**Let’s talk: How communication affects contract design**

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**Abstract:**  We study experimentally how communication changes the effectiveness of contract types when sellers choose unenforceable trade quality after a possible cost shock. In theory, credible communication can remove conflicting perceptions that may otherwise plague flexible contracts. Indeed, we find a weak advantage of rigid contracts that is sharply reversed in favor of flexible contracts with free-form communication, where earnings are dramatically higher. This is true with exogenous (selection-effect-free) and also endogenous contracts, which feature a strong parallel shift from rigid to flexible. Chat content analysis and a restricted-communication treatment identify clarification of post-shock transfers and personal rapport as key factors.

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1. **Introduction**

An enduring topic in contract theory is how to motivate a seller who 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 (Macauley, 1963). Traders’ 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 as a key managerial challenge, calling for research on the role of clarity.

Communication plays a vital role in enabling parties to reach the shared understandings that underlie their agreements. The *Oxford English Dictionary* defines a contract as “a mutual agreement between two or more parties that something shall be done or forborne by one or both.” Thus communication, where feasible, is most likely a critical factor in contract formation and design. However, to date there has been little or no empirical work on the impact of rich communication in an explicit contracting environment.

In this paper, we argue that recent theoretical advances on contract design by Hart and Moore (2008), henceforth denoted HM, and Hart (2009) *inter alia*, while stimulating and highly influential, are overly pessimistic about the power of informal agreements and industry norms. These papers apply behavioral economics to understand incomplete contracting, but do not model the communication process and its influence on traders’ expectations or reference points. In our contrasting view, such psychological models should allow trader behaviors to respond to informal elements of an interaction, in principle as much as to the formal contract and market structure. Moreover, we claim that the cost of flexibility in such models is fundamentally grounded in communication failure.

In HM, the advantage of rigid contracts (which do not permit adjustments) derives from the risk that flexible contracts (which do permit adjustments) may introduce ambiguity and therefore costly disagreements over what adjustments are appropriate. However, as noted in the earlier literature following Macauley (1963), these ambiguity costs provide strong incentives for individuals and organizations to develop shared understandings. Concretely, we argue that, in the symmetric-information environments studied in all these papers, rational traders who are able to engage in free-form communication prior to contract commitment should manage to avoid ambiguity in their trading plans. We therefore conjecture that introducing a costless, free-form communication channel in a bilateral trade relationship will enable most traders to escape the misunderstanding costs of flexibility and thereby evade the tradeoff that lies at the heart of HM and related theories.[[1]](#footnote-2)

Our main contribution is to demonstrate experimentally that: 1) free-form communication makes flexible contracts more effective than rigid ones, with this process resolving the potential ambiguity of flexibility; 2) free-form communication is greatly beneficial in achieving higher efficiency and earnings for both contracting parties. Overall, our data provide strong support for our main prediction on the disappearance of HM’s tradeoff. We run additional treatments to control for contract selection and restricted communication. We also perform data analyses to probe how communication generates these effects. The results are consistent with our conjecture and an exploratory coding suggests how to design tests to distinguish the roles of different kinds of communication.[[2]](#footnote-3)

Despite the practical importance of communication for effective contract design (see e.g., Van de Ven and Walker, 1984) and wide variation in available communication technologies (see e.g., Bandiera et al., 2012), this realm has been largely unexplored empirically. We break ground by investigating how the choice and effectiveness of contract types varies across experimental environments with no communication, with ongoing, free-form communication, and with a form of restricted communication. We work in a trade context where adaptation is potentially valuable. A buyer and seller both observe a non-verifiable shock to the seller’s cost but only 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 (low, normal or high), but the simplest plan is to trade at a fixed price. A rigid contract fixes a base price and rules out the discretion to make additional transfers later on. By contrast, a flexible contract allows the buyer to add an additional transfer after observing the cost shock.[[3]](#footnote-4)

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, thereby raising cooperation.[[4]](#footnote-5) However, flexibility leaves room for ongoing disagreement over appropriate actions. Disagreements are often costly, as disgruntled sellers tend to set inefficiently low quality. This is the essence of HM’s theory: conflicting feelings of entitlement or “reference points” result in retaliation via low quality.[[5]](#footnote-6) We part company with HM over the determination of reference points; for HM, competition is critical, since its impersonal objectivity can legitimatize a resulting (rigid) contract price. We instead appeal to the idea that transparent bilateral agreements, being procedurally fair, can legitimatize resulting outcomes. Specifically, if traders give an informed consent, they should not later pay to retaliate (unless other parties breached their agreement promises or abused power asymmetries during the initial negotiation). This follows from a broad norm of “decision responsibility” that people should accept the anticipatable consequences of their decisions.

A rigid contract completely pins down the buyer’s transfer obligation. There is no ambiguity on what transfer the seller should expect from the agreement. So decision responsibility should prevent a seller who accepts a rigid contract from later feeling cheated by the agreed transfer. By contrast, a flexible contract (absent communication) leaves the transfer plan open, with room for disagreement *ex post* over the additional transfers that the buyer should pay. Business practitioners encourage interacting parties to simplify plans, avoiding subjective terms, when communication is difficult. Such plans are necessarily 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 sharply 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 commitments to quality and additional transfers, specified for each cost state. Such agreements are unambiguous, stating exactly what traders do in each state, with no room for later disagreements. Credible communication removes the downside of flexibility by clarifying the buyer’s transfer plan.[[6]](#footnote-7) 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.

Our cleanest design compares only treatments with exogenous contract types: either all rigid or all flexible.[[7]](#footnote-8) In our baseline exogenous treatments with no communication, we find little difference in prices, quality, or overall earnings across these contract types, but sellers reject rigid contracts more often. Also, conditioning on seller acceptance, buyer and total earnings are slightly higher with rigid contracts. A no-communication treatment with endogenous contract types gives slightly stronger results: flexible contract choices reduce quality enough to lower buyer and total earnings overall (not only given seller acceptance).[[8]](#footnote-9) Consistent with this cost of flexibility, rigid contracts are chosen 25 percent more often.

Results are very different in treatments with free-form communication (“chat”). We see a dramatic increase in prices and quality and a dramatic decrease in contract rejections. Buyers earn much more and quality is considerably higher with flexible contracts, while sellers earn slightly more and the rejection rate is less than one-third of that with rigid contracts, in exogenous contract comparisons. All of these differences are greater for endogenous contracts; flexible contracts induce only 20 percent of the rejection rate with rigid contracts.[[9]](#footnote-10) In brief, there is a sharp switch from a slight rigid-contract advantage to a dramatic advantage of flexible contracts.

These results are fully consistent with the clarification role of free-form communication discussed above. Chat also permits informal quality commitments and may enhance social preferences, which can increase efficiency of both contract types and demand for flexibility. To shed further light on how communication works, we analyze the chat data to see which chat categories are most associated with the relative success of flexible and rigid contracts. Consistent with our main prediction and these complementary effects, we find that clarifying transfer plans leads to better outcomes with flexible contracts, while establishing a good personal rapport improves outcomes with both contract types, in particular, making these clarifications credible.

For a different angle on how communication works, we also conducted a treatment where communication is restricted to only letting buyers with flexible contracts state two numbers indicating how much will be added to the base price for each cost outcome. In principle, this impersonal clarification could resolve the ambiguity of flexible contracts. We detect a shift to flexible contracting and mild clarification benefits, but not at all comparable with the gains from free-form communication.

We analyze treatments with endogenous as well as exogenous contract types for two reasons. First, in some field environments, traders choose their contract type, while in others, contract type is fixed, perhaps by hierarchy or standard practice. Second, the literature in this area has mostly featured endogenous contract choice, despite selection concerns. This project is related to HM and the Fehr, Hart and Zehnder (2009, 2011 and 2012) experiments, henceforth denoted FHZb, FHZa and FHZc (where a,b,c reflects the order of writing).

As noted above, the main departure from HM’s theory where only formal and competitively-determined contracts shift the reference points, is that we allow informal, as well as formal, agreements to affect perceived entitlements and to do so without competition. Our predictions follow from HM’s model after adapting the process that determines reference points to allow clear bilateral agreements to influence subsequent perceived entitlements.[[10]](#footnote-11) For us, what matters is ambiguity in agreements. Without communication, flexible contracts generate unclear expectations and decision responsibility fails to restrain perceived entitlements. Communication can remove this downside by letting traders clarify, discuss and adapt their plans and expectations until unambiguous and mutually compatible (that is, until their reference points coincide).[[11]](#footnote-12) 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.

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.

1. **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 bilateral cooperation. For example, Cooper, DeJong, Forsythe, and Ross (1992) find that non-binding pre-play communication is effective in improving coordination on the Pareto-superior but risk-dominated outcome.[[12]](#footnote-13) Charness (2000) features a very high rate of coordination on the payoff-dominant equilibrium despite the issue of signal credibility. More recently, Charness and Dufwenberg (2006, 2011) find free-form communication very effective in achieving optimal social outcomes with hidden action or information. Promises (statements of intent) drive these gains by raising beliefs about beliefs and improving signal credibility.[[13]](#footnote-14)

Brandts and Cooper (2007) consider Leontief production in a team of four workers. Coordination failure is rife in a no-communication treatment, but when the manager can either increase incentives or send free-form messages, the chat content reveals that simply requesting high effort and pointing out its mutual benefits is very effective. While their coordination problem differs from Charness and Dufwenberg’s principal-agent setting, communication again helps by clarifying intentions and thereby influencing expectations.

Ellman and Pezanis-Christou (2010) examine how decision-making structure (horizontal or vertical) and communication (free-form, bilateral) affect the extent to which a firm maximizes profits at the expense of a helpless third party. Communication makes vertical firms more ethical and raises social surplus. Having a voice in group decisions seems to make actors feel more responsible. 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 (“at will”) contracts can induce better outcomes for buyers than flexible ones when there is asymmetric competition (two potential sellers per buyer) and uncertainty over a potential cost shock.[[14]](#footnote-15) They find that the buyer’s average profit is higher with rigid contracts, as flexible contracts lead to lower quality (in no shock states) when controlling for a linear effect of total price. The seller’s profit is lower, so total earnings differ little.[[15]](#footnote-16) Rigid contracts are chosen 50 percent of the time. Our design avoids two unrealistic features of FHZa,b,c. First, their rigid contracts automatically preclude trade after a cost shock, but in field environments sellers can usually trade at a loss, and may do so if they consider the contract fair on average.[[16]](#footnote-17) Second, FHZa,b,c exclude costly efforts that raise quality. This tilts towards rigid contracts since, in shifting responsibility for low prices onto competition to avoid negative reciprocation, rigid contracts also preclude positive reciprocations that can motivate costly effort in field environments.[[17]](#footnote-18)

FHZb seek to verify that competition between sellers drives FHZa’s result. They create a control without seller competition by imposing base prices (randomly selected from winning bids in the baseline treatment). Rigid contracts no longer give higher buyer profits and are only chosen 18 percent of the time. But sellers cannot reject contracts in FHZb’s design; absent mutual agreements, the norm of decision responsibility is clearly inapplicable.

FHZc (conducted after our chat treatments) does consider a limited form of communication in which buyers announce numerical state-contingent transfers before sellers compete. In sharp contrast to the strong effects of our free-form communication treatment, they do not find flexible contracts become more profitable than rigid ones (though buyers are no longer worse off from flexible); in our (subsequent) comparable treatment, buyers benefit from flexible but the effect is small. 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.[[18]](#footnote-19),[[19]](#footnote-20)

Erlei and Reinhold (2012) 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 exogenous contract types, finding higher quality for both contract types. They interpret in terms of negative reciprocity against rigid *choices* and (fairness) signaling of flexible *choices*.[[20]](#footnote-21) This idea is less relevant in our non-competitive setting where the buyer can choose rigid but still be kind or fair by setting a high base price.

In sum, existing work on flexible versus rigid contracts offers some support for the notion that *ex ante* flexibility risks *ex post* misunderstandings in “at will” contracting. Our study generalizes into new trade and contract environments. Most importantly, by introducing communication, we paint a substantially less gloomy picture than previously reported: frictionless bilateral communication may well remove the flexibility/disagreement tradeoff.

1. **Experimental design and implementation**

Our focus is on communication and agreements. Some communication is possible in most real-world settings and is typically free-form and personalized. Our no-communication treatment starkly prevents all communication (beyond that implicit in the formal contract offer). We intend it to capture a setting in which traders cannot reach a common understanding on the precise terms of trade because the relevant contingencies are difficult to describe. Our restricted-communication treatment allows the buyer to indicate the precise transfer commitments but nothing else – no quality requests, no seller messages, no conversations. This treatment, not inspired by any real-world setting, serves as an experimental control and is comparable with FHZc’s informal-agreement treatment.[[21]](#footnote-22)

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 improvement as well as costly quality reduction. Since our predictions do not rely on competition, it is natural to dispense with it. Doing so allows us to focus on a simpler environment with less risk of confusion. The control study of FHZb also removes seller competition, but leaves no contract agreement at all since sellers cannot even reject contract offers, in sharp contrast to our setting. Specific performance contracting further simplifies: trade is decided once and for all, in stages 1 and 2 (“*ex ante* ”).[[22]](#footnote-23) This is quite valuable: in true “at will” contracting environments, traders face an *ex post* trade decision as well; as a shortcut, FHZa,b,c oblige sellers to trade when and only when in their *ex post* material interest. However, traders clearly deviate from purely selfish motives in their game, and might wish to do so in the trade decision itself.

Finally, costly high quality is the more standard assumption in economics. We allow for both upward and downward deviations from the self-interested benchmark level, which we call normal quality. This adds realism, identification power and richer transfer-quality effects (see the remark on FHZ at footnote 17); it slightly raises complexity but the previous two design features (and our help screen described below) seem to more than compensate.[[23]](#footnote-24)

Participants play the same one-shot game in each of 10 periods. Across periods, they are re-matched and no two individuals ever play each other twice or observe another’s behavior in past periods (nor any average outcomes), so there is no way to build 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.[[24]](#footnote-25)

**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. We chose this relatively large cost shock to make it salient. Both buyer and seller observe the outcome of this cost shock. Then, if a flexible contract was chosen, the buyer can augment the initial price P by any amount, which we denote by Q. However, if a rigid contract was chosen at the initial stage, the initial price cannot now be changed.[[25]](#footnote-26) After observing any additional transfer Q from the buyer, the seller chooses the good’s quality.[[26]](#footnote-27)

This quality response (*x*) can take one of three values: *x* = 0 is normal quality, while *x* = -1 and *x* = +1, each costing the seller one additional unit, are respectively low and high quality. 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.[[27]](#footnote-28)

**3.2 Treatments**

We conducted seven treatments, with four sessions in each. Four treatments have exogenous contracts (varying by contract type and chat feasibility) and two (again varying by chat feasibility) have endogenous contracts in which the buyer could choose to offer a rigid or flexible contract.[[28]](#footnote-29) In our view, the chat setting is the most natural form of communication, but to better determine why free-form communication proved so effective, we also conducted a treatment in which buyers could accompany flexible contracts with (only) a nonbinding structured message indicating additional transfer values with/without the cost shock.

**3.3 Timing**

The sequence of events for the treatments with exogenous contract is defined by the following five-stage game in which both parties observe the outcomes of all preceding stages:

*Stage 1: 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.*

The sequence is the same with endogenous contracts, except that the buyer also chooses whether the (stage 1) offered contract is rigid or flexible.

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 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 enter two numbers, 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 is not binding and the buyer cannot add any further explanation. The message is sent with the initial price and contract proposal, prior to the seller’s stage-2 acceptance decision.

**3.4 Implementation**

Our sessions were conducted at the LINEEX laboratory (Valencia). Each session had 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 1€, and participants received an 8€ show-up fee. In all, we ran 28 sessions with 616 participants, with average earnings of about 17€ for no-communication sessions, 16€ for restricted-communication sessions and 25€ for 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.

1. **Our predictions**

We begin with general considerations about the interaction between buyers and sellers. Section 4.3 contains our theoretical predictions for communication, contract choice, and performance, and section 4.4 offers our 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; contract type and communication are then irrelevant.

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 no surplus. Moreover, pro-social preferences, trust and reciprocation can each generate higher quality and surplus and imply a positive causal effect of the total transfer P + Q on quality *x*.[[29]](#footnote-30)

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

Only a flexible contract permits cost sharing. This is valuable not only if the seller is risk averse, but also in the plausible case where the seller reacts badly to unmitigated negative shocks for any of the above reasons or others.[[30]](#footnote-31) Such reactions also make cost sharing credible and whenever buyers can communicate a transfer plan, even if dishonest, they have strong incentives to fulfill it, because sellers can readily use quality to reward or punish lying. Equal sharing requires 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 and many lower values. Free-form communication enhances social motivations for sharing and trust (and allows insurance negotiation), so we predict more cost sharing (higher dQ) in chat treatments, for both exogenous and endogenous contract settings. Restricted-communication does little to enhance trust, so we expect slightly higher dQ-values than with no-communication, but much less than with chat.

**4.3 Communication, contract choice and performance**

It is not obvious why buyers should ever pick rigid contracts given the adaptation benefits of flexibility. Rigidity is a commitment against paying an additional transfer later on. This has no standard strategic advantage, but 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 pays less than the seller’s reference point or sense of entitlement; when (objective) competition fixes a unique final transfer (as with rigid contracts), this pins down the seller’s reference point, whereas in flexible contracts, buyers retain discretion over the final transfer and no clear reference point. So buyers with flexible contracts must pay higher total transfers to induce a given level of quality.

We chose to have competition play no role in our bilateral-negotiation setting, so HM is not directly applicable. However, the underlying idea – that flexibility may introduce ongoing disagreement costs – still applies once we apply the familiar (decision-responsibility) norm that people should take responsibility for foreseeable consequences of their agreements.[[31]](#footnote-32) Specifically, a seller who accepts a rigid price will not later feel entitled to a transfer above that price. 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* (otherwise the seller can claim to have accepted in expectation of higher transfers).

This requires communication: traders must specify a transfer Q for each cost state. The restricted-communication channel is just sufficient for buyers to indicate this set of unique transfers but not to discuss quality; so an efficient plan may not be credible (high quality might be tacitly obvious to some but others may view normal quality as the most natural implicit agreement). Free-form communication is both sufficient for clarification and much enhances credibility of the transfer promises. So we expect flexible contracts to dominate rigid ones with free-form communication.[[32]](#footnote-33)

In Conjecture A (and A' further below), we therefore generalize to non-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 Conjecture B (and B' below), we sharply reverse this prediction for contexts with free-form communication. Our parallel Conjectures B-RC (and B'-RC below) are more tentative for the restricted-communication treatment.

*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.*

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

Notice that we predict higher seller earnings with flexible contracts in the chat treatment, since sellers can then argue for 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 high quality. For the endogenous-contract treatments, we can also predict how buyers will choose contract type. HM assume buyers maximize their payoffs but even if buyers care about sellers, in our setting buyers can always raise seller earnings by raising prices within a fixed contract type (efficiency then rises or stays fixed). So we predict:

*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.*

However, selection effects are a serious concern where buyers realistically have heterogeneous types, which may affect their selection of contract type and the ensuing trade outcomes. Indeed, this is a weakness of FHZa and other endogenous-contract studies (such as FHZb,c). The exogenous-types replication of Erlei and Reinhold (2012) generates very different outcomes.[[33]](#footnote-34)

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 with restricted communication. In addition, free-form, but not restricted, communication permits seller promises and enhances mutual consideration. 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, reinforcing Conjectures B and B'.[[34]](#footnote-35) 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 with 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. The key difference between clarification and the other two is that friendliness and quality promises benefit rigid as well as 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.

Before we dive into the details, we summarize the principal experimental results using the “chat” shorthand for free-form communication:

* Chat increases earnings and quality, especially for flexible contracts.
* Chat sharply increases cost-sharing for flexible contracts.
* Chat leads to a substantial advantage of flexible over rigid contracts.
* In endogenous-contract treatments, all these effects are even stronger; and

chat leads to a switch from rigid (slightly more frequent absent communication) to flexible contracts (far more frequent with chat).

* Restricted-communication is closer to no-communication but does increase the frequency of flexible contracts, where buyers (but not sellers) then earn more.

**5.1 Descriptive statistics**

We present information on the contracts chosen, prices and transfers, rejections, quality levels, and earnings. Table 1 shows aggregate data for the three treatments with no communication and Table 2 for the four treatments that allow some form of communication (we disaggregate endogenous treatments by contract type proposed).

We begin with the first two columns of Table 1, showing the exogenous treatments without communication. The rejection rates are 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%. Total transfers (P+Q) are similar across these treatments. Average quality is substantially negative, as sellers are more likely to sacrifice money to hurt buyers than to help them. Average earnings appear similar across contract types, but looking at accepted offers, we see that buyer and total earnings are higher for rigid contracts, while seller earnings are negligibly lower. In brief, rigid contracts lead to similar, but possibly higher, earnings than flexible contracts when communication is not feasible.

The third and fourth columns of Table 1 reveal generally similar patterns for the endogenous no-communication treatments. Here we observe contract proposals; buyers offer rigid contracts 11 percentage points more often than flexible ones. Offers are rejected about a third of the time for both contract forms. Prices are similar for rigid contracts regardless of exogeneity and are slightly lower for endogenous flexible contracts. Average quality is again substantially negative and earnings are largely similar to those in the endogenous case.

[Tables 1 and 2 about here]

Comparing Tables 1 and 2, one can see the impact of free-form communication, as well as restricted communication (discussed below). The rejection rate with free-form communication (chat) is greatly reduced from the rejection rate without chat for rigid and especially for flexible contracts. There is much more cost-sharing (difference in Q across cost-shock outcomes) with chat, limiting the negative quality effects from disagreements under flexibility.[[35]](#footnote-36) The difference is 7.45 units (74.5 percent of full cost sharing) versus 0.97 units with exogenous contracts and 5.83 units versus 1.77 units with endogenous contracts. Free-form communication also greatly changes the likelihood of the buyer offering a flexible contract, from 44.6 percent in the no-communication treatment to 74.7 percent in the chat treatment. Quality is substantially positive with chat in all cases, with far more high quality than low quality. Indeed, the average quality is positive in every session of every treatment with free-form communication and is negative in every session of every treatment without it*.*

Buyer earnings increase substantially with exogenous contracts: free-form communication leads to increases in overall earnings of 47 and 72 percent for rigid and flexible contracts, respectively. The patterns are similar with endogenous contracts: With rigid contracts, buyer earnings increase slightly while seller earnings more than double; overall earnings increase by 58 percent; with flexible contracts, these differences are larger, as buyer earnings almost double and seller earnings nearly triple; overall earnings increase by 128 percent. Note that the gains from chat are lower for both types of exogenous contract. 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 for chat across exogenous and endogenous contracts. The differences are again slight: with rigid contracts, average prices are almost identical, and with flexible contracts, average total prices vary little. For rigid contracts, the only notable difference is the lower rejection rate under exogeneity (13.9% versus 18.0%), suggesting that sellers may react negatively to buyers who *choose* rigid contracts. For flexible contracts, exogeneity leads to slightly more low quality, though higher added transfers Q partly counter-balance the lower initial prices P. Overall, chat leads to higher prices, higher quality, fewer rejections, greater earnings for both sides, and a much higher proportion of flexible contracts when buyers can choose.

Finally, the restricted-communication treatment looks much more like the no-communication treatment than the chat treatment. Overall quality is quite negative and the rejection rate is quite high.[[36]](#footnote-37) 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. But buyers rarely deliver on Q after a cost shock: the total transfer is barely higher after the 20-unit shock (0.43 units).[[37]](#footnote-38) This low credibility of promises, along with the substantially lower prices, may explain why performance is so much poorer than in chat. 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 seems to raise buyer and total earnings from flexible 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 with experience. 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**

We perform non-parametric tests on two levels for the differences we have just highlighted. A conservative testing philosophy treats each session as just one observation, so that we only have four observations for 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/outcomes for each person; so we complement our session-level tests with individual-level tests, based on individual seller data – that is, for each seller, we average the values of the relevant variable over that seller’s ten active matches with buyers.[[38]](#footnote-39)

*Earnings*

In the treatments without communication, there is no significant difference in buyer, seller, or total earnings across exogenous rigid and flexible offered contracts, even with individual-level ranksum tests (*Z* = 0.768, -0.689, and 0.092, respectively). However, focusing on accepted contracts, buyer earnings are slightly higher with rigid contracts (*p* = 0.052, individual-level test); for seller earnings there is no difference (Z = -0.300).[[39]](#footnote-40) This test speaks directly to the theory behind Conjecture A, because rigid contracts only benefit from the decision-responsibility norm when sellers decide to participate by accepting the contract. The no-communication endogenous treatment offers some direct support for Conjecture A: buyer earnings are significantly higher with rigid contracts (*p* = 0.063 and 0.060, session- and individual-level signed-ranks tests, respectively), as are total earnings (*p* = 0.063 and 0.029, session- and individual-level signed-ranks tests, respectively). There is no significant difference in seller earnings across rigid and flexible contracts (Z = 0.312 and 1.179, session- and individual-level signed-ranks tests, respectively).

In the chat treatments, we find strong support for Conjecture B in that flexible contracts lead to higher earnings. Comparing exogenous rigid and flexible contracts in terms of buyer, seller and total earnings, the respective *p*-values are 0.000, 0.055, and 0.000 in rank-sum tests at the individual level; at the session level, the *p*-values are 0.243, and 0.171, and 0.014. Turning to the endogenous treatments, individual-level signed-ranks tests show that differences for buyer, seller, and total earnings are all highly significant (*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, just failing to do so for buyer and total earnings, giving *p* = 0.125.

With restricted-communication, buyer earnings are significantly higher with flexible contracts using individual-level data (*p* = 0.027); there is a marginally-significant difference for total earnings (*p* = 0.071).[[40]](#footnote-41) On the session level, both buyer earnings and total earnings are higher with flexible contracts in every session (so *p* = 0.063 in both cases). For seller earnings, there are no significant differences at individual or session level. In sum, Conjecture B-RC receives support, especially at the session-level.

Comparing across communication treatments, there is strong support for Conjecture C. The differences across no-communication and chat treatments for buyer, seller, and total earnings are highly significant in all comparisons – exogenous and endogenous, rigid and flexible: all *p*-values are 0.004 or less in individual-level rank-sum tests, with all earnings much higher with chat.[[41]](#footnote-42) For flexible contracts (only), Conjecture C-RC(b) predicts similar but weaker effects of restricted communication.[[42]](#footnote-43) Both buyer and total earnings are significantly higher with restricted-communication than with no-communication (*p* = 0.066 and 0.045, individual-level rank-sum tests); seller earnings are also higher, but not significantly so (*p* = 0.132). So there is some support for C-RC(a). There is strong support for prediction C-RC(b) that chat is more effective: buyer, seller, and total earnings were all higher in each chat session than in any session with restricted-communication, for both rigid and flexible contracts (so rank-sum tests give *p* = 0.014 for every session-level test, also, *p* < 0.001 for all the individual-level tests).

*Quality*

Results on tests for quality differences are similar to those for earnings. In the treatments with no communication, there is no significant difference in quality across exogenous rigid and flexible (accepted) contracts, even with individual-level data (*p =* 0.664, two-tailed); quality is only observed after acceptance. The same holds when comparing endogenous rigid and flexible (*p =* 0.897, two-tailed).[[43]](#footnote-44)

In the chat treatments, there is a significant difference in quality across exogenous rigid and flexible contracts, even with session-level data (*p* = 0.014); there is also a significant difference in quality across contract types within the endogenous chat treatment (*p =* 0.062 at the session level). There is no difference between endogenous and exogenous rigid contracts (*p* = 0.229, two-tailed); however, quality is significantly higher for exogenous flexible contacts than for endogenous ones in individual- and session-level data (*p* = 0.052, *p* = 0.058, respectively, two-tailed). Finally, there is no quality difference across contract types in the restricted-communication treatment, even at the individual-level (*p* = 0.979), possibly because buyers often fail to fulfill their indicated prices, particularly after a cost shock.

Quality is significantly higher in chat treatments than in no-communication treatments. The average quality is higher in each of the four chat sessions with exogenous rigid contracts than in any of the four sessions without chat (*p* = 0.014) and similarly for flexible contracts; individual-level tests give *p* = 0.000 in both cases. The same test statistics apply with endogenous contract comparisons. Quality in the restricted-communication treatment is lower in every session compared to any session with chat (*p* = 0.014 with session-level data). There is no difference in quality comparing flexible contracts across the no-communication and restricted-communication treatments even with individual-level data (*p* = 0.264); for rigid contracts *p* = 0.942.

*Total transfers and cost sharing*

Conjecture C also predicts total transfers. Total transfers paid in (accepted) exogenous contracts are much higher in the chat than in the no-communication treatments both with rigid and with flexible contracting (for both comparisons, *p* = 0.014 at the session-level and *p* = 0.000 at the individual-level). Comparisons of the endogenous treatments with chat versus no communication have the same flavor. The total transfer is much higher with chat for both rigid contracts and flexible contracts (respectively, *p* = 0.028 and *p* = 0.014 at the session level, and *p* = 0.000 for both at the individual level). Total transfers with accepted flexible contracts are slightly but not significantly higher with restricted communication than with no communication (*p* = 0.103, individual-level data) and there is no difference with rigid contracts (*p* = 0.464, two-tailed test with individual-level data).

Finally, we test whether chat raises cost-sharing (dQ) for flexible contracts. We estimate cost-sharing as the average Q paid after a cost shock minus that paid after no cost shock, conditioning on flexible contracts. So we compare accepted flexible contracts across the chat and no-communication variants of the exogenous flexible-contract treatments and across the endogenous treatments. Session-level tests give *p* = 0.014 in both cases, while individual-level tests giving *p* = 0.000 and 0.001, respectively. So both exogenous and endogenous data strongly support the prediction that chat promotes cost sharing. [[44]](#footnote-45)

*Contract frequencies*

In the endogenous treatments, we can test Conjectures A' and B' that, respectively, with no-communication, rigid contracts will be more frequent, and with chat, flexible contracts will be more frequent. Testing for a higher proportion of rigid than flexible contracts in the no-communication treatment shows a marginally-significant difference at the individual level (*p* = 0.063), and none at the session level. So support for Conjecture A' is rather weak. On the other hand, in the chat treatment, flexible contracts clearly dominate at both the individual and session levels (signed-ranks tests give *p* = 0.000 with individual data and *p* = 0.063 at the session level). So there is strong support for Conjecture B'.[[45]](#footnote-46)

**5.3 Regression analysis**

In this section, we study the effects of the treatments on all main variables using regression analysis. The results essentially confirm the non-parametric tests reported above.

[Table 3 about here]

The regressions are shown in Table 3. All specifications include only treatment dummies as independent variables, where the exogenous treatment with rigid contracts and no communication serves as baseline. We start with regressions (1) and (2). Buyers and especially sellers earn much more in all chat treatments than in the baseline, with the point estimates of the coefficients larger for sellers than for buyers in all three cases. The earnings for buyers and sellers are not significantly different in the restricted-communication treatment than in the baseline. There is no immediate support for Conjecture A. Regression (3) simply shows the treatment effects on the sum of buyer and seller earnings.

Regression (4) shows the effects of quality levels, which exhibit the same pattern as those for total earnings: all treatments involving chat have a significant impact on quality, while no treatment without chat does. Regression (5) shows the effects on trade acceptance, all chat treatments have a strong positive effect; there is also a (weak) positive effect for exogenous flexible contracts with no communication. This fits the pattern observed in the above weak non-parametric support for Conjecture A where exogenous rigid contracts were rejected more often but accepted rigid contracts gave higher buyer earnings than accepted flexible ones. Finally, regression (6) shows that the total transfer is higher than in the baseline in all chat treatments but not in any treatments without chat; in fact, the total transfer with restricted communication is actually slightly lower than in the baseline.

In Table 4, we test Conjectures B and C by comparing across treatment pairs, using tests of equality of regression coefficients. There is strong support for Conjecture C in the exogenous treatments: all the decisions/outcomes increase significantly with chat for flexible as well as rigid contracts (see first row of Table 4 for flexible and the exo-rigid-chat row of Table 3 for rigid).

[Table 4 about here]

In the exogenous treatments, we compare behavior with flexible and rigid contracts both with and without chat. As already noted, the coefficients for exo-flex-no-communication in the regressions reveal directly that flexible contracts do not make a difference compared to rigid contracts in (1)-(4) but have a marginally positive effect on trade acceptance. With chat, row two of Table 4 shows flexible has a significant effect on all variables except total transfers and seller earnings, supporting Conjecture B for buyer and total earnings and quality but not seller earnings. The third row in Table 4 tests for differences-in-differences between flexible and rigid contracts among the four exogenous treatments, with and without chat. These are significant for buyer earnings and weakly for total earnings, but not for seller earnings and quality. This provides strong support for our most important prediction: chat complements the use of flexible contracts by making them more effective for buyers. Though we only found support for the acceptance-conditional version of Conjecture A, the difference-in-difference implied by comparing Conjectures A and B offers strong support even for exogenous contracts. There is also a significant effect on trade acceptance.

The remaining rows in Table 4 show test results for the endogenous treatments. They confirm that chat leads to significantly higher values of all variables than in all treatments without chat and a lack of difference for any variable with no communication or restricted communication. Not included in the table, we also added a flexible contract dummy and an interaction between the flexible dummy and the endogenous-chat treatment to the buyer and seller earnings regressions. This reveals a weak negative effect of flexibility under no-communication (consistent with the relatively weak support for Conjecture A) and a highly significant positive effect under chat (supporting Conjecture B).[[46]](#footnote-47)

**5.4 Summary on support for main theoretical conjectures**

Conjecture A states that, with no communication, buyer earnings and quality will be higher with rigid than flexible. We find some weak supportive evidence for buyer earnings but quality levels are essentially the same for both contract types. In the endogenous no-communication treatment, we also find weak support for Conjecture A' which predicts more frequent rigid than flexible contracts.

Conjecture B predicts that buyer earnings, seller earnings and quality will all be higher with flexible than rigid contracts when chat is permitted. We find strong and highly-significant support for all these predictions. According to Conjecture B', flexible contracts will predominate with feasible chat; we find very strong support, with 75 percent flexible contracts overall and 84 percent in the final two periods. Conjectures B-RC and B'-RC make similar predictions about restricted communication. Buyer earnings are indeed somewhat higher with flexible contracts and buyers pick them more frequently, but quality is not higher.

**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. We also provide some examples of chat conversations in Appendix C.

**6.1 Message content**

We coded our free-form messages on the basis of three categories.[[47]](#footnote-48) 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. Three, sellers often make promises about the quality that they will choose, so this is our third category. 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. 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. We disaggregate the chat treatment into the subsets where the chosen contract was flexible and rigid.

The rate of Q-clarification rises over time from 70 to over 90 percent and from 60 to 80 percent for exogenous and endogenous flexible contracts, respectively, while remaining very low for endogenous rigid contracts.[[48]](#footnote-49) This suggests that participants quickly learn that if they use flexible contracts, it is in their interest to clarify aspects of their transfer plans. Promises on quality become more frequent over time in all treatments with chat, with higher rates for exogenous treatments and for flexible contracts. Thus, the rate of promises is highest with endogenous flexible contracts (about 50 percent overall, 60 percent in the final two periods), and exogenous rigid contracts have the lowest rate (around 30 percent). Average friendliness increases over time in all cases except for endogenous rigid contracts. This is consistent with the prediction that in friendly matches, traders share in the cost shock by using flexible contracts and that sellers often get upset if buyers instead pick rigid contracts.

So Q-clarification, promises over quality, and friendliness are generally highest in the treatments and for the contract type 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.

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.[[49]](#footnote-50) 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 C1 in Appendix C shows the average quality for all combinations of chat values in the treatments that feature free-form communication. 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 all chat treatments. Similarly, quality promises are also associated with higher average quality in each of these sub-treatments and treatments. A quality promise suggests 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 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 pervasive in the chats with flexible contracts, 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 quality differences from *Friendly* = 1 to *Friendly* = 0 are 0.468 and 0.348 for the respective exogenous and endogenous cases. Holding promises constant at 1, the differences are 0.143 and 0.254, respectively. Similarly, we find a bigger effect of a seller quality promise, holding friendliness fixed, at 0 than at 1.[[50]](#footnote-51) So friendliness and promises seem 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 (0.063 and 0.069 in the exogenous and endogenous cases). Moreover, when a chat lacks either quality promises or friendliness, the benefit from clarification seems to disappear (e.g., 0.128 with exogenous contracts but only -0.019 with endogenous one), when Friendly = 0 and quality promise =1; when in addition, no promise has been made, the increase in quality is -0.073 and 0.172 in the exogenous and endogenous case. 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 is not sufficient without a more personal element, such as friendliness or promises over quality. This is again consistent with the results in the restricted-communication treatment, where impersonal claims are less credible and less often honored.

We have seen from the restricted-communication treatment that simple statements about Q technically serve as a clarification, but have little credibility. It seems that clarifications become credible only through the process of endogenous chat. We conjecture that friendliness plays a role in reducing ambiguity about the type of person with whom one is paired. Minor and even imperceptible elements of the chat (e.g., the manner in which sentences are written, the tone of the message) may well serve as a signal about this type.

Table 5 shows considerable heterogeneity in terms of average friendliness of buyers and sellers, so there is something to be learned about one’s counterpart’s type through the chat mechanism. The idea that chat may play an important role in reducing ambiguity about player types as well as shock-contingent transfers is worthy of future research. More generally, we conjecture that if contract partners feel comfortable that their counterparts will make good on any claims about plans such as transfers or quality, they are more likely to agree on and implement a mutually-beneficially arrangement.

[Table 5]

**6.2 Support for theoretical conjectures about chat content**

Conjectures D, E, and F predict how the three chat categories affect effectiveness, measured as total earnings here. Table 6 shows total earnings with different values for chat categories, as well as the signed-rank test statistics.

[Table 6]

Q-clarification significantly affects total earnings with flexible (but not rigid) contracts in the endogenous treatment; this evidence is consistent with both parts of Conjecture D. It also has a marginally-significant effect on total earnings in the exogenous flexible treatment. Thus, we have substantial support for Conjecture D. Friendliness has large positive effects on total earnings in all cases, offering powerful support for Conjecture E. Finally, promises over quality have positive effects on total earnings in all cases. So we have strong support for Conjecture F.

We also perform regression analysis (Table 7) for the effect of each of these chat categories on total earnings, controlling for the price paid and time trends:

[Table 7]

There are some interesting patterns. First, total earnings increase over time in each case, with particular significance for flexible contracts. Second, each chat category is highly significant, except for Q-clarification in the exogenous treatment (Q-clarification *is* significant in the corresponding non-parametric test).[[51]](#footnote-52) The effect of friendliness is particularly strong with flexible contracts, with a coefficient of over 10. With exogenous rigid chat, this coefficient is only one-third as large though still significant. Instead, the price paid largely drives total earnings, with nearly eight units of additional earnings from a price increase of 10. Price paid is also strongly significant with endogenous chat, except when friendliness is included. Overall, friendliness explains more of the variation than promises and the regressions with Q-clarification have the lowest R2.

In sum, our analysis provides evidence that friendliness and promises over quality increase total earnings, with Q-clarificationhelping with endogenous flexible contracts, helping only to a modest extent (in the non-parametric tests) with exogenous flexible contracts, and 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.

1. **Conclusion**

How does the ability to communicate affect the frequency and effectiveness of different types of contracts when sellers choose unenforceable trade quality after observing a post-contractual cost shock? We provide the first study on the effectiveness of rich communication in an explicit contracting environment, finding dramatic effects.

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. The advantage of rigid contracts without communication is robust to 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 solid. Indeed, our no-communication endogenous-contract results provide the first experimental support for HM’s prediction that flexible contracts may lead to reduced social welfare: we find lower total and buyer earnings with flexible than rigid contracts. We also find rigid contracts more frequent.

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 improve efficiency if the former is the case. However, if ambiguity is the problem, traders may find ways to credibly reduce the ambiguity and potentially induce better social outcomes. In this paper, our most important contribution is to test for the effect of unrestricted communication on the nature and effectiveness of contracting. We observe dramatic changes when the contracting parties are able to freely communicate from before trade is agreed until the seller chooses quality. People can then make informal agreements that remove the ambiguity of flexible contracts and promises which, though unenforceable, tend to be honored, leading to higher transfers and higher quality and complementing flexible contracts.

Overall, we find that transfers are higher, quality is higher, and earnings are substantially greater for both sides when free-form communication becomes feasible, especially with flexible contracts. With endogeneity, 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. This advantage of flexible over rigid contracts with communication still holds in our exogenous-contract treatments where it cannot be attributed to selection effects.

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. Flexible contracts are then associated with higher buyer earnings than rigid contracts (albeit a low-magnitude effect). This points to a slight positive earnings effect from clarification alone (the only communication available) with flexible contracts.

We also propose a conceptual approach based on the norm of decision responsibility and capturing the general 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.[[52]](#footnote-53) We find that it is not flexibility *per se* that causes problems in the contractual environment, but rather ambiguity over how transfers are to be adapted to subsequent events. Anonymous chat 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 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. 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). 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. Fully consistent with existing work, this underlines our view that it is natural to include communication when analyzing contractual interactions. Both types of trader have strong incentives for developing communication channels.

While the cost of communication may differ from the pure time cost in our lab study, we believe that some communication will emerge in many situations. 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 be unable to explain their own plans without ambiguity. The implications remain an exciting open question, though such environments are extremely difficult to analyze in a controlled fashion.

One limitation of our study (and others) is more readily investigated. We consider symmetric information, but even small information asymmetries could potentially lead to substantial distortion, limiting the power of communication. Charness and Dufwenberg (2006, 2011) find strong benefits from free-form communication 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.

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Table 1: Summary Statistics** | | | | | | |
| Category | Rigid No Comm. | Flexible No Comm. | Rigid  Chat | Flexible  Chat | Rigid Restricted | Flex Restricted |
| Frequency\* | 243 (55.4%) | 196 (44.6%) | 111 (25.3%) | 327 (74.7%) | 68 (15.5%) | 371 (84.5%) |
| Rejections | 79 (32.5%) | 65 (33.2%) | 20 (18.0%) | 12 (3.7%) | 32 (47.1%) | 110 (29.7%) |
| Average P (all offers) | 13.28 [0.41] | 11.13 [0.37] | 22.76 [0.83] | 16.92 [0.46] | 10.79 [0.82] | 8.96 [0.31] |
| Average P (accepted offers) | 15.74 [0.43] | 12.58 [0.46] | 25.22 [0.72] | 17.22 [0.47] | 15.31 [0.97] | 10.37 [0.39] |
| Average Q (with cost shock) | - | 3.35 [0.49] | - | 13.08 [0.66] | - | 3.27 [0.44] |
| Average Q (with no cost shock) | - | 1.58 [0.30] | - | 7.25 [0.66] | - | 2.82 [0.32] |
| Low quality (accepted offers) | 51 (31.1%) | 53 (40.5%) | 13 (14.3%) | 20 (6.3%) | 16 (44.4%) | 122 (41.2%) |
| Normal quality (accepted offers) | 107 (62.2%) | 74 (56.5%) | 33 (36.3%) | 61 (19.4%) | 17 (47.2%) | 150 (50.7%) |
| High quality (accepted offers) | 6 (3.7%) | 4 (3.0%) | 45 (49.4%) | 234 (74.3%) | 3 (8.3%) | 24 (8.1%) |
| Avg. quality (accepted offers) | -0.27 [0.04] | -0.38 [0.05] | 0.35 [0.08] | 0.68 [0.03] | -0.36 (0.11) | -0.33 (0.04) |
| Avg. buyer earnings (all offers) | 10.80 [0.58] | 9.73 [0.48] | 12.66 [0.99] | 17.02 [0.56] | 8.74 [1.13] | 11.80 [0.62] |
| Avg. buyer earnings (accepted offers) | 13.59 [1.06] | 12.09 [0.88] | 14.34 [1.14] | 17.47 [0.56] | 12.06 [1.99] | 14.68 [0.82] |
| Avg. seller earnings (all offers) | 7.81 [0.59] | 6.95 [0.68] | 16.68 [1.16] | 20.95 [0.46] | 7.82 [1.07] | 7.95 [0.55] |
| Avg. seller earnings (accepted offers) | 9.17 [0.86] | 7.93 [1.01] | 19.25 [1.27] | 21.56[0.44] | 10.33 [1.95] | 9.20 [0.77] |
| Avg. total earnings (all offers) | 18.61 [0.88] | 16.68 [0.99] | 29.34 [1.72] | 37.97 [0.84] | 16.56 [1.72] | 19.75 [0.77] |
| Avg. total earnings (accepted offers) | 22.76 [1.18] | 20.02 [1.40] | 33.59 [1.81] | 39.03 [0.81] | 22.39 [2.93] | 23.88 [0.99] |

\* No contract was offered on one occasion with the Restricted treatment. In the column for flexible contracts with chat, we exclude one case in which the buyer received an extremely large negative payoff Variable values are for all offered contracts except where otherwise indicated by parenthesis as conditioned on offer acceptance or cost shock realization. P refers to the initial (pre-cost-shock) price, while Q refers to the transfer added with flexible contracts after the cost shock. Standard errors are in brackets.

**Table 2: Outcomes across treatments, Random-effects regressions**

|  |  |
| --- | --- |
|  |  |
| Independent variables | (1)  Buyer  Earnings | (2)  Seller Earnings | (3)  Total Earnings | (4)  Quality^ | (5)  Trade Accepted | (6)  Total Transfer^ |
| No Comm\*Flexible | -1.046  (0.989) | -0.932  (0.940) | -1.990  (1.425) | -0.108  (0.070) | -0.075  (0.129) | -3.299\*\*\*  (0.765) |
| Chat | 1.748  (1.171) | 8.600\*\*\*  (1.175) | 10.422\*\*\*  (1.690) | 0.629\*\*\*  (0.082) | 0.391\*  (0.202) | 7.844\*\*\*  (2.157) |
| Chat\*Flexible | 5.546\*\*\*  (1.496) | 5.454\*\*\*  (1.427) | 10.868\*\*\*  (2.158) | 0.431\*\*\*  (0.101) | 1.018\*\*\*  (0.232) | -2.691\*\*  (1.116) |
| Restricted | -2.103  (1.395) | 0.087  (1.371) | -2.064  (2.013) | -0.072  (0.111) | -0.405\*  (0.210) | -0.144  (2.300) |
| Restricted\*Flexible | 4.175\*\*  (1.666) | 0.941  (1.578) | 5.136\*\*  (2.403) | 0.127  (0.126) | 0.532\*\*  (0.210) | -1.979  (1.369) |
| Constant | 10.775\*\*\*  (0.659) | 7.839\*\*\*  (0.677) | 18.580\*\*\*  (0.951) | -0.274\*\*\*  (0.050) | 0.481\*\*\*  (0.120) | 15.745\*\*\*  (1.483) |
| N | 1319 | 1319 | 1319 | 997 | 1319 | 997 |
| R2/LL | 0.068 | 0.265 | 0.247 | 0.381 | -656.1 | 0.271 |

Specifications (1)-(4) and (6) are GLS regressions and specification (5) is a Probit regression. Two-tailed *p*-values are in parentheses. ^Quality is only given for trade acceptance and we define total transfer only for accepted contracts, so that these regressions use that subset of the data. 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 session level. The omitted variable is the Rigid No Comm. treatment.

**Table 3: Average individual friendliness**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Friendliness range | | | | |
|  | -.5 to -.201 | -.2 to .099 | .1 to .399 | .4 to .699 | .7 to 1 |
| Number of buyers | 2 | 3 | 14 | 23 | 2 |
| Number of sellers | 2 | 3 | 12 | 25 | 2 |

Note: We consider only accepted contracts in this Table.

|  |  |  |
| --- | --- | --- |
| **Table 4: Total earnings as a result of chat category usage** | | |
| 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) |
| T2F, Promise | 38.87/37.88 | 1.961 (0.025) |
| T2R, Q-clarification | 29.55/30.46 | 0.210 (0.834) |
| T2R, Friendly | 41.27/24.93 | 3.210 (0.001) |
| T2R, Promise | 37.74/27.09 | 1.852 (0.032) |

Notes: “x/y” refers to the total earnings with/without a positive value for the category. T2F/T2R refer to endo-chat with flexible/rigid contracts. *p*-values (all one-tailed except for T2R, Q-clarification) are in parentheses.

**Table 5: Regressions for the effect of chat-category values on total earnings**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Independent variables | Total earnings | Total earnings | Total earnings | Total earnings |
| Period | 0.497\*  (0.261) | 0.577\*\*  (0.241) | 0695\*\*\*  (0.256) | 0.425\*  (0.246) |
| Price\_paid | 0.255\*\*  (0.106) | 0.060  (0.102) | 0.255\*\*  (0.111) | 0.008  (0.106) |
| Q-Clarification | 6.186\*\*\*  (1.727) | - | - | 4.092\*\*  (1.624) |
| Friendliness | - | 10.247\*\*\*  (1.150) | - | 9.764\*\*\*  (1.161) |
| Promises | - | - | 3.337\*\*\*  (1.583) | 0.922  (1.490) |
| Constant | 22.720\*\*\*  (2.608) | 28.061\*\*\*  (2.930) | 24.358\*\*\*  (3.177) | 27.243\*\*\*  (2.942) |
| N | 422 | 422 | 422 | 422 |
| R2 | 0.065 | 0.208 | 0.045 | 0.220 |

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**





**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 normal 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**

|  |  |  |
| --- | --- | --- |
| **Table B1: Behavior in session 1 of the endogenous no-communication treatment** | | |
| 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] |
| Low quality | 10 (25.0%) | 12 (27.9%) |
| Normal quality | 25 (62.5%) | 30 (69.8%) |
| High 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 treatment** | | |
| 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] |
| Low quality | 14 (33.3%) | 8 (44.4%) |
| Normal quality | 27 (64.3%) | 10 (55.6%) |
| High 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.

|  |  |  |
| --- | --- | --- |
| **Table B3: Behavior in session 3 of the endogenous no-communication treatment** | | |
| 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] |
| Low quality | 9 (25.7%) | 22 (44.9%) |
| Normal quality | 26 (74.3%) | 26 (53.1%) |
| High 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 treatment** | | |
| 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] |
| Low quality | 18 (38.3%) | 11 (55.0%) |
| Normal quality | 29 (61.7%) | 7 (35.0%) |
| High 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] |
| Low quality | 6 (30.0%) | 8 (10.4%) |
| Normal quality | 3 (15.0%) | 15 (19.5%) |
| High 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] |
| Low quality | 0 (0.0%) | 5 (5.3%) |
| Normal quality | 4 (66.7%) | 17 (18.1%) |
| High 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] |
| Low quality | 3 (6.0%) | 4 (7.8%) |
| Normal quality | 21 (42.0%) | 15 (29.4%) |
| High 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] |
| Low quality | 4 (26.7%) | 3 (3.2%) |
| Normal quality | 5 (33.3%) | 14 (15.1%) |
| High 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 | - |
| Low quality | 29 (39.7%) |
| Normal quality | 41 (56.2%) |
| High 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 | - |
| Low quality | 18 (26.9%) |
| Normal quality | 44 (65.7%) |
| High 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 | - |
| Low quality | 23 (28.4%) |
| Normal quality | 52 (64.2%) |
| High 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 | - |
| Low quality | 16 (25.4%) |
| Normal quality | 46 (73.0%) |
| High 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] |
| Low quality | 26 (34.2%) |
| Normal quality | 41 (54.0%) |
| High 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] |
| Low quality | 33 (47.1%) |
| Normal quality | 31 (44.3%) |
| High 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] |
| Low quality | 20 (23.8%) |
| Normal quality | 50 (59.5%) |
| High 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) |
| Low quality | 29 (32.6%) |
| Normal quality | 52 (58.4%) |
| High 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 | - |
| Low quality | 4 (4.1%) |
| Normal quality | 30 (30.6%) |
| High 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 | - |
| Low quality | 14 (14.7%) |
| Normal quality | 25 (26.3%) |
| High 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 | - |
| Low quality | 24 (27.3%) |
| Normal quality | 29 (32.9%) |
| High 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 | - |
| Low quality | 21 (21.9%) |
| Normal quality | 40 (41.7%) |
| High 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) |
| Low quality | 7 (6.6%) |
| Normal quality | 20 (18.9%) |
| High 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] |
| Low quality | 9 (8.5%) |
| Normal quality | 24 (22.6%) |
| High 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] |
| Low quality | 18 (17.1%) |
| Normal quality | 12 (11.4%) |
| High 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] |
| Low quality | 16 (15.2%) |
| Normal quality | 29 (27.6%) |
| High 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.

1. As explained below, this strong claim relies on the common assumption of efficient bargaining under symmetric information and uses the fact that some positive discretionary transfer statements are credible in environments that permit low-cost retaliation (as in HM and related works). Note that there may be a tradeoff between transfer adaptiveness and credibility *within* flexible contracts, but not between flexible and rigid contracts. Rigid contracts are not needed unless communication is restricted or information asymmetric. [↑](#footnote-ref-2)
2. We do not claim to pin down a simple answer to how communication works. As is clear in the aforementioned early literature, this is a subtle and complex topic. We do discuss recent advances, but even with fixed contract types, the study of complementarities between different communication strategies is in its infancy. [↑](#footnote-ref-3)
3. We study 1-shot interactions, but see below on parallels between repeated-game and behavioral enforcement. Notice that the buyer-seller pair could be a principal-agent exchanging a service. [↑](#footnote-ref-4)
4. In our data, following sharing norms promotes subsequent cooperation (in addition to insurance). [↑](#footnote-ref-5)
5. See also Gächter and Riedl (2005) on the impact of conflicting entitlements in a bargaining setting. [↑](#footnote-ref-6)
6. Traders can breach the informal terms of their agreement, but the buyer has strong incentives to fulfill her transfer commitments to avoid seller retaliation. [↑](#footnote-ref-7)
7. This rules out selection effects where different types of people may choose different types of contract. [↑](#footnote-ref-8)
8. This greater cost of *endogenous* flexibility could be driven by sellers misinterpreting buyer selection of flexible as a signal that the buyer is a kind or fair type who will raise transfers even in the low-cost state. Selection bias cannot readily account for this, since fairer types of buyer should be more likely to select flexible contracts, pay high transfers and avoid low quality, which we do not observe in the data. [↑](#footnote-ref-9)
9. This greater apparent advantage of endogenous flexibility may well reflect sellers punishing buyers for choosing rigid after sellers express a preference for flexibility or cost-sharing, as they typically do. [↑](#footnote-ref-10)
10. Applying HM directly, neither rigidity nor communication matter in a non-competitive setting like ours. [↑](#footnote-ref-11)
11. In essence, our communication result is a much simpler cousin of the Maskin and Tirole (1999) challenge to the Grossman-Hart-Moore “observable but non-verifiable” modeling strategy. Maskin and Tirole (1999) develop mechanisms that (under standard assumptions with restricted renegotiation or trader risk aversion) *indirectly verify* mutually foreseen and observable payoff-relevant events, such as our non-verifiable cost shock; *ex post* “message games” induce revelation of those events. In our distinct setting, with non-verifiable quality decisions, informal agreements (*ex ante* communication) simply specify complete plans of action to evade disagreement costs. [↑](#footnote-ref-12)
12. For a theoretical analysis of communication effects in coordination games, see Ellingsen and Östling (2010). [↑](#footnote-ref-13)
13. See also Ellingsen and Johannesson (2004) and Kessler and Leider (2012) on promises as “handshakes.” [↑](#footnote-ref-14)
14. Two potential buyers are matched with two potential sellers (with random re-matching over 15 periods). Each seller has two units to sell and each buyer has a one-unit demand. Each buyer determines a contract type (rigid or flexible) and the two sellers compete over price (an exogenous price interval prevents loss-making trades). Then a state of nature (seller cost shock) is determined. If the contract is flexible, the buyer can respond by unilaterally increasing the price to be paid (subject to the no-loss upper bound). After learning the final price, the seller trades *exactly* whenthe price covers cost (this seller behavior is actually imposed rather than “at will”). If trading, the seller chooses between normal and low quality. Choosing low is costly to the seller, but much more costly to the buyer. [↑](#footnote-ref-15)
15. In our endogenous no-communication treatment, rigid contracts yield higher total, as well as buyer, earnings. [↑](#footnote-ref-16)
16. Precluding trade in the high-cost state may also artificially reduce the seller’s reference price for rigid offers, by leading sellers to focus on the low-cost state (they have no decision in the high-cost state). [↑](#footnote-ref-17)
17. We thank Wouter Dessein for pointing to this advantage of our set-up. [↑](#footnote-ref-18)
18. Examples include Charness (2000), Andreoni (2005), Charness and Dufwenberg (2010), Ben-Ner, Putterman, and Ren (2011), and Oprea, Charness, and Friedman (2012). In this environment, simple statements provide little or no benefit; the personal element and a good rapport are critical. Our bilateral free-form communication reinforces seller responsibility, whereas the buyer’s numerical promises in FHZc are unilateral and impersonal. [↑](#footnote-ref-19)
19. Our restricted-communication treatment similarly generates mild benefits compared to our chat treatment. Still, flexible contracts do become slightly better for buyers. Possibly the lack of costly effort in FHZc tilts towards rigid contracts. The competition and consequent complexity in FHZc may also explain their weaker effect. Indeed, 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, with objective competition only fixing the base price. Competition might also affect the credibility and cost of communication (e.g., traders may deceive to win trade, or instead be more honest owing to the larger audience). [↑](#footnote-ref-20)
20. They also run a replication of FHZa’s endogenous-contracts, finding more low quality than in FHZa, particularly for rigid, and a revealed preference of buyers for choosing flexible contracts, at 72.3 percent of the time, in contrast to 50 percent in FHZa; buyer payoffs are (insignificantly) higher for rigid. Selection effects are not discussed. [↑](#footnote-ref-21)
21. This comparability has possible drawbacks: buyers can only send messages with flexible offers and the message framing inevitably highlights adaptation to cost. For instance, it may lead to stronger demand effects and selection (ungenerous buyers selecting rigid may explain the low prices in rigid contracts in our results). [↑](#footnote-ref-22)
22. 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. [↑](#footnote-ref-23)
23. Overall, our simple context gave us the confidence to not provide 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. [↑](#footnote-ref-24)
24. 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 a key benchmark before considering repeated interactions. [↑](#footnote-ref-25)
25. In practice, such rigidity is more likely enforced by informal commitments, but we simplify (as do FHZ). [↑](#footnote-ref-26)
26. 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). [↑](#footnote-ref-27)
27. 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. [↑](#footnote-ref-28)
28. Brief labels (in tables) are: exo-R-NC, exo-F-NC, exo-R-chat, exo-F-chat, endo-chat, and endo-NC, respectively. [↑](#footnote-ref-29)
29. 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 motives have similar effects (see Charness and Rabin, 2002). Trust raises quality and transfers, because sellers can then commit to provide higher quality in return for higher transfers. Contingent pro-sociality: sellers automatically reciprocate if better disposed towards buyers who pay high transfers; see also Sobel (2005) on intrinsic reciprocity. Finally, inequality-aversion and norms of fairness can generate a positive price, quality relationship (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, and tends to result in high quality if the buyer learns the seller’s requisite transfer, as is likely with chat. [↑](#footnote-ref-30)
30. Internalized sharing norms and inequality aversion are plausible; equally affect may drive such reactions; e.g., negative shocks induce bad moods and gifts induce good moods in Isen and Hermalin (2008). [↑](#footnote-ref-31)
31. 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.” [↑](#footnote-ref-32)
32. As noted above, sellers can commit to high quality conditional on transfer fulfillment. Chat also enhances trust and trustworthiness via social proximity (see e.g., Sally, 1995). This also helps rigid contracts, but removing ambiguity from flexible contracts ensures some flexible contract will dominate (buyers can make discretionary transfers small enough to be credible). [↑](#footnote-ref-33)
33. We emphasize our clean cross-treatment comparisons from the exogenous treatments, but exogeneity and endogeneity generate similar results in our environment, suggesting limited selection effects and adding credence to our tests of the revealed-preference predictions (only testable using endogenous results). In theory, selection effects are weak if trader characteristics that influence contract choice are uncorrelated with characteristics that affect outcomes. Our individual-level non-parametric tests partially control for selection, namely for seller fixed effects. [↑](#footnote-ref-34)
34. However, 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 provide the most parsimonious explanation of any shift from rigid to flexible. [↑](#footnote-ref-35)
35. To test whether chat raises dQ, we ran a random-effects GLS regression on data from the exogenous flexible no communication and chat treatments; this regression reveals a strong significant positive effect (*Z* = 6.17) of chat interacted with cost shock on Q, as well as a strong significant positive coefficient of chat on Q (*Z* = 7.05). [↑](#footnote-ref-36)
36. Buyers do choose flexible contracts more often, supporting our conjecture that agreement clarification complements the use of flexible contracting. However, we suspect that this difference in part reflects a demand effect, since there is an available additional action with flexible contracts but not with rigid ones. We chose this design to replicate the communication design in FHZc. [↑](#footnote-ref-37)
37. With restricted-communication (and accepted offers), buyers fulfill (or exceed) the relevant indicated Q value only 13.3% of the time after a cost shock, compared to 33.3% of the time after a 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. [↑](#footnote-ref-38)
38. 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, whereas 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. [↑](#footnote-ref-39)
39. Unless otherwise indicated, all p-values reflect one-tailed tests in keeping with directional hypotheses. [↑](#footnote-ref-40)
40. Note that there are far fewer observations here, since many buyers never offered any rigid contracts. [↑](#footnote-ref-41)
41. Session-level rank-sum tests for exogenous rigid contracts give *p* = 0.029, 0.100, and 0.014, respectively, and give *p* = 0.014 (for buyer, seller and total earnings) for exogenous flexible. [↑](#footnote-ref-42)
42. 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 buyer and total earnings are significantly lower, and seller earnings insignificantly lower, with restricted-communication than with no communication (*p* = 0.014, *p* = 0.024, and *p* = 0.352 in the respective two-tailed rank-sum tests on individual-level data). [↑](#footnote-ref-43)
43. Related to the signaling and selection isses, we compare endogenous and exogenous contracts: quality is significantly higher for exogenous flexible contacts than for endogenous ones (*p* = 0.052 and *p* = 0.058 at the individual- and session-levels, two-tailed), but not differing for rigid (*p* = 0.650, individual-level, two-tailed). [↑](#footnote-ref-44)
44. Cost-sharing does not vary across treatments without chat (p > .43 in all cases with individual-level data). [↑](#footnote-ref-45)
45. B'-RC receives similarly strong support. [↑](#footnote-ref-46)
46. A similar regression for total transfers reveals no significant impact of endogenously choosing flexibility, casting doubt on the notion of a strong selection bias where generous, fair-minded buyers are more likely to pick flexible contracts, though there is a mild tendency towards higher transfers from flexible in endo-chat. [↑](#footnote-ref-47)
47. We originally coded 18 detailed categories in endo-chat (see Brandts, Charness, and Ellman, 2012), but high variance, overlap and correlation led us to code only the three main categories in the exo-chat treatments. [↑](#footnote-ref-48)
48. Q-clarification is impossible with exogenous rigid contracts and so is omitted from the Figure. [↑](#footnote-ref-49)
49. See Brandts and Charness (2003) for experimental evidence showing that people will punish deception *per se*. [↑](#footnote-ref-50)
50. 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. [↑](#footnote-ref-51)
51. The effect of Q-clarification seems stronger when flexible contracts are endogenous. Endogeneity possibly makes Q plans more credible (or exogeneity may just help traders learn to clarify tacitly). As with restricted communication, clarification alone makes only a small difference, but Table C1 (and additional regressions interacting the chat categories) show much greater effects in combination with friendliness or promises. [↑](#footnote-ref-52)
52. 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. [↑](#footnote-ref-53)