Average P (accepted)	25.22 [0.72]	17.22 [0.47]	25.38 [0.41]	13.46 [0.30]	15.31 [0.97]	10.37 [0.39]
Average Q (with cost shock)	-	13.08 [0.66]	-	15.89 [0.55]	-	3.27 [0.44]
Average Q (with no cost shock)	-	7.25 [0.66]	-	8.44 [0.44]	-	2.82 [0.32]
Inferior quality	13 (14.3%)	20 (6.3%)	63 (16.7%)	50 (11.8%)	16 (44.4%)	122 (41.2%)
Normal quality	33 (36.3%)	61 (19.4%)	124 (32.9%)	85 (20.1%)	17 (47.2%)	150 (50.7%)
Superior quality	45 (49.4%)	234 (74.3%)	190 (50.4%)	287 (68.0%)	3 (8.3%)	24 (8.1%)
Avg. quality (cost shock)	0.19 [0.10]	0.63 [0.05]	0.28 [0.05]	0.53 [0.05]	-0.53 (0.12)	-0.38 (0.06)
Avg. quality (no cost shock)	0.52 [0.11]	0.73 [0.04]	0.40 [0.05]	0.60 [0.05]	-0.21 (0.16)	-0.29 (0.05)
Avg. buyer earnings (all offers)	12.66 [0.99]	17.02 [0.56]	12.58 [0.54]	16.58 [0.49]	8.74 [1.13]	11.87 [0.62]
Avg. buyer earnings (cost shock)	11.87 [1.75]	13.23 [0.66]	13.12 [0.85]	13.30 [0.64]	9.00 [2.32]	13.55 [1.29]
Avg. buyer earnings (no cost shock)	16.98 [1.34]	21.76 [0.78]	14.59 [0.87]	21.11 [0.66]	14.79 [3.07]	15.71 [1.06]
Avg. seller earnings (all offers)	16.68 [1.16]	20.95 [0.46]	17.44 [0.62]	19.03 [0.47]	7.82 [1.07]	7.92 [0.55]
Avg. seller earnings (cost shock)	9.62 [1.08]	15.15 [0.42]	9.51 [0.62]	13.12 [0.58]	-0.12 [1.48]	-1.78 [0.68]
Avg. seller earnings (no cost shock)	29.55 [0.93]	28.01 [0.29]	29.91 [0.53]	26.58 [0.32]	19.68 [1.38]	17.63 [0.69]
Avg. total earnings (all offers)	29.34 [1.72]	37.97 [0.84]	30.02 [0.83]	35.61 [0.78]	16.56 [1.72]	19.79 [0.77]
Avg. total earnings (cost shock)	21.49 [1.77]	28.37 [0.79]	22.62 [0.92]	26.42 [0.83]	8.88 [2.62]	11.77 [1.11]
Avg. total earnings (no cost shock)	46.52 [1.75]	49.76 [0.73]	44.50 [0.93]	47.69 [0.77]	34.47 [3.01]	33.33 [0.99]

* No contract was offered on two occasions with Exo Rigid. Average buyer, seller, total earnings, and P (all offers) refer to all offered contracts. All other values refer to accepted offers. Standard errors are in brackets.

Table 3: Determinants of earnings, Random-effects GLS regressions

Independent variables	(1) Buyer	(2) Buyer	(3) Buyer	(4) Seller	(5) Seller	(6) Seller
Period	-	0.069 (0.060)	0.056 (0.060)	-	0.268*** (0.041)	0.261*** (0.041)
Cost = 0	-	10.978*** (0.474)	10.882*** (0.475)	-	16.194*** (0.323)	16.172*** (0.324)
Cost = 20	-	6.113*** (0.478)	6.017*** (0.478)	-	-1.513** (0.326)	-1.544*** (0.326)
Treatment 2	5.554*** (0.713)	3.170*** (0.664)	0.529 (1.084)	12.374*** (0.719)	9.706*** (0.445)	7.409*** (0.739)
Treatment 3	0.102 (0.720)	-0.164 (0.661)	-0.568 (0.759)	2.490*** (0.719)	0.811* (0.440)	0.576 (0.517)
Treatment 4	-0.221 (0.720)	-0.951 (0.661)	-0.428 (0.814)	3.167*** (0.719)	1.690*** (0.439)	1.983*** (0.555)
Treatment 5	2.220*** (0.720)	0.452 (0.665)	0.066 (0.762)	10.015*** (0.719)	7.892*** (0.442)	7.662*** (0.519)
Treatment 6	6.224*** (0.720)	3.621*** (0.671)	4.171*** (0.825)	11.604*** (0.719)	8.870*** (0.447)	9.172*** (0.563)
Treatment 7	1.042 (0.720)	0.529 (0.661)	-1.099 (1.290)	0.508 (0.719)	-1.126** (0.439)	0.361 (0.880)
Flexible	-	-	-0.923 (0.906)	-	-	-0.529 (0.617)
Flexible* Treatment 2	-	-	3.961*** (1.380)	-	-	3.314*** (0.941)
Flexible* Treatment 7	-		2.349 (1.538)	-	-	-1.519 (1.048)
Constant	10.312*** (0.505)	4.455*** (0.628)	4.994*** (0.737)	7.426*** (0.509)	1.927*** (0.425)	2.218*** (0.502)
N	3079	3079	3079	3079	3079	3079
R^2	0.056	0.201	0.204	0.180	0.695	0.697

Standard errors are in parentheses. ***, **, and * indicate significance at $p = 0.01$, 0.05, and 0.10 (two-tailed tests), respectively. We exclude one case with an extreme buyer loss and seller gain. Clustering is at the individual level. The omitted variable is the case where no contract was reached.

Table 4: Determinants of earnings, Random-effects GLS regressions, Exogenous only

Independent variables	(1) Buyer	(2) Buyer	(3) Seller	(4) Seller
Period	-	0.212*** (0.080)	-	0.369*** (0.057)
Cost = 0	-	10.317*** (0.646)	-	17.688*** (0.461)
Cost = 20	-	5.652*** (0.659)	-	-0.413 (0.470)
Treatment 4	-0.323 (0.697)	-0.751 (0.650)	0.677 (0.758)	0.792* (0.463)
Treatment 5	2.118*** (0.697)	0.722 (0.661)	7.525*** (0.758)	6.831*** (0.472)
Treatment 6	6.123*** (0.697)	3.947*** (0.675)	9.114*** (0.758)	7.680*** (0.482)
Constant	10.457*** (0.493)	3.881*** (0.720)	9.916*** (0.574)	1.321*** (0.514)
N	1760	1760	1760	1760
R^2	0.058	0.190	0.114	0.672

Standard errors are in parentheses. ***, **, and * indicate significance at $p = 0.01$, 0.05, and 0.10 (two-tailed tests), respectively. Clustering is at the individual level. The omitted variable is the case where no contract was reached.

Table 5: Chat combinations and quality

Chat combinations	Avg. quality Treatment 2R	Avg. quality Treatment 2F	Avg. quality Treatment 5	Average quality Treatment 6
(0, -1, 0)	-0.667 (0.167) [9]	0.000 (1.000) [2]	-0.667 (0.142) [12]	-0.727 (0.195) [11]
(0, 0, 0)	0.296 (0.117) [27]	0.375 (0.125) [16]	0.099 (0.080) [81]	0.440 (0.130) [25]
(0, 1, 0)	0.714 (0.125) [14]	0.778 (0.147) [9]	0.326 (0.079) [92]	0.857 (0.143) [7]
(0, -1, 1)	1.000 (0.000) [2]	- (-) [0]	- (-) [0]	0.000 (-) [1]
(0, 0, 1)	0.636 (0.203) [11]	0.667 (0.167) [9]	0.620 (0.071) [71]	0.560 (0.130) [25]
(0, 1, 1)	0.833 (0.112) [12]	0.800 (0.200) [5]	0.724 (0.056) [87]	0.778 (0.101) [18]
(1, -1, 0)	- (-) [0]	0.111 (0.309) [9]	-	-0.800 (0.133) [10]
(1, 0, 0)	0.000 (0.000) [3]	0.547 (0.086) [64]	-	0.365 (0.103) [52]
(1, 1, 0)	0.500 (0.500) [2]	0.895 (0.041) [57]	-	0.833 (0.062) [48]
(1, -1, 1)	-1.000 (-) [1]	-0.800 (0.200) [5]	-	-0.500 (0.500) [2]
(1, 0, 1)	0.667 (0.333) [3]	0.648 (0.084) [54]	-	0.690 (0.690) [84]
(1, 1, 1)	1.000 (-) [1]	0.902 (0.033) [82]	-	0.833 (0.043) [120]
Qclarify = 0	0.413 (0.081) [75]	0.561 (0.086) [41]	-	0.425 (0.079) [87]
Qclarify = 1	0.300 (0.213) [10]	0.708 (0.035) [271]	-	0.658 (0.035) [316]
Friendly = -1	-0.417 (0.229) [12]	-0.188 (0.228) [16]	-0.667 (0.142) [12]	-0.708 (0.112) [21]
Friendly = 0	0.386 (0.093) [44]	0.573 (0.053) [143]	0.342 (0.058) [152]	0.548 (0.048) [168]
Friendly = 1	0.759 (0.081) [29]	0.889 (0.025) [153]	0.520 (0.051) [179]	0.829 (0.033) [189]
Promises = 0	0.236 (0.093) [55]	0.637 (0.049) [157]	0.162 (0.056) [162]	0.392 (0.063) [139]
Promises = 1	0.700 (0.109) [30]	0.742 (0.044) [155]	0.677 (0.044) [158]	0.740 (0.034) [239]

The chat combinations reflect clarification values, friendliness values, and promise values, respectively. Thus, for example, (1, 0, 1) means clarification = 1, friendly = 0, and promises = 1. Numbers in parentheses refer to standard errors, while numbers in brackets give the number of observations. Clarification was not used in Treatment 5, so we code this as 0 for the chat combinations.

Table 6: Frequency and timing of quality promises and friendliness

Category	Pre shock (T5)	Post shock (T5)	Pre shock (T6)	Post shock (T6)
Promise	216 (55.8%)	47 (12.1%)	85 (20.5%)	202 (48.7%)
No promise	168 (43.4%)	96 (24.8%)	25 (6.0%)	176 (42.4%)
Friendly	185 (47.8%)	71 (18.4%)	116 (28.0%)	169 (41.9%)
Neutral	179 (46.2%)	68 (17.6%)	261 (62.9%)	188 (46.6%)
Unfriendly	20 (5.2%)	4 (1.0%)	13 (3.1%)	21 (5.2%)

Notes: Post-shock percentages are based on the chats with accepted contracts. There were many cases with no post-shock discussion. T5 (T6) means Treatment 5 (6). The missing percentages reflect cases without conversation in the relevant timing. There were 3 (37) such cases pre-shock in Treatment 5 (6) and 244 (25) such cases post-shock in Treatment 5 (6).

Table 7: Effect of pre-shock and post-shock promises and friendliness on high quality

Independent variables	T5 (1)	T5 (2)	T5 (3)	T6 (4)	T6 (5)	T6 (6)
Pre-shock promise	0.954*** (0.146)	-	0.880*** (0.155)	0.142 (0.099)	-	0.025 (0.169)
Post-shock promise	0.253*** (0.064)	-	0.873*** (0.064)	0.349*** (0.088)	-	0.236* (0.140)
Pre-shock friendly		0.326*** (0.120)	-0.038 (0.144)	-	0.245** (0.096)	0.339** (0.160)
Post-shock friendly	-	0.173*** (0.057)	0.417** (0.202)	-	0.511*** (0.093)	0.606*** (0.137)
Pre-promise*pre-friendly	-	-	0.271* (0.145)	-	-	0.214** (0.109)
Post-promise*post-friendly	-	-	0.665*** (0.153)	-	-	0.368*** (0.095)
Constant	-0.207 (0.130)	0.126 (0.112)	-0.755*** (0.175)	0.424*** (0.074)	0.454*** (0.078)	0.108 (0.116)
N	343	343	343	403	403	403
Log-likelihood	-206.0	-226.3	-192.3	-234.8	-219.8	-208.4

Notes: All specifications are Probit regressions. T5 (6) refer to Treatment 5 (6), respectively. Standard errors are in parentheses. ***, **, and * indicate significance at $p = 0.01$, 0.05, and 0.10 (two-tailed tests), respectively.

Table 8: Total earnings as a result of chat category usage

Treatment, category	Total earnings	Z-statistic	Treatment, category	Total earnings	Z-statistic
T2F, Q-clarification	39.07/33.84	2.184 (0.014)	-	-	-
T2F, Friendly	43.08/33.42	3.447 (0.000)	T5, Friendly	34.27/29.03	3.303 (0.005)
T2F, Promise	38.87/37.88	1.961 (0.025)	T5, Promise	38.03/26.95	4.890 (0.000)
T2R, Q-clarification	29.55/30.46	0.210 (0.834)	T6, Q-clarification	37.38/34.53	1.717 (0.043)
T2R, Friendly	41.27/24.93	3.210 (0.001)	T6, Friendly	42.27/30.40	5.129 (0.000)
T2R, Promise	37.74/27.09	1.852 (0.032)	T6, Promise	40.10/31.66	3.968 (0.000)

Notes: "x/y" refers to the total earnings with and without a positive value for the category. All test statistics are one-tailed except to. T2F, T2R, T5, and T6 refer to Treatment 2 with flexible contracts, Treatment 2 with rigid contracts, Treatment 5 and Treatment 6, respectively. *p*-values (all one-tailed except for T2R, Q-clarification) are in parentheses.

Table 9: Regressions for the effect of chat-category values on total earnings

Independent variables	T2	T2	T2	T5	T5	T6	T6	T6
Period	0.497* (0.261)	0478** (0.241)	0.695*** (0.256)	0.493* (0.290)	0.420 (0.288)	1.240*** (0.273)	1.015*** (0.248)	1.200*** (0.263)
Price_paid	0.255** (0.106)	0.060 (0.102)	0.255*** (0.111)	0.799*** (0.086)	0.754*** (0.087)	0.188* (0.097)	-0.040 (0.091)	0.080 (0.096)
Q-Clarification	6.186*** (1.727)	-	-	-	-	0.822 (1.833)	-	-
Friendliness	-	10.247*** (1.150)		3.582*** (1.317)	-	-	10.805*** (1.175)	-
Promises	-	-	3.337** (1.583)	-	6.133*** (1.635)	-	-	7.413*** (1.534)
Constant	22.720*** (3.155)	28.060*** (2.930)	24.458*** (3.177)	23.564*** (3.037)	8.111*** (2.413)	24.296*** (2.800)	27.747*** (2.453)	23.453*** (2.610)
N	422	422	422	387	387	415	415	415
R^2	0.065	0.208	0.045	0.254	0.266	0.072	0.230	0.120

Standard errors are in parentheses. ***, **, and * indicate significance at $p = 0.01$, 0.05, and 0.10 (two-tailed tests), respectively. Clustering is at the individual level.

Figures

Figure 1: Flexible contracts over time

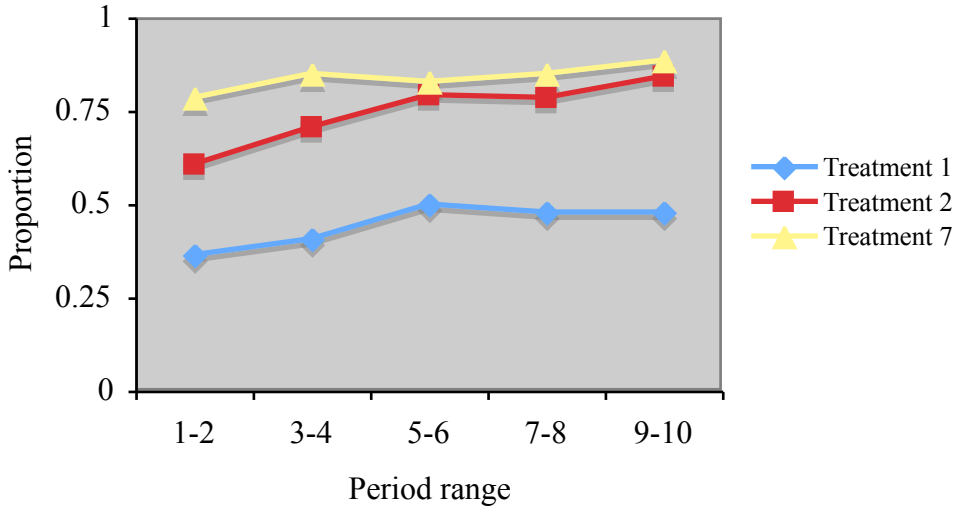


Figure 2: Average quality over time

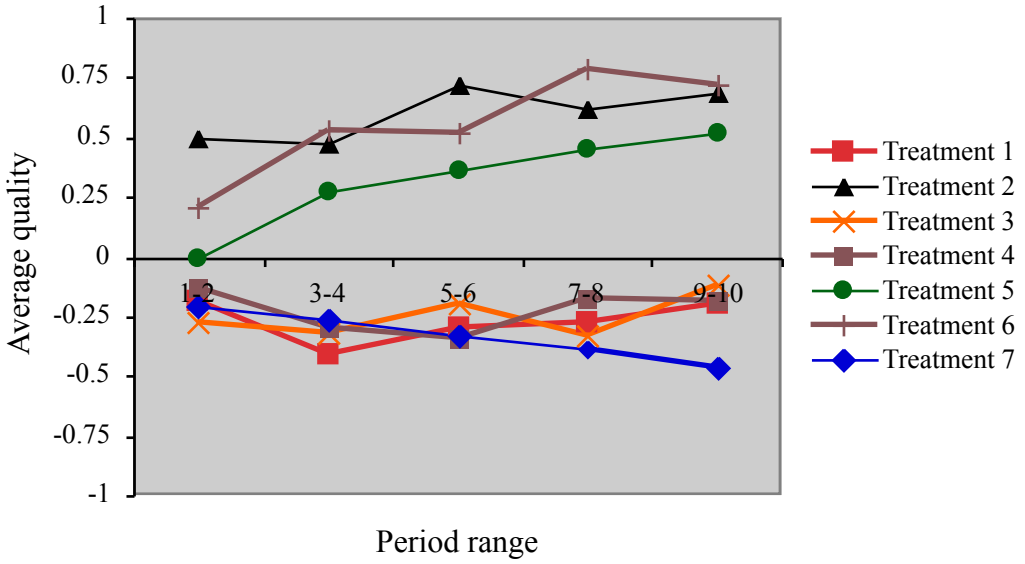


Figure 3: Proportion of Q-clarification over time

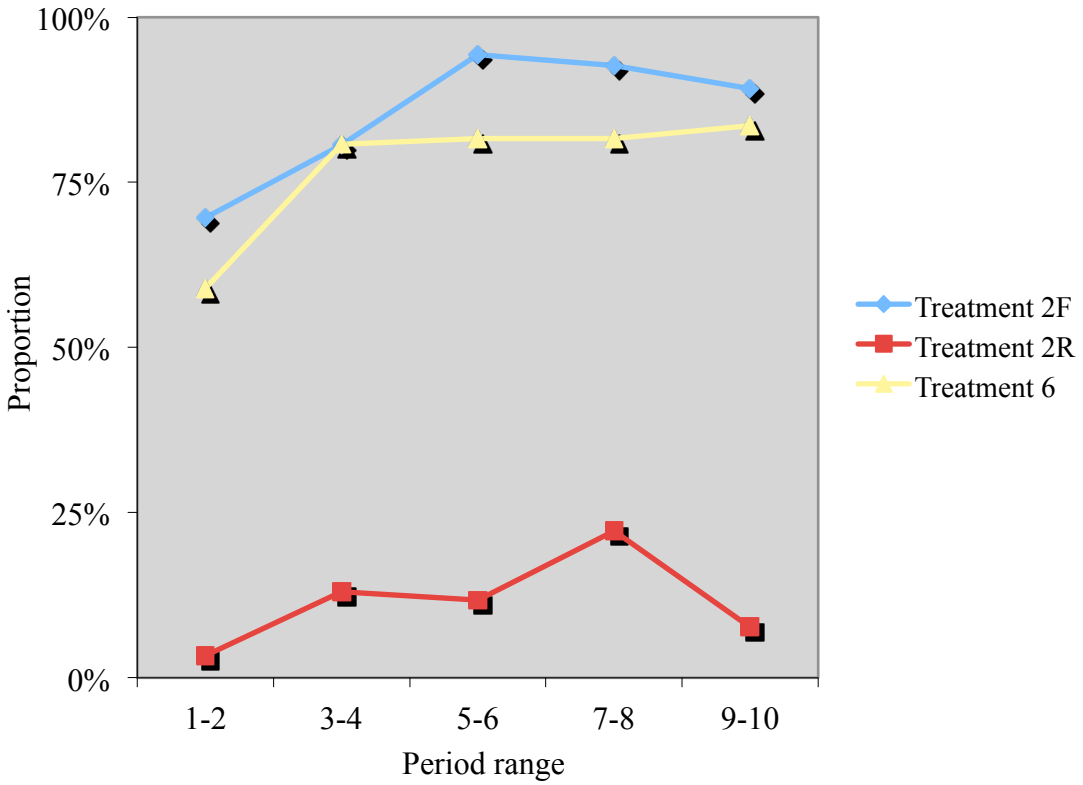


Figure 4: Proportion of promises on quality over time

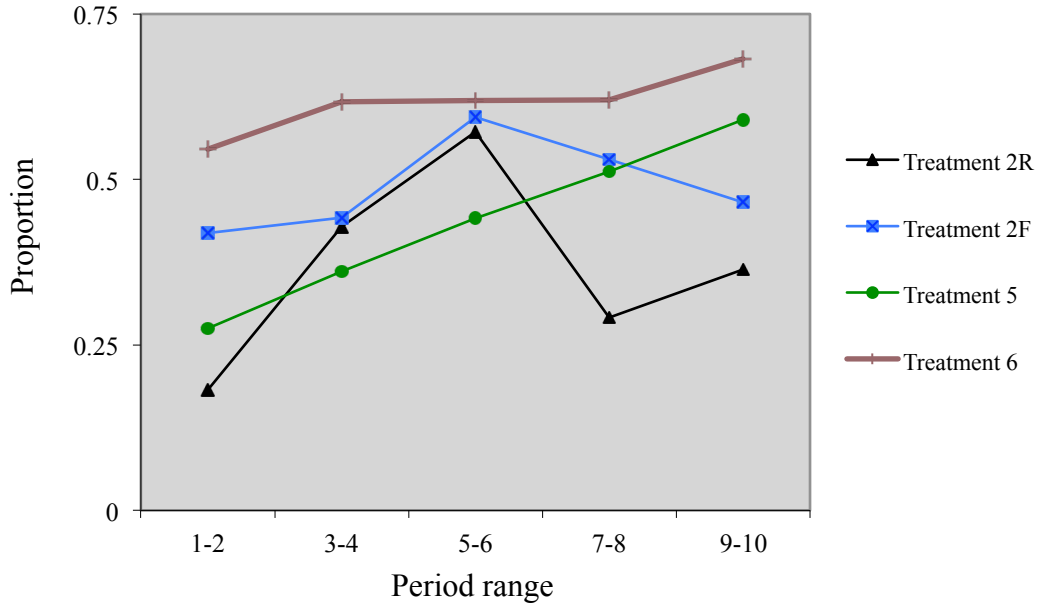
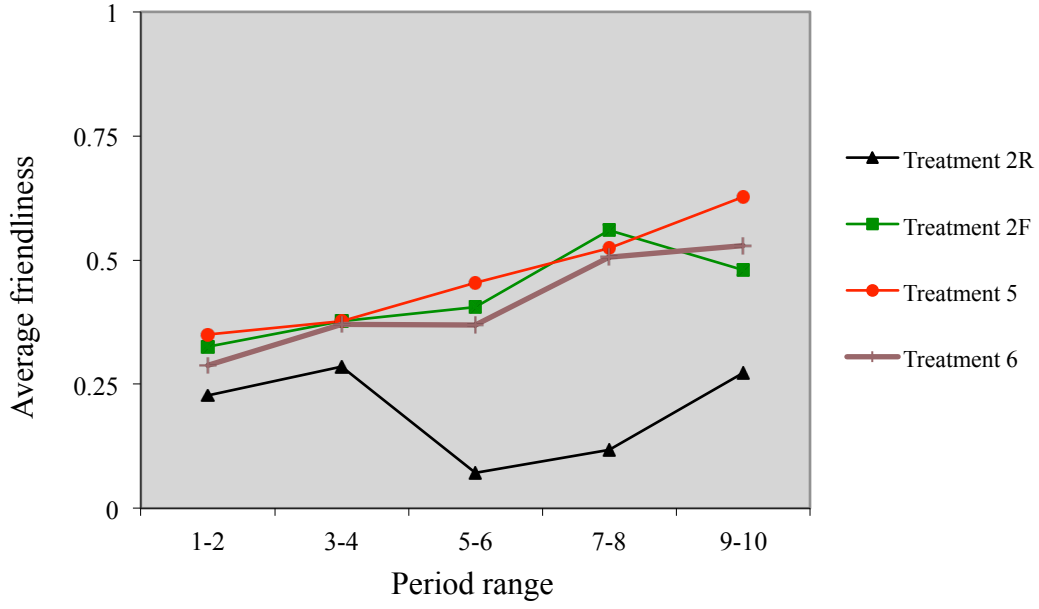


Figure 5: Average friendliness over time



Appendix A: Instructions

(Notes to reader: the only difference between the chat and no-communication treatments is the presence of the paragraph on communication; the exogenous-contract and restricted-communication treatments are identical but for the minor changes indicated in section 3; we relabeled quality *x* as response R to maintain neutral language.)

Thanks for coming to the experiment. You will receive 8 Euro for having shown up on time. In addition you will make money during the session.

The participants have been randomly divided into two roles – agents A and agents B – according to the seat number. These roles will remain constant during the whole experiment.

The experiment will have 11 periods. In each period you will be matched with another person in the other role. This person will change from period to period and you will never be paired twice with the same person. At no point will you know with whom you are matched.

Each period is independent and develops as follows. Agent A and agent B each has an endowment of 5 monetary units and an opportunity to interact. To interact with B, A has to propose a contract type (I or II) and a transfer, P, and B must accept this; all this occurs before knowing whether B's cost is high (20) or low (0). After observing this cost (and if A and B agreed to interact), agent A can make an additional transfer, Q, but only if the negotiated contract is of type II. If, by contrast, the negotiated contract is of type I, the transfer remains fixed at P. After observing the cost and agent A's final transfer (P or P+Q), agent B chooses his/her response R between the values -1, 0 and 1, where R = -1 or R = 1 imply an additional cost of 1 on B relative to R = 0. This response affects what agent A receives as explained below. In fuller detail, each period contains 5 stages:

- Stage 1: Agent A proposes to agent B:
  a contract of type I with a non-negative transfer P(I)
  --or--
  a contract of type II with a non-negative transfer of P(II) (the initial transfer)
- Stage 2: Agent B accepts or rejects this proposal.
  If agent B rejects, then the period ends without the following steps.
  If agent B accepts, then the period proceeds to step 3.
- Stage 3: The cost of agent B is randomly determined by the computer. With probability ½ the cost is 0 and with probability ½ the cost is 20.
- Stage 4: If a contract of type II is agreed, then agent A can now increase the initial transfer with an additional non-negative transfer Q (that is, can make a total transfer of P+Q instead of P).
- Stage 5: Agent B chooses a response level R = -1, R = 0 or R = 1.

At each stage, agent A and agent B are both directly informed of what happened in all earlier stages (of that period).

At the end of a period, the results are as follows:

If agent B rejects the contract proposed by agent A:

Agent A and agent B each receive their initial endowment of 5 units.

If agent B accepts:

Agent A receives: 15 + 0 (if R=-1)+ 20 (if R=0)+ 35(if R=1) – transfer from A to B.
Agent B receives 5 – cost – |R| + transfer from A to B.
where the cost is = 0 or 20, depending on the outcome given by the computer,
and the transfer from A to B = P(I) if the contract is of type I, and
= P(II) + Q if the contract if of type II.

After this we will proceed to the next period which will develop in the same way. Remember that you will never play the same person twice.

The first period, called period 0, will be a trial period and will not be taken into account in determining what you will earn in the experiment. Periods 1 to 10 will not be trial periods. One of these will be randomly selected to determine what you earn in the experiment.

Each monetary unit is worth 1 Euro. At the end of the session you will be paid 8 Euros plus what you will have earned in the period that is selected randomly.

Communication: During each period, the agents A and B, can communicate through a chat. To do this, they have to write a message in the appropriate field and push "ENTER". Each participant A and B can close his/her chat window and can open it again after having closed it (all previous messages of the period will remain visible). While one participant has his chat window closed, he/she will not be able to read or send messages, but the participant he is matched with will continue to be able to send messages (which will be visible for the matched person once he/she reopens the chat window).
It is important not to use the chat window to send messages that reveal your identity.

You can ask questions at any time. If you have a question, raise your hand and one of us will come to your cubicle to answer it.

Now we will briefly explain the screens that you will see once the experiment starts.

Appendix B: Session-level data[46]

Table B1: Behavior in session 1 of the endogenous no-communication treat

Category	Rigid contract	Flexible contract
Frequency*	53 (48.6%)	56 (51.4%)
Rejections	13 (24.5%)	13 (23.2%)
Average P	15.15 [1.00]	13.00 [0.83]
Average Q	-	2.44 [0.58]
Inferior quality	10 (25.0%)	12 (27.9%)
Normal quality	25 (62.5%)	30 (69.8%)
Superior quality	5 (12.5%)	1 (2.3%)
Avg. quality	-0.12 (0.10)	-0.26 (0.08)
Avg. buyer earnings (all offers)	12.08 [1.41]	11.00 [1.20]
Avg. seller earnings (all offers)	9.62 [1.48]	9.21 [1.42]
Avg. total earnings (all offers)	21.70 [1.83]	20.21 [1.82]

* No contract was offered on one occasion. Standard errors are in brackets.

Table B2: Behavior in session 2 of the endogenous no-communication treat

Category	Rigid contract	Flexible contract
Frequency*	66 (60.0%)	44 (40.0%)
Rejections	24 (36.3%)	26 (59.1%)
Average P	14.09 [0.62]	10.00 [0.55]
Average Q	-	1.78 [0.83]
Inferior quality	14 (33.3%)	8 (44.4%)
Normal quality	27 (64.3%)	10 (55.6%)
Superior quality	1 (2.4%)	0 (0.0%)
Avg. quality	-0.31(0.08)	-0.44 (0.12)
Avg. buyer earnings (all offers)	9.78 [1.08]	8.55 [1.32]
Avg. seller earnings (all offers)	8.68 [1.11]	4.00 [0.92]
Avg. total earnings (all offers)	18.46 [1.74]	12.55 [1.45]

Standard errors are in brackets.

[46]Averages and frequencies are for all (offered) contracts, except with Q and quality (accepted contracts).

Table B3: Behavior in session 3 of the endogenous no-communication treatr

Category	Rigid contract	Flexible contract
Frequency	46 (41.8%)	64 (58.2%)
Rejections	11 (23.9%)	15 (23.4%)
Average P	12.93 [0.88]	10.66 [0.48]
Average Q	-	2.78 [0.44]
Inferior quality	9 (25.7%)	22 (44.9%)
Normal quality	26 (74.3%)	26 (53.1%)
Superior quality	0 (0.0%)	1 (2.0%)
Avg. quality	-0.26 [0.07]	-0.43 [0.08]
Avg. buyer earnings (all offers)	12.61 [1.35]	10.34 [1.19]
Avg. seller earnings (all offers)	7.41 [1.32]	6.88 [1.20]
Avg. total earnings (all offers)	20.02 [2.13]	17.22 [1.86]

Standard errors are in brackets.

Table B4: Behavior in session 4 of the endogenous no-communication treatr

Category	Rigid contract	Flexible contract
Frequency	78 (71.6%)	31(28.4%)
Rejections	31 (39.7%)	11 (35.5%)
Average P	11.56 [0.76]	10.35 [1.19]
Average Q	-	3.45 [0.72]
Inferior quality	18 (38.3%)	11 (55.0%)
Normal quality	29 (61.7%)	7 (35.0%)
Superior quality	0 (0.0%)	2 (10.0%)
Avg. quality	-0.38 (0.07)	-0.43 (0.15)
Avg. buyer earnings (all offers)	9.65 [0.94]	7.84 [1.28]
Avg. seller earnings (all offers)	5.88 [0.92]	7.23 [1.89]
Avg. total earnings (all offers)	15.54 [1.47]	15.06 [2.82]

^We exclude one case in which the buyer received a very large negative payoff in the final period. Standard errors are in brackets.

Table B5: Behavior in session 1 of the endogenous chat treatment

Category	Rigid contract	Flexible contract
Frequency	29 (26.4%)	81 (73.6%)
Rejections	9 (23.7%)	4 (4.7%)
Average P	19.41 [1.76]	17.37 [0.84]
Average Q	-	9.29 [0.86]
Inferior quality	6 (30.0%)	8 (10.4%)
Normal quality	3 (15.0%)	15 (19.5%)
Superior quality	11 (55.0%)	54 (70.1%)
Avg. quality	0.25 [0.20]	0.60 [0.08]
Avg. buyer earnings (all offers)	10.83 [0.58]	15.59 [1.45]
Avg. seller earnings (all offers)	16.00 [2.03]	21.54 [0.93]
Avg. total earnings (all offers)	26.83 [3.62]	37.14 [1.94]

Standard errors are in brackets.

Table B6: Behavior in session 2 of the endogenous chat treatment

Category	Rigid contract	Flexible contract
Frequency*	12 (11.1%)	96 (88.9%)
Rejections	6 (50.0%)	2 (2.0%)
Average P	13.42 [2.28]	10.92 [0.97]
Average Q	-	15.74 [1.02]
Inferior quality	0 (0.0%)	5 (5.3%)
Normal quality	4 (66.7%)	17 (18.1%)
Superior quality	2 (33.3%)	72 (76.6%)
Avg. quality	0.33 [0.21]	0.71 [0.06]
Avg. buyer earnings (all offers)	14.42 [3.63]	18.39 [0.79]
Avg. seller earnings (all offers)	7.92 [3.78]	20.81 [0.95]
Avg. total earnings (all offers)	22.33 [4.51]	39.20 [1.44]

* No contract was offered on two occasions. Standard errors are in brackets.

Table B7: Behavior in session 3 of the endogenous chat treatment

Category	Rigid contract	Flexible contract
Frequency	53 (48.2%)	57 (51.8%)
Rejections	3 (5.7%)	6 (10.5%)
Average P	25.91 [0.85]	19.23 [1.04]
Average Q	-	7.92 [1.17]
Inferior quality	3 (6.0%)	4 (7.8%)
Normal quality	21 (42.0%)	15 (29.4%)
Superior quality	26 (52.0%)	32 (62.8%)
Avg. quality	0.46 [0.09]	0.55 [0.09]
Avg. buyer earnings (all offers)	14.47 [1.24]	13.86 [1.41]
Avg. seller earnings (all offers)	18.94 [1.69]	19.19 [1.23]
Avg. total earnings (all offers)	33.42 [2.37]	33.05 [2.19]

Standard errors are in brackets.

Table B8: Behavior in session 4 of the endogenous chat treatment

Category	Rigid contract	Flexible contract
Frequency	15 (15.4%)	93 (84.6%)
Rejections	2 (11.8%)	0 (0.0%)
Average P	25.24 [2.08]	21.30 [0.32]
Average Q	-	6.52 [0.58]
Inferior quality	4 (26.7%)	3 (3.2%)
Normal quality	5 (33.3%)	14 (15.1%)
Superior quality	6 (40.0%)	76 (81.7%)
Avg. quality	0.13 [0.22]	0.78 [0.05]
Avg. buyer earnings (all offers)	8.88 [2.59]	18.80 [0.86]
Avg. seller earnings (all offers)	17.00 [1.16]	21.65 [2.80]
Avg. total earnings (all offers)	25.88 [4.39]	40.44 [1.27]

Standard errors are in brackets.

Table B9: Behavior in session 1 of the exogenous rigid no-communication treatment

Category	Rigid contract
Frequency*	109 (100%)
Rejections	36(33.0%)
Average P	14.09 [0.62]
Average Q	-
Inferior quality	29 (39.7%)
Normal quality	41 (56.2%)
Superior quality	3(4.1%)
Avg. quality	-0.36 [0.07]
Avg. buyer earnings (all offers)	7.13 [0.90]
Avg. seller earnings (all offers)	13.08 [1.17]
Avg. total earnings (all offers)	20.21 [1.48]

* No contract was offered on one occasion. Standard errors are in brackets.

Table B10: Behavior in session 2 of the exogenous rigid no-communication treatment

Category	Rigid contract
Frequency*	107 (100%)
Rejections	40 (37.4%)
Average P	14.07 [0.57]
Average Q	-
Inferior quality	18 (26.9%)
Normal quality	44 (65.7%)
Superior quality	5 (7.5%)
Avg. quality	-0.19 [0.07]
Avg. buyer earnings (all offers)	12.11 [0.96]
Avg. seller earnings (all offers)	7.36 [0.79]
Avg. total earnings (all offers)	19.47 [1.34]

* No contract was offered on three occasions. Standard errors are in brackets.

Table B11: Behavior in session 3 of the exogenous rigid no-communication treatment

Category	Rigid contract
Frequency	110 (100%)
Rejections	29 (26.4%)
Average P	16.53 [0.45]
Average Q	-
Inferior quality	23 (28.4%)
Normal quality	52 (64.2%)
Superior quality	6 (7.4%)
Avg. quality	-0.21 [0.06]
Avg. buyer earnings (all offers)	11.55 [0.94]
Avg. seller earnings (all offers)	10.55 [0.90]
Avg. total earnings (all offers)	22.10 [1.40]

Standard errors are in brackets.

Table B12: Behavior in session 4 of the exogenous rigid no-communication treatment

Category	Rigid contract
Frequency	110 (100%)
Rejections	47 (42.7%)
Average P	14.62 [0.40]
Average Q	-
Inferior quality	16 (25.4%)
Normal quality	46 (73.0%)
Superior quality	1 (1.6%)
Avg. quality	-0.24 [0.06]
Avg. buyer earnings (all offers)	11.04 [0.86]
Avg. seller earnings (all offers)	8.67 [0.81]
Avg. total earnings (all offers)	19.71 [1.28]

Standard errors are in brackets.

Table B13: Behavior in session 1 of the exogenous flex no-communication treatment

Category	Flexible contract
Frequency*	109 (100%)
Rejections	33 (30.3%)
Average P	15.17 [0.76]
Average Q	3.62 [0.50]
Inferior quality	26 (34.2%)
Normal quality	41 (54.0%)
Superior quality	9 (11.8%)
Avg. quality	-0.22 [0.07]
Avg. buyer earnings (all offers)	9.25 [0.96]
Avg. seller earnings (all offers)	10.75 [1.09]
Avg. total earnings (all offers)	20.00 [1.59]

- No contract was offered on one occasion. Standard errors are in brackets.

Table B14: Behavior in session 2 of the exogenous flex no-communication treatment

Category	Flexible contract
Frequency	110 (100%)
Rejections	40 (36.4%)
Average P	13.57 [0.63]
Average Q	3.30 [0.76]
Inferior quality	33 (47.1%)
Normal quality	31 (44.3%)
Superior quality	6 (8.6%)
Avg. quality	-0.39 [0.08]
Avg. buyer earnings (all offers)	8.17 [0.90]
Avg. seller earnings (all offers)	8.11 [0.93]
Avg. total earnings (all offers)	16.28 [1.40]

Standard errors are in brackets.

Table B15: Behavior in session 3 of the exogenous flex no-communication treatment

Category	Flexible contract
Frequency	110 (100%)
Rejections	26 (39.7%)
Average P	14.48[0.63]
Average Q	4.88 [1.12]
Inferior quality	20 (23.8%)
Normal quality	50 (59.5%)
Superior quality	14 (16.7%)
Avg. quality	-0.07 [0.07]
Avg. buyer earnings (all offers)	11.40 [1.02]
Avg. seller earnings (all offers)	13.84 [1.33]
Avg. total earnings (all offers)	25.24 [1.63]

Standard errors are in brackets.

Table B16: Behavior in session 4 of the exogenous flex no-communication treatment

Category	Rigid contract
Frequency	110 (100%)
Rejections	21 (19.1%)
Average P	12.37 [0.47]
Average Q	2.90 (0.41)
Inferior quality	29 (32.6%)
Normal quality	52 (58.4%)
Superior quality	8 (9.0%)
Average quality	-0.24 [0.06]
Avg. buyer earnings (all offers)	9.67 [1.10]
Avg. seller earnings (all offers)	11.72 [0.87]
Avg. total earnings (all offers)	21.39 [1.56]

Standard errors are in brackets.

Table B17: Behavior in session 1 of the exogenous rigid chat treatment

Category	Rigid contract
Frequency	110 (100%)
Rejections	12(10.9%)
Average P	27.37[0.81]
Average Q	-
Inferior quality	4 (4.1%)
Normal quality	30 (30.6%)
Superior quality	64 (65.3%)
Avg. quality	0.61 [0.06]
Avg. buyer earnings (all offers)	13.03[0.85]
Avg. seller earnings (all offers)	22.35 [1.11]
Avg. total earnings (all offers)	35.38 [1.38]

Standard errors are in brackets.

Table B18: Behavior in session 2 of the exogenous rigid chat treatment

Category	Rigid contract
Frequency	110 (100%)
Rejections	15 (13.6%)
Average P	23.28[0.68]
Average Q	-
Inferior quality	14 (14.7%)
Normal quality	25 (26.3%)
Superior quality	56 (58.9%)
Avg. quality	0.44 [0.08]
Avg. buyer earnings (all offers)	14.11 [1.13]
Avg. seller earnings (all offers)	18.80 [1.10]
Avg. total earnings (all offers)	32.91 [1.69]

Standard errors are in brackets.

Table B19: Behavior in session 3 of the exogenous rigid chat treatment

Category	Rigid contract
Frequency	110 (100%)
Rejections	22 (20.0%)
Average P	21.17[1.20]
Average Q	-
Inferior quality	24 (27.3%)
Normal quality	29 (32.9%)
Superior quality	35 (39.8%)
Avg. quality	0.12 [0.09]
Avg. buyer earnings (all offers)	9.84[1.18]
Avg. seller earnings (all offers)	15.67[1.40]
Avg. total earnings (all offers)	25.51 [1.68]

Standard errors are in brackets.

Table B20: Behavior in session 4 of the exogenous rigid chat treatment

Category	Rigid contract
Frequency	110 (100%)
Rejections	14 (12.7%)
Average P	19.91 [0.78]
Average Q	-
Inferior quality	21 (21.9%)
Normal quality	40 (41.7%)
Superior quality	35 (36.5%)
Avg. quality	0.15 [0.08]
Avg. buyer earnings (all offers)	13.19 [1.12]
Avg. seller earnings (all offers)	12.88 [1.18]
Avg. total earnings (all offers)	26.06 [1.75]

Standard errors are in brackets.

Table B21: Behavior in session 1 of the exogenous flex chat treatment

Category	Rigid contract
Frequency*	106 (100%)
Rejections	4 (3.6%)
Average P	13.98 [0.57]
Average Q	12.05 (0.76)
Inferior quality	7 (6.6%)
Normal quality	20 (18.9%)
Superior quality	79 (74.5%)
Avg. quality	0.68 [0.06]
Avg. buyer earnings (all offers)	18.04[0.82]
Avg. seller earnings (all offers)	19.95 [0.88]
Avg. total earnings (all offers)	37.99 [1.44]

*No contract was offered on four occasions. Standard errors are in brackets.

Table B22: Behavior in session 2 of the exogenous flex chat treatment

Category	Rigid contract
Frequency	110 (100%)
Rejections	4 (3.6%)
Average P	14.74 [0.60]
Average Q	9.88 [0.76]
Inferior quality	9 (8.5%)
Normal quality	24 (22.6%)
Superior quality	73 (68.9%)
Avg. quality	0.60 [0.06]
Avg. buyer earnings (all offers)	18.19 [0.92]
Avg. seller earnings (all offers)	18.84 [0.92]
Avg. total earnings (all offers)	37.03 [1.47]

Standard errors are in brackets.

Table B23: Behavior in session 3 of the exogenous flex chat treatment

Category	Rigid contract
Frequency	110 (100%)
Rejections	5 (4.6%)
Average P	10.64[0.63]
Average Q	15.05 [0.83]
Inferior quality	18 (17.1%)
Normal quality	12 (11.4%)
Superior quality	75 (71.4%)
Avg. quality	0.54 [0.08]
Avg. buyer earnings (all offers)	15.87 [0.99]
Avg. seller earnings (all offers)	18.15 [0.95]
Avg. total earnings (all offers)	34.02 [1.61]

Standard errors are in brackets.

Table B24: Behavior in session 4 of the exogenous flex chat treatment

Category	Rigid contract
Frequency	110 (100%)
Rejections	5 (4.6%)
Average P	13.21 [0.58]
Average Q	12.21 [0.77]
Inferior quality	16 (15.2%)
Normal quality	29 (27.6%)
Superior quality	60 (57.1%)
Avg. quality	0.42 [0.07]
Avg. buyer earnings (all offers)	14.22 [1.12]
Avg. seller earnings (all offers)	19.18 [1.03]
Avg. total earnings (all offers)	33.40 [1.68]

Standard errors are in brackets.

Table B25: Behavior in session 1 of the restricted-communication treatmen

Category	Rigid contract	Flexible contract
Frequency	12 (10.9%)	98 (89.1%)
Rejections	4 (33.3%)	26 (26.5%)
Average P	12.25 [2.02]	10.01 [0.58]
Average Q	-	4.57 [0.56]
Inferior quality	5 (12.5%)	30 (41.7%)
Normal quality	3 (62.5%)	34 (47.2%)
Superior quality	0 (0.0%)	8 (11.1%)
Avg. quality	-0.62 [0.18]	-0.31 [0.08]
Avg. buyer earnings (all offers)	6.50 [1.78]	10.32 [1.14]
Avg. seller earnings (all offers)	8.08 [3.75]	10.52 [1.15]
Avg. total earnings (all offers)	14.58 [4.06]	20.84 [1.67]

Standard errors are in brackets.

Table B26: Behavior in session 2 of the restricted-communication treatmen

Category	Rigid contract	Flexible contract
Frequency*	15 (13.6%)	94 (86.4%)
Rejections	12 (80.0%)	30 (31.9%)
Average P	7.13 [1.65]	9.27 [0.57]
Average Q	-	2.44 [0.39]
Inferior quality	1 (33.3%)	18 (28.1%)
Normal quality	1 (33.3%)	42 (65.6%)
Superior quality	1 (33.3%)	4 (6.3%)
Avg. quality	0.00 [0.58]	-0.22 [0.07]
Avg. buyer earnings (all offers)	7.33 [1.61]	13.00 [1.14]
Avg. seller earnings (all offers)	8.20 [1.86]	7.95 [0.93]
Avg. total earnings (all offers)	15.53 [3.42]	20.95 [1.44]

*No contract was offered on one occasion. Standard errors are in brackets.

Table B27: Behavior in session 3 of the restricted-communication treatment

Category	Rigid contract	Flexible contract
Frequency	22 (20.0%)	88(80.0%)
Rejections	9 (40.9%)	30 (31.9%)
Average P	9.86 [1.38]	7.53 [0.44]
Average Q	-	2.10 [0.49]
Inferior quality	6 (46.2%)	29 (46.8%)
Normal quality	6 (46.2%)	30 (48.4%)
Superior quality	1 (7.7%)	3 (4.8%)
Avg. quality	-0.38 [0.18]	-0.42 [0.07]
Avg. buyer earnings (all offers)	10.05 [2.45]	12.47 [1.30]
Avg. seller earnings (all offers)	6.23 [1.79]	5.18 [0.98]
Avg. total earnings (all offers)	16.27 [3.20]	17.65 [1.40]

Standard errors are in brackets.

Table B28: Behavior in session 4 of the restricted-communication treatment

Category	Rigid contract	Flexible contract
Frequency	19 (17.3%)	91 (82.7%)
Rejections	7 (36.8%)	29 (31.9%)
Average P	13.84 [1.41]	8.82 [0.82]
Average Q	-	2.73 [0.58]
Inferior quality	4 (33.3%)	29 (46.8%)
Normal quality	7 (58.3%)	27 (43.5%)
Superior quality	1 (8.3%)	6 (9.7%)
Avg. quality	-0.25 [0.18]	-0.37 [0.08]
Avg. buyer earnings (all offers)	9.74 [2.38]	11.29 [1.40]
Avg. seller earnings (all offers)	9.21 [1.78]	7.89 [1.25]
Avg. total earnings (all offers)	18.95 [3.39]	19.18 [1.62]

Standard errors are in brackets.

Appendix C:

Table 3a: Tests for equality of the treatment coefficients, Table 3

Comparison	Specif. (1)	Specif. (2)	Specif. (3)	Specif. (4)	Specif. (5)	Specif. (6)
T2 vs. T5	20.58 (0.000)	16.36 (0.000)	0.21 (0.647)	10.77 (0.001)	17.09 (0.000)	0.14 (0.713)
T2 vs. T6	0.83 (0.361)	0.45 (0.502)	7.24 (0.007)	1.15 (0.284)	3.63 (0.057)	3.65 (0.056)
T2 vs. T7	37.69 (0.000)	15.08 (0.000)	1.26 (0.262)	272.50 (0.000)	593.03 (0.000)	50.69 (0.000)
T3 vs. T4	0.21 (0.643)	1.50 (0.221)	0.02 (0.900)	0.89 (0.346)	4.00 (0.046)	3.48 (0.062)
T5 vs. T6	33.04 (0.000)	24.30 (0.000)	13.64 (0.000)	4.88 (0.027)	4.96 (0.026)	3.98 (0.046)
(T6-T5) – (T4-T3)	19.29 (0.000)	19.02 (0.000)	19.07 (0.000)	0.80 (0.370)	0.03 (0.871)	0.03 (0.867)

Test statistics are χ_1^2 . Two-tailed *p*-values are in parentheses.

Table 4a: Tests for equality of the treatment coefficients from Table 4

Comparison	(1) Buyer	(2) Buyer	(3) Seller	(4) Seller
T4 vs. T5	12.25 (0.001)	5.10 (0.024)	81.56 (0.000)	168.14 (0.000)
T4 vs. T6	85.42 (0.000)	50.28 (0.000)	123.79 (0.000)	211.99 (0.000)
T5 vs. T6	32.97 (0.000)	24.60 (0.000)	4.39 (0.036)	3.35 (0.067)