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 quality after a possible cost shock. Communication potentially removes conflicting perceptions that may otherwise plague flexible contracts. Indeed, we find that introducing free-form communication sharply reverses an advantage of rigid contracts in favor of flexible contracts, which then deliver much higher earnings. Control treatments that avoid selection effects, reveal a strong parallel shift from rigid to flexible. Chat content analysis identifies clarification of post-shock transfers, promises, and personal rapport as key correlates of high earnings, with clarification working only in conjunction with flexible contracts. A communication channel restricted to clarifying transfer plans also favors use of flexible contracts, but mildly compared to chat.

Keywords: Contracts, flexibility, communication, experiments.

JEL Classifications: C91, D03, D86.

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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. Imperfections and costs of formal (court-enforced) contracting often lead trading parties to 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, within firms, Gibbons and Henderson (2012) call for research on clarity, identifying the development of shared understandings as a key managerial challenge.

Communication plays a vital role in enabling parties to reach the common understanding that enables an effective agreement.1 However, to date there has been little or no empirical work on the impact of rich communication on contract formation and design.

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 behavioral approaches should allow traders to respond to informal elements of an interaction, not only to the formal contract and market structure. Moreover, we claim that the cost of flexibility in such models is fundamentally grounded in ambiguity and 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

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1 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.”
and therefore costly disagreements over what adjustments are appropriate. However, these costs provide strong incentives for individuals and organizations to develop shared understandings. In simple symmetric-information environments such as HM, they should manage to do so. We therefore conjectured that introducing a costless, free-form communication channel in a bilateral relationship would usually enable the traders to escape the misunderstanding costs of flexibility and thereby evade the tradeoff at the core of HM.

Our main contribution is to demonstrate experimentally that free-form communication indeed provokes a switch in contract design from rigid to flexible, with flexible becoming considerably more effective than rigid. Free-form communication also delivers much higher efficiency and earnings for both parties. We run additional treatments that control the type of communication and contract; the results for both types of control are consistent with our main predictions. We also perform data analyses to probe how communication generates these effects; an exploratory coding highlights three roles of communication, of which clarification complements flexible contracts. Overall, our data provide strong support for our main prediction on the disappearance of HM’s tradeoff.

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 study a one-shot context where two actors, depicted as traders, can adapt to a shock. 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. With a flexible contract, the buyer can respond to the shock with an additional transfer before the seller sets the trade’s non-verifiable quality (low, normal or high),
whereas a rigid contract obliges trade at a fixed price.

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 and thereby raise cooperation. However, flexibility leaves room for ongoing disagreements that are often costly, since dissatisfied 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. We part company with HM over the determination of reference points. For HM, competition is critical: its impersonal objectivity can legitimize the competitive price. We instead appeal to the idea that transparent bilateral agreements, being procedurally fair, can legitimize resulting outcomes. Specifically, if traders give their informed consent, then barring breach of promises or abuse of power by others, they should not later pay to retaliate. This follows from the 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, leaving no ambiguity regarding what the seller should expect. 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 do limit the risk of misunderstandings and disagreements. Accordingly, without communication, we expect traders to often select rigid contracts.

Free-form communication sharply changes this prediction. Traders can agree on a flexible contract with informal commitments to quality and additional transfers, specified for each cost state. This agreement defines an unambiguous action plan with no room for later
disagreements. Thus, communication can remove the downside of flexibility by clarifying the buyer’s transfer plan. We predict that having a communication channel open 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.

We focus on our baseline treatments where contract type is endogenous. In the no-communication treatment, we find slightly higher buyer and total earnings and quality with rigid contracts, and the fraction choosing rigid is 24 percent more than that for flexible.

Results are very different in the treatment with free-form communication (“chat”). We see a pronounced increase in prices and quality and a pronounced decrease in contract rejections. The benefit is greatest for flexible contracts. They give considerably higher quality and earnings and 79 percent fewer rejections. The fraction choosing flexible contracts is nearly double that for rigid. In brief, there is a sharp switch from a slight rigid-contract advantage to a striking advantage of flexible contracts.

These results are fully consistent with the clarification role of chat just discussed. 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 how chat categories associate with the relative success of flexible and rigid contracts. We find that clarifying transfer plans leads to better outcomes with flexible contracts, while establishing a good personal rapport and promising high quality improves outcomes with both contract types.

To isolate a pure clarification effect, we also conduct a treatment restricting communication to only let buyers with flexible contracts state two numbers indicating how much they will add to the base price for each cost outcome. In principle, this impersonal clarification could resolve the ambiguity of flexible contracts. We do detect a shift to
flexible contracting and the clarification benefits are fully in line with those of free-form communication, but much lower in magnitude.

To control for selection effects that might drive the above results if different types of people choose different types of contract, we also run parallel treatments: two impose rigid contracts, while in another pair all contracts are flexible. Note that exogeneity is also relevant in some field environments where hierarchy or standard practice determines the contract type.

This project is related to HM and the Fehr, Hart and Zehnder (2009, 2011 and 2015) experiments, henceforth denoted FHZb, FHZa and FHZc; a,b,c reflects the order of writing. These experiments provide some evidence that flexibility without communication has negative consequences. FHZa find that rigid (“at will”) contracts can induce better outcomes for buyers than flexible ones when there is asymmetric competition and uncertainty over a potential cost shock. They find that the buyer’s average profit is higher with rigid contracts, but the seller’s profit is lower, so total earnings differ little. Rigid contracts were chosen 50 percent of the time. Our design avoids two 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. Second, FHZa,b,c exclude costly efforts that raise quality. This tilts towards rigid contracts since rigid contracts preclude positive surprises that can motivate costly effort.

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2 Two potential buyers are matched with two potential sellers. 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 the 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 when the 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.

3 Erlei and Reinhold (2012) use exogenous contracts to investigate negative reciprocity and signaling in FHZa’s setup where, because of seller competition, selecting a rigid contract always leads to a low total price (unlike in our design). Their endogenous contract replication finds differences compared to FHZa: quality is significantly lower, particularly for rigid; flexible is chosen more (72 percent); buyer payoffs are no longer significantly higher for rigid. In their setup, exogeneity matters: it significantly raises quality for both contract types.

4 We thank Wouter Dessein for pointing to this advantage of our set-up.
FHZb seek to verify that seller competition drives FHZ’a’s result. In a no-competition control that imposes base prices (randomly selected from winning bids in FHZa), rigid contracts no longer give higher buyer profits and are only chosen 18 percent of the time. But as sellers cannot reject contracts, this design precludes our decision-responsibility effect.

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 stark contrast to the strong effects of our free-form communication treatment, flexible contracts are not more profitable than rigid ones (but no longer make buyers worse off). Restricted and unilateral communication is relatively ineffective. Indeed, a stylized fact emerging from the experimental literature on communication is that personal elements and a good rapport are critical for avoiding inefficient equilibria when unique; exogenous messages are insufficient.\(^5\) In our parallel restricted-communication treatment, flexible contracts do slightly benefit buyers.\(^6\)

In sum, existing work on flexible versus rigid contracts offers some support for the notion that ex-ante flexibility risks ex-post misunderstandings under “at will” contracting. Our study generalizes into new trade and contract environments and, most importantly, paints a substantially less gloomy picture by introducing free-form communication that effectively removes the flexibility/disagreement tradeoff.

2. Experimental design and implementation

Our focus is on communication and agreements. Real-world settings typically allow some degree of free-form and personalized communication; this motivates our focal “chat”

\(^5\) Charness and Dufwenberg (2006, 2010, 2011) demonstrate the superiority of free-form communication with hidden action or information. They identify the role of promises (see also Ellingsen and Johannesson, 2004). More generally, communication raises coordination and trust in many studies. Using free-form messages, Brandts and Cooper (2007) highlight the role of simple messages in a team production game. Related to our focus on actors feeling responsible for accepting clearly-stated agreements, Ellman and Pezaris-Christou’s (2010) bilateral chat treatments show that actors feel more responsible if they have voice in a group decision.

\(^6\) FHZ’s seller competition could potentially interfere with communication by making it multilateral and possibly more strategic or by complicating the game.
treatment. Our no-communication treatment starkly prevents all communication (beyond the formal contract offer). We intend it to capture a setting where time pressure and complexity (hard-to-describe contingencies) prevent traders from reaching a common understanding on the precise terms of trade. Our restricted-communication treatment allows the buyer to indicate a full transfer plan but nothing else. Not inspired by any real-world setting, it serves as an experimental control and is comparable with FHZe’s informal-agreement treatment.\footnote{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).}

Before describing our design in detail, we motivate three other major design choices. (1) Our predictions do not rely on competition, and dispensing with it allows us to focus on an equally relevant environment, bilateral negotiation, that is simpler for the subjects. Crucially, we retain voluntary participation, unlike FHZb. (2) Specific-performance contracting further simplifies: trade is decided once and for all ‘ex-ante’ (i.e., before the cost shock).\footnote{As in the related studies, we do not explicitly model why traders should contract in advance: long-term contracts, e.g., specific performance, help motivate non-contractible, relationship-specific investments.} This is quite valuable, as it eliminates the need to make assumptions on ex-post trade (cf., FHZa,b,c).\footnote{In a true “at will” contract, traders would also have an ex-post trade choice. FHZa,b,c instead simplify by obliging sellers to trade when and only when in their ex-post material interest. But sellers clearly deviate from that maximization in their actual choices. Also, this restriction may artificially reduce the seller’s reference price on rigid contracts by focusing sellers on the low-cost state (the only state where they can choose quality).} (3) Finally, costly high quality (excluded by FHZa,b,c) 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 and allows richer transfer-quality relationships (see also footnote 4) and gives more room for distinguishing treatments; it slightly raises complexity but the previous two design features (and our help screen described below) seem to more than compensate.\footnote{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.}

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.\footnote{With single interactions, informal agreements must be behaviorally enforced, but there are close parallels with repeated-game enforcement, as explained in MacLeod (2007). Business relationships between two firms or a firm and an employee are typically repeated over time, but the one-shot model is a useful benchmark and is directly relevant when the buyer is a final consumer (see the construction examples in Hart, 1995).}

\subsection*{2.1 Details and parameters of the basic game}

Sample instructions are presented in Appendix A. The buyer can choose a contract type and a price $P$. The seller then accepts or rejects the offer. If no contract is accepted, the buyer and seller each receive outside option payments. If the seller accepts a contract offer, the seller provides a good to the buyer. The seller’s cost is subject to a shock $C$ that both buyer and seller observe (though formal contract enforcers cannot). If a flexible contract was chosen, the buyer can augment the initial price $P$ by any non-negative amount, which we denote by $Q$. However, if a rigid contract was chosen, the initial price cannot be changed.\footnote{The design precludes renegotiation. Even with formal renegotiation, rigidity may be enforced informally. FHZc add a ‘renegotiation’/repudiation treatment (sellers have no say); see also Bartling and Schmidt (2015).} After observing $Q$, the seller chooses the good’s quality $x$. 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 $v(x) = 10, 30, \text{or } 45$, for $x = -1, 0, +1$, and $C$ is either 0 or 20, with equal probability.

\subsection*{2.2 Treatments}

We conduct seven treatments with four sessions in each. Our main focus is on the three endogenous treatments: no communication, chat and restricted communication, where the buyer could choose to offer a rigid or flexible contract. In our exogenous control treatments, contract type was imposed as rigid or flexible; combined with no-communication and chat variants, this gives four more treatments.
2.3 Timing

The parties play a five-stage game in which they both observe the outcomes of all preceding stages (in exogenous treatments, buyer B’s stage 1 choice is only to choose P):

*Stage 1:* Buyer B sets the contract’s initial price offer $P$ and at the same time proposes a rigid or a flexible contract.

*Stage 2:* Seller S accepts or rejects this offer.

*Stage 3:* The computer randomly determines the seller’s base cost $C$ at 0 or 20.

*Stage 4:* If the contract is flexible, buyer B sets an additional transfer $Q$.

*Stage 5:* Seller S sets the quality level, $x = -1$, $x = 0$ or $x = 1$.

In chat treatments, 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). In the restricted-communication treatment, buyers can accompany flexible contracts in stage 1 with (only) a pre-formulated message: the buyer can enter two numbers that “indicate the additional transfers ($Q$) to be paid in the events of a high [20] and low [zero] cost shock.” As in chat treatments, this message is non-binding and both buyer and seller are made aware of the fact.

2.4 Implementation

Our sessions were conducted at the LINEEX laboratory (Valencia, Spain). 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 (including the exogenous-contract treatments), 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 counterpart payoffs from any set of feasible choices he or she wished to consider.

3. Our predictions

If the buyer and seller are self-interested money maximizers, the seller 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. But a wealth of experimental evidence leads us to expect this prediction to fail. Instead, pro-social preferences, trust and reciprocation can each generate higher quality and surplus, and a positive causal effect of the total transfer $P + Q$ on quality $x$. Even with risk-neutral sellers, flexible contracting to enable cost-sharing is valuable if sellers react badly to unmitigated negative shocks. And we expect cost-sharing, especially with communication: buyers tend to fulfill clearly-stated transfer plans, because sellers have low costs of punishing a breach.\(^\text{13}\)

3.1 Communication, contract choice and performance

An accepted rigid contract has the simplicity advantage of leaving no room for subsequent disagreement over what the buyer should do. HM formalize a related advantage: with rigidity, ‘objective’ competition legitimizes the buyer’s total transfer, necessarily equal to the low price $P$ that results from seller bidding, whereas flexible contracts leave post-competitive discretion; so rigidity pins down a low reference point (allowing buyers to pay less for a given quality level from the reciprocal sellers). We adapt HM’s process for determining reference points beyond formal seller competition to include non-competitive

\(^{13}\) The impact of punishment with low quality is 20 while $Q(20)=10$, with $Q(0)=0$, permits equal sharing.
informal agreements. Applying a decision-responsibility norm to such agreements,\textsuperscript{14} the seller reference point cannot exceed transfers that clearly fulfill the buyer’s side of the deal. Now, absent communication, only a rigid contract unambiguously constrains seller expectations, so buyers may prefer rigid as in HM. But free-form communication enables traders to remove ambiguity without the need for rigidity; the tradeoff disappears and we predict that flexible contracts will dominate rigid ones in chat.\textsuperscript{15}

As well as clarifying discretionary transfers $Q(0)$ and $Q(20)$, chat allows traders to discuss quality and try to build a friendly rapport; this can raise transfers and quality for both rigid and flexible contracts. Since the chat is bilateral, sellers can use it to pressure for a reasonable share of the pie, perhaps threatening to otherwise withhold cooperation. We therefore predict that sellers will share in the efficiency advantage from flexible.

Our restricted communication just suffices for buyers to indicate a full set of cost-contingent transfers but not to discuss quality.\textsuperscript{16} So we again predict that buyers switch to flexible contracts, but with weaker quality improvements. In sum:

\textit{Conjecture: In the no-communication treatment, (A) buyer earnings and quality are higher with rigid than flexible and (A') rigid contracts predominate.}

\textit{Conjecture: In the chat treatment, (B) buyer and seller earnings and quality are higher with flexible than rigid contracts and (B') flexible contracts predominate.}

\textit{Conjecture: In the restricted-communication treatment, (B-RC) buyer earnings and quality are higher with flexible than rigid and (B'-RC) flexible contracts predominate.}

Notice that unlike for B, Conjectures A and B-RC do not align seller earnings with contract type since, absent bilateral communication, buyers set the contract without seller input.

\textsuperscript{14} Captured in the commonplace refrain, “you’ve made your bed – now lie in it!”, 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.”

\textsuperscript{15} This result is a simple cousin of Maskin and Tirole’s (1999) challenge to the Grossman-Hart-Moore “observable but non-verifiable” modeling strategy. Communication allows traders to clarify, discuss and adapt their plans and expectations until unambiguous and mutually compatible, so their reference points coincide.

\textsuperscript{16} Social norms may ‘fill in’ a tacit agreement on high quality but some may view normal quality as implicit. Doubts that buyers would pay promised transfers in counter-factual cost states could also lower quality.
In addition to raising quality and cost-sharing under flexible contracts, chat fosters social preferences (see Sally, 1995, on social proximity), promises and trust. So we predict that chat will raise quality, transfers and earnings of buyers and sellers for either contract type. Restricted-communication, by contrast, should only benefit flexible contracts. Buyer earnings then rise as numeric clarifications lower seller expectations. Transfers and seller earnings possibly also rise as inducing high quality becomes easier. So we tentatively predict effects in the same direction as chat, only much weaker. Summarizing,

*Conjecture: (C)* Free-form communication raises buyer and seller earnings, quality, total transfers relative to both no communication and restricted communication, most strongly for flexible, where chat also raises cost-sharing. *(C-RC)* For flexible contracts, restricted-communication raises buyer and seller earnings, quality, total transfers, and cost-sharing relative to no communication, but less than for chat.

Notice that Conjectures A, B, C, but not A' and B', also apply to the exogenous treatments, if there are no important selection effects (thanks to avoiding competition – cf., footnote 3).

3.4 The effect of chat categories

In addition to “(Q)-clarification,” we focus on two social-preference effects of communication: “promises” by sellers over quality and “friendliness.” Much evidence (see above) predicts that these types of chat will raise quality and hence earnings in rigid *as well as* flexible contracts. By contrast, clarification should only benefit flexible contracts.

*Conjecture: (D)* Flexible contracts accompanied by clarification chats deliver higher earnings and quality than when chats are not clarifying.

*Conjecture: (E)* Both rigid and flexible contracts accompanied by friendly chats deliver higher earnings and quality than when chats are not friendly.

*Conjecture: (F)* Both rigid and flexible contracts accompanied by seller promises deliver higher earnings and quality than chats not accompanied by seller promises.

If clarification indeed drives the shift to flexible in the chat treatment, we should observe ubiquitous attempts at clarification in chats with flexible contracts. We also predict

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17 Transfers share the efficiency gains. Chat may also raise tastes for cost-sharing, reinforcing B and B'.
that when (quality) promises and friendliness accompany (Q) clarifications, buyers will have more confidence in high seller quality, raising their incentive and willingness to make high transfers and generating higher quality and earnings compared to a drier, one-sided clarification. Clarification and promises are necessarily prior to trade agreement, so they are not affected by the cost shock or discretionary choices (of Q and quality) but chat variables may still interact dynamically, complicating causal inference. We use the restricted-communication treatment as an independent angle on Q-clarification without other communicative effects.

4. Experimental results

Before diving into the detailed descriptive, non-parametric, and regression analysis, we summarize the principal experimental results for the three focal treatments; recall that “chat” is 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.
- 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.

The treatments with exogenous contract type generate similar results:

- Behavior differs little across endogenous- and exogenous-contract treatments.

4.1 Non-parametric tests for the endogenous treatments.

Table 1 shows summary statistics for the main variables in the endogenous treatments, distinguishing contract types; the first two columns pertain to no communication, the middle pair to chat and the last pair to restricted communication. Many of the key effects

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18 For the decision-responsibility norm to apply, the clarification must be ex-ante (before trade acceptance).
can be seen by inspecting Table 1, but for brevity we move directly to non-parametric tests.

We test our hypotheses on two levels. A conservative testing philosophy treats each session as just one observation, so that we only have four observations per treatment. A more powerful but less pure statistical approach is to consider the aggregate behavior/outcomes for each person; so we complement session-level tests with individual-level tests that average the relevant variable’s values over each individual seller’s ten active matches with buyers. We indicate the type of test as a subscript on the \( p \)-value: e.g., \( p_{\text{indiv}} \) when at the individual-level.

**Earnings**

Signed-rank tests on the no-communication treatment offer some direct support for Conjecture A: buyer earnings are significantly higher with rigid contracts \((p_{\text{session}}=0.062 \text{ and } p_{\text{indiv}}=0.060)\), as are total earnings \((p_{\text{session}}=0.062 \text{ and } p_{\text{indiv}}=0.029)\). Moreover, seller earnings do not differ significantly across these contracts \((p_{\text{session}}=0.312 \text{ and } p_{\text{indiv}}=0.122)\).

In the chat treatment, we find strong support for Conjecture B in that flexible contracts lead to higher earnings. Individual-level signed-ranks tests show that differences for buyer, seller, and total earnings are all highly significant \((p_{\text{indiv}}=0.003, 0.002, 0.000, \text{ respectively})\); at the session level, signed-ranks tests line up perfectly for seller earnings, giving \( p_{\text{session}}=0.062 \), just failing to do so for buyer and total earnings, where \( p_{\text{session}}=0.125 \). In the restricted-communication treatment, we find significant differences for buyer earnings \((p_{\text{session}}=0.062 \text{ and } p_{\text{indiv}}=0.004)\) and total earnings \((p_{\text{session}}=0.062 \text{ and } p_{\text{indiv}}=0.006)\) but not for seller earnings \((p_{\text{session}}=0.438 \text{ and } p_{\text{indiv}}=0.444)\), consistent with Conjecture B-RC.

Support for Conjecture C is also strong. Session-level rank-sum tests find

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19 Lacking repeated interactions, we cannot control for both buyer and seller fixed effects at the same time. We expect buyer fixed effects to be less important; even self-interested buyers will share 50:50 if that ensures a high quality response, whereas sellers move last and variations in their sense of entitlement have large payoff implications for buyers; the data support this idea. So we control for seller fixed effects by using seller-level data in the signed-rank and rank-sum tests. Buyer-level data give similar results but somewhat less significance.

20 All \( p \)-values, rounded to three decimal places, reflect one-tailed tests in keeping with directional hypotheses.
significantly higher earnings in the chat treatment compared to no-communication and restricted-communication for buyer, seller, and total earnings ($p_{\text{session}}=0.014$ in all types of comparison). Individual-level tests find the same, with all $p_{\text{indiv}}$-values below 0.001.\textsuperscript{21}

Conjecture C-RC predicts that, comparing flexible contracts, buyer earnings in the restricted treatment will be higher than with no communication and lower than with chat. We find support in the comparison with no-communication ($p_{\text{session}}=0.057$ and $p_{\text{indiv}}=0.084$) and in that with chat ($p_{\text{session}}=0.014$ and $p_{\text{indiv}}=0.000$). More tentatively, C-RC also predicts higher seller earnings with restricted than with no communication. This part of Conjecture C-RC is rejected by the data ($p_{\text{session}}=0.249$ and $p_{\text{indiv}}=0.123$); in restricted, buyers seem to use flexible contracts to pay less in the low-cost state, rather than seek high quality in both states (which would raise transfers and benefit sellers). Finally, comparing seller earnings in restricted to those in chat, the support is as strong as for buyer earnings ($p_{\text{session}}=0.014$, $p_{\text{indiv}}=0.000$).

Quality

The results are similar to those for earnings. In the no-communication treatment, quality is significantly higher for rigid than flexible (accepted) contracts ($p_{\text{session}}=0.062$ and $p_{\text{indiv}}=0.018$), consistent with Conjecture A.\textsuperscript{22} With chat, flexible delivers higher quality than rigid ($p_{\text{session}}=0.062$ and $p_{\text{indiv}}=0.000$), consistent with Conjecture B. However, with restricted communication, there is no support for Conjecture B-RC on quality across contract types ($p_{\text{session}}=0.428$ and $p_{\text{indiv}}=0.271$); again, buyers seem to focus on exploiting restricted to lower transfers (see also the regressions below). Supporting Conjecture C, the advantages of chat

\textsuperscript{21} We also test separately for earnings differences in flexible and rigid contracts. For flexible, chat raises earnings in all tests, at least at 5 percent significance (session-level) and 1 percent (individual-level). For rigid, all tests are significant at least at the 10\% level, except chat does not raise buyer earnings ($p_{\text{session}}=0.343$, $p_{\text{indiv}}=0.267$). Consistent with Conjecture C, chat affects flexible contracts more strongly; see the chat*flexible interaction in section 4.3’s regressions for a direct test.

\textsuperscript{22} Quality is only observed after acceptance. All non-parametric tests on quality, total transfers, cost-sharing and contract frequency are based on accepted contracts.
for quality are every bit as strong as for earnings.\textsuperscript{23} On Conjecture C-RC, we find that, in flexible contracts, quality is not higher under restricted than under no-communication (\(p_{\text{session}}=0.557, p_{\text{indiv}}=0.364\)) but is lower than with chat (\(p_{\text{session}}=0.014, p_{\text{indiv}}=0.000\)).

\textit{Total transfers and cost sharing}

Conjecture C also predicts total transfers. Total transfers paid in (accepted) contracts are much higher in the chat than in the no-communication and restricted-communication treatments; for both comparisons \(p_{\text{session}}=0.014\) and \(p_{\text{indiv}}=0.000\).\textsuperscript{24}

We also 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 contracting. So we use rank-sum tests to compare, across the three treatments, the difference between the (session or seller) average transfer paid in accepted flexible contracts after high and low costs. Chat raises cost-sharing relative to both no communication and restricted communication: \(p_{\text{session}}=0.014\) and \(p_{\text{indiv}}\geq 0.001\) for both comparisons. So the data strongly support Conjecture C’s prediction that chat promotes cost-sharing. On the other hand, for Conjecture C-RC, restricted communication does not raise cost-sharing, indeed there is slightly less sharing on average than with no communication (\(p_{\text{session}}, p_{\text{indiv}}\) exceed 0.5). To delve further, we investigate the indicated Q-values.

In the restricted-communication treatment, we can observe \textit{indicated} dQ-values for each individual match. In chat, we can extract these values from the coded chat data. The most frequently indicated values of dQ are 0, 5 and 10, with a mean of 5.36 in restricted and 0, 8 and 10 with a mean of 7.05 in chat. So buyers signal more sharing in chat, but the greater

\textsuperscript{23} Quality is significantly higher in chat than with no communication. The average quality is higher in each of the four chat sessions than in any of the four no-communication sessions (\(p_{\text{session}}=0.014\)) and similarly for flexible contracts; moreover, \(p_{\text{indiv}}=0.000\) for both contract types. Chat has the same strong advantages relative to restricted communication (same \(p\)-values for all tests). Testing separately by contract type, all comparisons have at least 5 percent and 0.1 percent significance at session and individual levels, respectively.

\textsuperscript{24} Testing again separately for flexible and rigid contracts, all tests are significant at the 5 percent level, except comparing chat and restricted communication, where \(p_{\text{session}}=0.0571\) for rigid contracts.
advantage of chat for sharing is that buyers are then much more likely to fulfill these informal commitments: in restricted, the fulfillment rates are only 51 percent after no cost shock and 29 percent after a cost shock, whereas in chat, the fulfillment rate is 90 percent even after a cost shock. This can explain the general failure of the quality predictions in restricted: when buyers fail to deliver on their indicated Q-values, sellers naturally tend to punish the deception (see Brandts and Charness, 2003). It can also explain the cost-sharing puzzle: buyers who always fulfill their indications do cost-share more in restricted than no-communication, but this is counteracted by the higher breach rates in high-cost states.

**Contract frequencies**

Conjectures A', B' and B'-RC predict that rigid contracts will be more frequent with no communication, while flexible contracts will predominate with chat and restricted communication. We find some support for A'. Testing for a higher proportion of rigid than flexible contracts in the no-communication treatment shows a significant difference ($p_{indiv}=0.016$ and $p_{session}=0.062$). Meanwhile, in the chat treatment, flexible contracts clearly dominate at both the session and individual levels (signed-ranks tests give $p_{session}=0.062$ and $p_{indiv}=0.000$). So there is strong support for Conjecture B'. For restricted communication, flexible contracting is again much more frequent ($p_{session}=0.062$ and $p_{indiv}=0.000$) strongly supporting Conjecture B'-RC (this last may reflect a demand effect since only flexible contracts permit the additional action of value indication).25

### 4.2 Control treatments with exogenous contracts

Table 2 shows the summary statistics for the four treatments with exogenous contract choice. Overall, the data pattern is visibly similar to that of the treatments discussed in 4.1.

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25 There are some time trends in the contract-type frequencies. The strongest is the increase in the chat treatment, where the proportion of flexible contracts rises from 60 percent in the first two periods to 84 percent in the final two periods. Importantly, in any period range, the frequency of flexible contracts is always substantially higher for chat and restricted-communication than for no-communication.
4.3 Regression analysis

This section mainly serves to corroborate the non-parametric results, but also adds a test for complementarity between communication and flexible contracting. The regressions in Table 3 study how the chat and restricted-communication treatments affect the principal variables. They all include treatment dummies for chat and restricted communication, with no communication as the baseline. We also include a dummy for flexible contracts and its interactions with chat and restricted communication.26

We can assess the conjectures on earnings, quality and total transfers using Table 3. Conjecture A is supported by the significant negative coefficients on the flexible contracts dummy in the regressions for buyer earnings and quality.

Table 4 shows the test results for other conjectures. For Conjecture B, row (1) shows the test results on the differential effect of flexible vs. rigid contracts given chat, captured by the test statistic “Chat*Flexible + Flexible”: significant at the 1 percent level for buyer earnings and quality and at the 5 percent level for seller earnings. Similarly, row (2) shows support at the 1 percent level for Conjecture B-RC on the differential effect of flexible vs. rigid on buyer earnings and quality given restricted communication.

Row (3) tests Conjecture C on chat versus no-communication for flexible contracts. The results show highly significant differences for buyer and seller earnings, quality and total transfers. The last three rows show results for different parts of Conjecture C-RC. We compare restricted and no communication for flexible contracts in Row 4. The results are not fully consistent with Conjecture C-RC. Restricted communication does raise buyer and total

26 We focus on random-effects regressions; our treatment dummy regressors are uncorrelated with seller-specific effects by experimental design and the flexible dummy is also exogenous since buyers choose the contract type independently of individual seller characteristics, except possibly in the chat treatment. In the endogenous regressions with the flexible dummy, random effects may hold since buyers set the contract type, but sellers may influence this choice with chat. So we offer OLS regressions in Appendix C (Tables C1-C4). Moreover, our exogenous contract regressions completely evade this concern. Indeed the OLS and random effects specifications are almost identical there, as well as being similar in the endogenous case.
earnings, but fails to raise seller earnings, quality and total transfers (see the non-parametric test discussion above for an interpretation). Finally, rows (5) and (6) show the differential effect of chat vs. restricted communication for flexible and rigid contracts, respectively. One can see that for all cases the test results are highly significant.

Table 5 presents regression results for the exogenous treatments. They confirm the corresponding endogenous results, except that Conjecture A is not supported (see row 2 of Table 5). So, while Conjecture A is supported by both the non-parametric and regression results for endogenous contracts, the advantage of rigid under no-communication is weak and is not found with exogenous contracts. Nonetheless, the results do support the more general prediction that chat raises buyer and total earnings in flexible relative to rigid contracts: the row 3 interaction term of chat and flexible has a significantly positive coefficient in Table 5.

4.4 Summary on support for theoretical conjectures on outcomes

On the basis of the results from the non-parametric tests and the regressions, we find:

- Conjectures A, B: Non-parametric and regression results consistent with all parts.
- Conjecture B-RC: Non-parametric and regression results consistent with all parts, except the effect on quality is only found in the regressions.
- Conjectures A’, B’ and B’-RC: Non-parametric tests consistent with all three.
- Conjecture C: Non-parametric and regression results consistent with all parts.
- Conjecture C-RC: Non-parametric and regression results consistent with the superiority of chat with flexible contracts.
- Results are similar with exogenous contracts except Conjecture A is not supported; regressions still support the complementarity of flexible and chat.

5. How does communication work?

We have seen that free-form communication shifts heavily in favor of flexible contracting, with much higher transfers, quality, and earnings. But which chat features drive these changes? And how well do the observed patterns fit with our theoretical predictions? We discuss chat content descriptively in 5.1 and estimate statistical effects in 5.2.
5.1 Message content

We coded our free-form messages on the basis of three categories.27 Discussion about Q is central to our investigation and very common, so “Q-clarification” is our first category. Traders typically seek to establish a personal rapport; “Friendly” is our second category. Sellers often make promises about the quality that they will choose; “Promises (over quality)” is our third category. A research assistant independently coded all chats.

Throughout the development and implementation of the coding scheme, she was not informed of our hypotheses. Coding was binary for Q-clarification and Promises, but trinary for Friendly. The coder could check as many or as few categories as she deemed appropriate.

The rate of Q-clarification rises from 60 to 80 percent for flexible contracts, while staying very low for rigid ones.28 Arguably participants learn that with flexible contracts, they need to clarify their transfer plans. Similarly, Promises become more frequent, reaching 60 percent by the last two periods, with higher rates for flexible contracts. Average friendliness increases over time with flexible but not rigid contracts. So Q-clarification, Promises, and Friendly are higher for the contract type with the highest quality and earnings.29

We can also assess which combinations of chat messages are used together. Table B1 shows the frequencies of all the combinations of the values of our three chat categories, distinguishing between rigid and flexible contracts. The first seven rows give aggregate information. One can see directly that chats associated with rigid contracts have much less content. In particular, clarification of transfer plans is mostly associated with flexible contracts and is negatively associated with rigid contracts. Chats with Friendly=−1 are infrequent for both types of contracts. So our tests use “pFriendly,” which is a dummy for

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27 We originally coded 18 detailed categories for (endogenous) chat, but the overlap and correlation led us to focus on these three main categories; see Appendix B for some examples of chat conversations.
28 For exogenous flexible contracts the increase is from 70 to 90 percent.
29 Notable heterogeneity in traders’ average match friendliness gives something to learn about counterparts’ types via the chat mechanism. Some are in the −.5 to −.201 and .7 to 1 ranges, but most lie between .1 and .69.
positively Friendly; i.e., we transform Friendly into the binary category $p_{\text{Friendly}}$ which takes a value of 0 for friendliness equal to -1 or 0, and a value of 1 for friendliness equal to 1.

The lower part of the table shows the data for all the different combinations. One can observe some of the complementarities in the use of chat categories for flexible contracts. Observe that the frequency of (0, 0, 1) is nine whereas the frequency of (1, 0, 1) is 54, and note that the frequency of (0, 1, 1) is five whereas the frequency of (1, 1, 1) is 82. That is, promises for quality are seldom used without also clarifying transfers values; quality naturally depends on transfers.

5.2 Support for theoretical conjectures about chat content

Given the endogeneity of communication contents, we cannot make clear causal inferences. Nonetheless, the associations offer suggestive evidence. Conjectures D, E, and F predict how the three chat categories affect effectiveness, measured as total earnings here; we focus the tests on total earnings since bilateral chats usually share surplus gains. Table 6 shows total earnings with different values for chat categories with endogenous contracts, as well as the signed-rank $p$-value.

Q-clarification significantly affects total earnings with flexible but not rigid contracts, giving some support to Conjecture D (at the individual-level only). Friendliness has large positive effects on total earnings, offering strong support for Conjecture E. Finally, promises over quality have a weakly significant positive effect on total earnings for both types of contracts (individual-level only). So we also find some support for Conjecture F.

Table 7 presents our regression analysis for the effects of each of these chat categories on total earnings, controlling for flexibility. The first four columns use all of the data, while the last column restricts the data to matches where both buyer and seller were Spanish.

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30 Friendliness may emerge in conjunction with other variables. We conjecture that it plays a role in reducing ambiguity about the type of person with whom one is paired. Minor, almost imperceptible, elements of the chat (e.g., the tone of a message and manner of writing) may well serve as a signal about this type; cf., footnote 29.
nationals. Observe that in the first three regressions, friendliness and promises have significantly positive effects on total earnings, whereas the clarification of transfer plans does not. In contrast, the interaction with flexibility has a significantly positive effect for clarification and significantly negative effects with friendliness and promises. In regressions (4) and (5) involving all chat categories, clarification continues to be insignificant on its own and its interaction with flexibility continues to be significantly positive. For the other two chat categories, the interactions with flexibility remain negative or insignificant.31

The main implication of the results shown in Tables 7 and 8 is that friendliness and quality promises are major benefits from chat in rigid as well as in flexible, whereas clarification of transfer plans complements flexibility and has no effect with rigid contracts.

It is intuitive that communication, particularly clarifying messages, delivers higher earnings and quality when the subjects share a common language and culture; this also reduces error in our categorization of chat content. Since most subjects were Spanish, we could not run any meaningful analysis with foreigner-dummies, but we could exclude foreign nationals. This gave the results in the last column of Table 7: they are similar to (4) but the interaction between clarification and flexibility is stronger, consistent with the idea that sharing a common cultural background facilitates effective communication.

In sum, our non-parametric tests and our regression analysis support Conjectures D and E and offer somewhat weaker support for Conjecture F. This ties in nicely with the positive effects of restricted versus no communication on flexible contracts. The restricted-communication treatment only permits transfer clarification, so it controls for friendliness and promises. In addition, the restricted-communication design encourages buyers to clarify specific transfer values (90 percent do so); this demand effect generates a selection effect distinct to that in chat, so the similar results provide a reassuring robustness.

31 Table C2 (in Appendix) shows the very similar corresponding results in OLS regressions.
6. Conclusion

We provide the first study on the effectiveness of rich communication in an explicit contracting environment. The ability to communicate produces a marked shift in frequency and effectiveness from rigid towards flexible contracts in our data. Flexible contracts are necessary for traders to adapt the terms of trade to changing circumstances. Yet ambiguity over how to interpret flexible contracts can make it useful for traders to tie their hands and some recent experimental work indeed finds that rigid contracts may be better, at least for buyers. Our results without communication qualitatively confirm and extend this point, showing robustness to removing competition, which had been viewed as central to the theory.

We focus on the effect of unrestricted communication, showing that the problem is not flexibility per se. Overall, free-form communication leads to higher quality and substantially greater earnings for both sides. Flexible contracts become increasingly frequent over time, consistent with the idea that traders learn that flexible contracts work best. Parties who are able to freely communicate prior to agreeing on trade can make informal agreements that remove the ambiguity of flexible contracts. The key result is that introducing this communication has two effects: a sharp switch from rigid to flexible contracting and higher relative effectiveness of flexible contracts. Both effects also hold in our exogenous-contract treatments, where they cannot be attributed to selection effects. In addition, both effects hold to a milder degree in our restricted treatment, where messages can only clarify transfer plans.

This result is fully consistent with our conceptual approach, based on the norm of decision responsibility, where free-form communication can effectively eliminate ambiguity costs by aligning expectations. Content analysis of our chat data reveals that clarification is associated with improved outcomes for flexible contracts (only). Consistent with chat’s advantage over restricted-communication, we also find positive impacts of friendliness and promises. These positive impacts are as strong or stronger for rigid contracts. This points to
clarification as a key driver of the complementarity between communication and flexible contracting, corroborating the restricted-treatment results.

In light of the strong implications for contract design and large benefits from informal agreements, it is important to know whether the presence or absence of communication channels between buyers and sellers is the more relevant case. Traders have strong incentives for finding ways to communicate, not only to foster trust, but also to exchange views and clarify plans, enabling effective use of flexible contracts for adapting to shocks. Of course, communication is more difficult and costly in complex environments beyond our lab setting. 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 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's (2006, 2011) clear benefits from free-form communication in asymmetric-information environments with moral hazard and adverse selection are encouraging, but this issue calls for future research in settings with endogenous contract design.

References


Table 1: Behavior in the three treatments with endogenous contract choice (disaggregated by contract type chosen)

<table>
<thead>
<tr>
<th>Category</th>
<th>Endogenous No-comm. (Rigid)</th>
<th>Endogenous No-comm. (Flexible)</th>
<th>Endogenous Chat (Rigid)</th>
<th>Endogenous Chat (Flexible)</th>
<th>Endogenous Restricted (Rigid)</th>
<th>Endogenous Restricted (Flexible)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency*</td>
<td>243 (55.4%)</td>
<td>196 (44.6%)</td>
<td>111 (25.3%)</td>
<td>327 (74.5%)</td>
<td>68 (15.5%)</td>
<td>371 (84.5%)</td>
</tr>
<tr>
<td>Rejections</td>
<td>79 (32.5%)</td>
<td>65 (33.2%)</td>
<td>20 (18.0%)</td>
<td>12 (3.7%)</td>
<td>32 (47.1%)</td>
<td>111 (29.9%)</td>
</tr>
<tr>
<td>Average P</td>
<td>13.28 [0.41]</td>
<td>11.59 [0.59]</td>
<td>22.76 [0.83]</td>
<td>16.92 [0.46]</td>
<td>10.79 [0.82]</td>
<td>8.94 [0.31]</td>
</tr>
<tr>
<td>Average P (accepted offers)</td>
<td>15.74 [0.43]</td>
<td>13.25 [0.81]</td>
<td>25.22 [0.72]</td>
<td>17.22 [0.47]</td>
<td>15.31 [0.97]</td>
<td>10.37 [0.39]</td>
</tr>
<tr>
<td>Average Q (with cost shock)</td>
<td>3.35 [0.49]</td>
<td>13.08 [0.66]</td>
<td>3.27 [0.44]</td>
<td>6.25 [0.66]</td>
<td>2.82 [0.32]</td>
<td></td>
</tr>
<tr>
<td>Average Q (with no cost shock)</td>
<td>3.41 [1.85]</td>
<td>7.25 [0.66]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low quality</td>
<td>51 (31.1%)</td>
<td>53 (40.5%)</td>
<td>13 (14.3%)</td>
<td>20 (6.3%)</td>
<td>16 (44.4%)</td>
<td>106 (40.8%)</td>
</tr>
<tr>
<td>Normal Quality</td>
<td>107 (65.2%)</td>
<td>74 (56.5%)</td>
<td>33 (36.3%)</td>
<td>61 (19.4%)</td>
<td>17 (47.2%)</td>
<td>133 (51.2%)</td>
</tr>
<tr>
<td>High Quality</td>
<td>6 (3.7%)</td>
<td>4 (3.1%)</td>
<td>45 (49.5%)</td>
<td>234 (74.3%)</td>
<td>3 (8.3%)</td>
<td>21 (8.1%)</td>
</tr>
<tr>
<td>Avg. quality</td>
<td>-0.27 [0.04]</td>
<td>-0.37 [0.05]</td>
<td>0.35 [0.08]</td>
<td>0.68 [0.03]</td>
<td>-0.36 [0.11]</td>
<td>-0.33 [0.04]</td>
</tr>
<tr>
<td>Avg. buyer earnings</td>
<td>10.80 [0.58]</td>
<td>8.84 [1.09]</td>
<td>12.66 [0.99]</td>
<td>17.02 [0.56]</td>
<td>8.74 [1.13]</td>
<td>11.78 [0.62]</td>
</tr>
<tr>
<td>Avg. buyer earnings (accepted offers)</td>
<td>13.59 [0.77]</td>
<td>10.74 [1.61]</td>
<td>14.34 [1.14]</td>
<td>17.48 [0.56]</td>
<td>12.06 [1.99]</td>
<td>14.68 [0.82]</td>
</tr>
<tr>
<td>Avg. seller earnings</td>
<td>7.81 [0.59]</td>
<td>7.96 [1.22]</td>
<td>16.68 [1.16]</td>
<td>20.95 [0.46]</td>
<td>7.82 [1.07]</td>
<td>7.94 [0.55]</td>
</tr>
<tr>
<td>Avg. seller earnings (accepted offers)</td>
<td>9.17 [0.86]</td>
<td>9.44 [1.81]</td>
<td>19.25 [1.27]</td>
<td>21.56 [0.44]</td>
<td>10.33 [1.95]</td>
<td>9.20 [0.77]</td>
</tr>
<tr>
<td>Avg. total earnings</td>
<td>18.61 [0.88]</td>
<td>16.80 [0.99]</td>
<td>29.34 [1.72]</td>
<td>37.97 [0.84]</td>
<td>16.56 [1.72]</td>
<td>19.73 [0.77]</td>
</tr>
<tr>
<td>Avg. total earnings (accepted offers)</td>
<td>22.76 [1.18]</td>
<td>20.18 [1.40]</td>
<td>33.59 [1.81]</td>
<td>39.03 [0.81]</td>
<td>22.39 [2.93]</td>
<td>23.88 [0.99]</td>
</tr>
</tbody>
</table>
Table 2: Behavior in the treatments with exogenous contract choice

<table>
<thead>
<tr>
<th>Category</th>
<th>Exogenous Rigid No-comm.</th>
<th>Exogenous Flexible No-comm.</th>
<th>Exogenous Rigid Chat</th>
<th>Exogenous Flexible Chat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rejections</td>
<td>152 (34.9%)</td>
<td>119 (27.2%)</td>
<td>61 (13.9%)</td>
<td>18 (4.1%)</td>
</tr>
<tr>
<td>Average P</td>
<td>13.91 [0.31]</td>
<td>12.44 [0.28]</td>
<td>23.04 [0.46]</td>
<td>13.14 [0.31]</td>
</tr>
<tr>
<td>Average P (accepted offers)</td>
<td>16.28 [0.33]</td>
<td>14.21 [0.31]</td>
<td>25.38 [0.41]</td>
<td>13.47 [0.30]</td>
</tr>
<tr>
<td>Average Q (with cost shock)</td>
<td>4.18 [0.67]</td>
<td></td>
<td>15.89 [0.55]</td>
<td></td>
</tr>
<tr>
<td>Average Q (with no cost shock)</td>
<td>3.21 [0.37]</td>
<td></td>
<td>8.44 [0.44]</td>
<td></td>
</tr>
<tr>
<td>Low quality</td>
<td>86 (30.3%)</td>
<td>108 (33.9%)</td>
<td>63 (16.7%)</td>
<td>50 (11.8%)</td>
</tr>
<tr>
<td>Normal Quality</td>
<td>183 (64.4%)</td>
<td>174 (54.5%)</td>
<td>124 (32.9%)</td>
<td>85 (20.1%)</td>
</tr>
<tr>
<td>High Quality</td>
<td>15 (5.3%)</td>
<td>37 (11.6%)</td>
<td>190 (50.4%)</td>
<td>287 (68.0%)</td>
</tr>
<tr>
<td>Avg. quality</td>
<td>-0.25 [0.03]</td>
<td>-0.22 [0.04]</td>
<td>0.34 [0.04]</td>
<td>0.56 [0.03]</td>
</tr>
<tr>
<td>Avg. buyer earnings</td>
<td>10.51 [0.47]</td>
<td>10.16 [0.48]</td>
<td>12.61 [0.54]</td>
<td>16.58 [0.49]</td>
</tr>
<tr>
<td>Avg. buyer earnings (accepted offers)</td>
<td>13.45 [0.65]</td>
<td>12.08 [0.62]</td>
<td>13.84 [0.61]</td>
<td>17.07 [0.50]</td>
</tr>
<tr>
<td>Avg. seller earnings</td>
<td>9.96 [0.48]</td>
<td>10.62 [0.57]</td>
<td>17.50 [0.62]</td>
<td>19.03 [0.47]</td>
</tr>
<tr>
<td>Avg. seller earnings (accepted offers)</td>
<td>12.62 [0.68]</td>
<td>12.71 [0.75]</td>
<td>19.52 [0.67]</td>
<td>19.63 [0.47]</td>
</tr>
<tr>
<td>Avg. total earnings</td>
<td>20.47 [0.69]</td>
<td>20.78 [0.79]</td>
<td>30.11 [0.84]</td>
<td>35.61 [0.78]</td>
</tr>
<tr>
<td>Avg. total earnings (accepted offers)</td>
<td>26.07 [0.90]</td>
<td>24.80 [0.99]</td>
<td>33.36 [0.86]</td>
<td>36.70 [0.77]</td>
</tr>
</tbody>
</table>
Table 3: Outcomes across endogenous treatments, Random-effects regressions

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>(1) Buyer Earnings</th>
<th>(2) Seller Earnings</th>
<th>(3) Total Earnings</th>
<th>(4) Quality$^\wedge$</th>
<th>(5) Total Transfer$^\wedge$</th>
<th>(6) Trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chat</td>
<td>1.992*** (1.092)</td>
<td>8.855*** (1.742)</td>
<td>10.605*** (2.533)</td>
<td>0.575*** (0.081)</td>
<td>9.404*** (1.237)</td>
<td>0.501 (0.359)</td>
</tr>
<tr>
<td>Flexible</td>
<td>-1.456*** (0.172)</td>
<td>-0.879 (1.254)</td>
<td>-2.456* (1.323)</td>
<td>-0.132*** (0.023)</td>
<td>-0.543 (0.704)</td>
<td>-0.064 (0.160)</td>
</tr>
<tr>
<td>Chat*Flexible</td>
<td>5.428*** (1.453)</td>
<td>5.150** (2.187)</td>
<td>10.932*** (3.522)</td>
<td>0.494*** (0.093)</td>
<td>2.789** (1.125)</td>
<td>0.977* (0.529)</td>
</tr>
<tr>
<td>Restricted</td>
<td>-2.729*** (0.931)</td>
<td>0.001 (1.077)</td>
<td>-2.632* (1.407)</td>
<td>-0.135 (0.094)</td>
<td>-0.421 (1.116)</td>
<td>-0.465* (0.257)</td>
</tr>
<tr>
<td>Restricted*Flexible</td>
<td>5.095*** (0.693)</td>
<td>0.997 (1.492)</td>
<td>6.024*** (1.730)</td>
<td>0.171** (0.079)</td>
<td>-1.411 (1.306)</td>
<td>0.584** (0.274)</td>
</tr>
<tr>
<td>Constant</td>
<td>10.969*** (0.643)</td>
<td>7.824*** (0.833)</td>
<td>18.857*** (1.257)</td>
<td>-0.250*** (0.054)</td>
<td>15.761*** (0.598)</td>
<td>0.522*** (0.108)</td>
</tr>
</tbody>
</table>

N = 1315
Number of unique sellers = 132

R$^2$/LL = 0.067

Specifications (1-5) are GLS random-effects regressions and (6) is a random-effects probit; session-level cluster-robust standard errors are in parentheses. The omitted treatment is no-communication. We exclude one case with an extreme buyer loss and seller gain. We also dropped two matches in which the buyer did not make any offer. ***, **, and * indicate significance at $p = 0.01$, 0.05, and 0.10 (two-tailed tests), respectively. R$^2$ is reported in specifications 1-5, while Pseudo LL is reported for specification (6).

$^\wedge$ Quality and total transfers are only observed conditional on trade acceptance, so regressions (4) and (5) use that subset of the data.
### Table 4: Tests of conjectures comparing Table 3 coefficients

<table>
<thead>
<tr>
<th>Test statistic</th>
<th>(1) Buyer Earnings</th>
<th>(2) Seller Earnings</th>
<th>(3) Total Earnings</th>
<th>(4) Quality^</th>
<th>(5) Total Transfer^</th>
<th>(6) Trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Chat*Flexible + Flexible</td>
<td>0.006</td>
<td>0.017</td>
<td>0.009</td>
<td>0.000</td>
<td>0.010</td>
<td>0.070</td>
</tr>
<tr>
<td>(2) Restricted*Flexible + Flexible</td>
<td>0.000</td>
<td>0.883</td>
<td>0.001</td>
<td>0.608</td>
<td>0.076</td>
<td>0.020</td>
</tr>
<tr>
<td>(3) Chat*Flexible + Chat</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>(4) Restricted*Flex + Restricted</td>
<td>0.008</td>
<td>0.472</td>
<td>0.046</td>
<td>0.566</td>
<td>0.161</td>
<td>0.583</td>
</tr>
<tr>
<td>(5) Chat<em>Flex + Chat – (Res</em>Flex + Res)</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>(6) Chat – Restricted</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.020</td>
</tr>
</tbody>
</table>

Test statistics are F(1,11) for specification (1-5) and chi-squared for (6). The p-values are two-tailed.
### Table 5: Outcomes across exogenous treatments, Random-effects regressions

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>(1) Buyer Earnings</th>
<th>(2) Seller Earnings</th>
<th>(3) Total Earnings</th>
<th>(4) Quality^</th>
<th>(5) Total Transfer^</th>
<th>(6) Trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chat</td>
<td>2.118 (1.317)</td>
<td>7.525*** (2.129)</td>
<td>9.643*** (2.250)</td>
<td>0.582*** (0.110)</td>
<td>9.001*** (1.928)</td>
<td>0.730*** (0.120)</td>
</tr>
<tr>
<td>Flexible</td>
<td>-0.323 (1.269)</td>
<td>0.677 (2.103)</td>
<td>0.355 (1.740)</td>
<td>0.008 (0.065)</td>
<td>1.521 (1.296)</td>
<td>0.240* (0.138)</td>
</tr>
<tr>
<td>Chat*Flexible</td>
<td>4.327** (1.744)</td>
<td>0.911 (2.412)</td>
<td>5.239* (2.969)</td>
<td>0.209 (0.134)</td>
<td>-1.142 (2.054)</td>
<td>0.476*** (0.169)</td>
</tr>
<tr>
<td>Constant</td>
<td>10.457*** (1.013)</td>
<td>9.916*** (1.111)</td>
<td>20.373*** (0.533)</td>
<td>-0.239*** (0.030)</td>
<td>16.375*** (1.116)</td>
<td>0.402*** (0.088)</td>
</tr>
<tr>
<td>N</td>
<td>1760</td>
<td>1760</td>
<td>1760</td>
<td>1402</td>
<td>1402</td>
<td>1760</td>
</tr>
<tr>
<td>Number of unique sellers</td>
<td>176</td>
<td>176</td>
<td>176</td>
<td>175</td>
<td>175</td>
<td>176</td>
</tr>
<tr>
<td>R²/Pseudo LL</td>
<td>0.058</td>
<td>0.114</td>
<td>0.137</td>
<td>0.218</td>
<td>0.232</td>
<td>-788.3</td>
</tr>
</tbody>
</table>

Specifications (1-5) are GLS random-effects regressions and (6) is a random-effects probit; session-level cluster-robust standard errors are in parentheses. The omitted treatment is exogenous rigid with no-communication. ***, **, and * indicate significance at $p = 0.01$, 0.05, and 0.10 (two-tailed tests), respectively. $R^2$ is reported in specifications 1-5, while Pseudo LL is reported for specification (6).

^ Regressions (4) and (5) use data with trade acceptance where quality and total transfers are observed.
<table>
<thead>
<tr>
<th>Treatment, category</th>
<th>Total earnings</th>
<th>Session level; Individual level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexible, Q-clarification</td>
<td>38.94/33.40</td>
<td>$p_{session} = 0.125; p_{indiv} = 0.014$</td>
</tr>
<tr>
<td>Flexible, pFriendly</td>
<td>41.60/34.77</td>
<td>$p_{session} = 0.062; p_{indiv} = 0.001$</td>
</tr>
<tr>
<td>Flexible, Promise</td>
<td>39.97/36.50</td>
<td>$p_{session} = 0.312; p_{indiv} = 0.025$</td>
</tr>
<tr>
<td>Rigid, Q-clarification</td>
<td>27.37/23.93</td>
<td>$p_{session} = 0.250; p_{indiv} = 0.238$</td>
</tr>
<tr>
<td>Rigid, Friendly</td>
<td>41.64/26.52</td>
<td>$p_{session} = 0.062; p_{indiv} = 0.001$</td>
</tr>
<tr>
<td>Rigid, Promise</td>
<td>36.08/26.22</td>
<td>$p_{session} = 0.125; p_{indiv} = 0.032$</td>
</tr>
</tbody>
</table>

Notes: In the middle column “x/y” refers to the total earnings with/without a positive value for the category. These earnings figures are computed excluding those participants who never varied in the corresponding chat category. The $p$-values are all one-tailed except for Rigid, Q-clarification.
Table 7: Effect of chat-categories on total earnings, Random-effects regressions

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>(1) Total earnings</th>
<th>(2) Total earnings</th>
<th>(3) Total earnings</th>
<th>(4) Total earnings</th>
<th>(5) Total Earnings*+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexible</td>
<td>3.081 (3.319)</td>
<td>8.130** (3.445)</td>
<td>9.556*** (2.248)</td>
<td>6.396*** (1.443)</td>
<td>4.467*** (0.795)</td>
</tr>
<tr>
<td>Q-clarification</td>
<td>2.447 (1.521)</td>
<td>-</td>
<td>-</td>
<td>0.011 (1.903)</td>
<td>-0.274 (2.610)</td>
</tr>
<tr>
<td>Q-clarification*Flexible</td>
<td>3.407* (2.026)</td>
<td>-</td>
<td>-</td>
<td>4.260* (2.224)</td>
<td>4.764** (2.309)</td>
</tr>
<tr>
<td>pFriendly</td>
<td>-</td>
<td>14.988*** (0.659)</td>
<td>-</td>
<td>13.837*** (0.980)</td>
<td>12.997*** (1.125)</td>
</tr>
<tr>
<td>pFriendly*Flexible</td>
<td>-</td>
<td>-6.551** (3.127)</td>
<td>-</td>
<td>-5.576 (3.187)</td>
<td>-5.469* (3.274)</td>
</tr>
<tr>
<td>Promise</td>
<td>-</td>
<td>-</td>
<td>9.443*** (3.665)</td>
<td>7.341** (2.957)</td>
<td>4.715 (3.902)</td>
</tr>
<tr>
<td>Promise*Flexible</td>
<td>-</td>
<td>-</td>
<td>-7.420** (3.369)</td>
<td>-7.237** (3.330)</td>
<td>-4.823 (4.234)</td>
</tr>
<tr>
<td>Constant</td>
<td>30.202*** (2.281)</td>
<td>26.141*** (1.395)</td>
<td>27.756*** (1.008)</td>
<td>24.204*** (0.885)</td>
<td>26.433*** (2.253)</td>
</tr>
<tr>
<td>N</td>
<td>421</td>
<td>421</td>
<td>421</td>
<td>421</td>
<td>395</td>
</tr>
<tr>
<td>Number of unique sellers</td>
<td>44</td>
<td>44</td>
<td>44</td>
<td>44</td>
<td>43</td>
</tr>
<tr>
<td>R²</td>
<td>0.053</td>
<td>0.151</td>
<td>0.067</td>
<td>0.169</td>
<td>0.138</td>
</tr>
</tbody>
</table>

* Specification (5) uses only matches where both the buyer and seller were Spanish nationals. All specifications are GLS random-effects regressions with session-level cluster-robust standard errors in parentheses. The total number of observations reported is 421 (395 when restricting to matches where both buyer and seller were Spanish nationals), because we do not observe chat categories when both subjects were silent (there were 17 missing chats) and we do not observe contract type in two matches where the buyer did not propose a contract; the chat treatment has 440 matches. ***, **, and * indicate significance at p = 0.01, 0.05, and 0.10 (two-tailed tests), respectively.
Table 8: Tests of conjectures comparing coefficients in Table 7

<table>
<thead>
<tr>
<th>Test statistic</th>
<th>(1) Total Earnings</th>
<th>(2) Total Earnings</th>
<th>(3) Total Earnings</th>
<th>(4) Total Earnings</th>
<th>(5) Total Earnings^+</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Q-clarif*Flexible + Q-clarif</td>
<td>0.001</td>
<td>-</td>
<td>-</td>
<td>0.069</td>
<td>0.051</td>
</tr>
<tr>
<td>(2) pFriendly*Flexible + pFriendly</td>
<td>-</td>
<td>0.001</td>
<td>-</td>
<td>0.003</td>
<td>0.006</td>
</tr>
<tr>
<td>(3) Promise*Flexible + Promise</td>
<td>-</td>
<td>-</td>
<td>0.001</td>
<td>0.856</td>
<td>0.895</td>
</tr>
</tbody>
</table>

Test statistics are F(1,11) for specification (1-5) and chi-square for (6). The p-values are two-tailed.
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 $5 - \text{cost} - |R| + \text{transfer from A to B}.$

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 is 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: Chat

Examples of chat conversations

Here we offer some illustrative chat examples. Note that in the experiment, we used a neutral frame so buyers are called A and sellers B and the seller’s private quality action x is labelled R for response rather than x.

1. In this friendly and clarifying conversation, the buyer (A) proposes a flexible contract (type 2) with P=5 and a clear equal sharing plan and the seller (B) promises x=1 and the outcome is cooperative (x=1); after seeing the zero cost shock, the buyer (A) more than fulfills the plan by setting Q=19 and the seller (B) responds by setting x (here, R) =1. The three reported category codings are: Q-clarification = Friendly = xPromise = 1.

   A  Good afternoon
   B  Hey
   B  I have the
   B  Formula
   A  Let’s see what you like
   B  Look
   B  There is a formula for earning the same
   B  And both of us winning
   B  Listen and do the simulation
   A  I am listening
   B  Put 5 with contract 2
   B  If the cost turns out to be low, you later add 18
   B  And if the cost turns out to be high you later add 28
   B  I will select 1
   B  In this way we both earn 27
   B  Or 17
   B  Depending on what the cost will be.
   A  Perfect
   B  If later you don’t pass me the 18 or 28
   A  Don’t worry about this
   B  I don’t mark 1 and you’ll end up losing
   B  We are both going to earn 27
   B  great!!!
   B  Pass me 18
   A  I am going to give you 19 so that it is easy for you to set r=1
   B  ok!

2. In this example, only the seller (B) talks and the buyer (A) proposes a rigid contract (type 1) with P=20. The seller accepts but tries to communicate and the buyer ignores the seller. The realized cost is 20 and the outcome is bad (x= -1). The three reported category codings are: Q-clarification = 0; Friendly = -1, Promise = 0.

   B  Hi
   B  But what are you doing?
   B  By doing this you are just going to earn less
   B  I don’t know if you realize
3. In this example, the buyer (A) proposes a flexible contract (type 2) with P=10. The realized cost is 20. The buyer responds with Q=23 (the equal sharing plan) and the outcome is good (x= 1). The conversation is business-like rather than friendly but they joke around and reach an understanding. The three reported category codings are: Q-clarification = 1; Friendly = 1, Promise = 1.

A Depending on the cost I’ll give you more or less
B Ok sounds good
B The cost is high offer me a high quantity, that is what my response depends on
A I can not offer you a lot, because if you choose a low r it subtracts for me
A Make proposals and me too and we reach an agreement.
B Offer me at least 30
B To compense
A Right (ironic)
B For you the transfer subtracts but for me with a cost of 20 my payoff is already negative.
A In this way you earn a lot and I earn nothing.
B Nooo
B I give you a response of r=1 and you get exactly 30
B Sorry 35
B What do you propose?
A That I give you 35??
B Hahaha yes
A Really
B You would earn 5
B At least no losses
A And you how much??
A No way
B A little more...
B Do the calculations
B Wait
B If you give me 30 you already earn 10
A Right and you 24
A Not so much and not so little
B Yes, but whether your payoff is negative depends on my response
A Sure, I know this, but if we don’t reach an agreement I offer you 1 and go do the calculations
A It’s not only you who has decision power
B Ok offer me 25
A It has to be something balanced.
B You earn 15 and I 19
B It think this is quite just
B Isn’t it?
A with 23 we both earn 17
B Ok, let’s dooo it
B Offer it to me
A I am not sure whether I should trust you
B It’s your decision...
B I tell you
A Ok, here it goes
B I prefer if we both earn less than me losing

4. In this example, the buyer proposes a flexible contract (type 2) with P=20 and the seller makes no promise on x (R). Then the realized cost is zero and the buyer (A) sets Q=2 and the outcome is cooperative (x=1).
The three reported category codings are: Q-clarification = 1; Friendly = -1, Promise = 0.

A How do you think that we’ll both earn more??
A Hiii
A Haha
B I don’t know
B I only know that one has to take into account your transfer and my expenses.
A Sure
A And to earn more you have to set R=1
B Yes
B I believe this option is the best for both
A Yes
A And what contract?
A I offer a contract 2
A And with an initial transfer of 2
B With a transfer of 2??
A And what transfer do you want?
A Of 20?
B I think more because two would not be above my costs and I would not earn anything.
A OK, contract 1
A And transfer 23
A Do you want it??
A Decide
A That’s my offer!
B Contract 1 with 2 no, because I will lose money
A contract 1 of 23
A You want it??
B No
A All right tell me what you want?
A Quick
B We can try contract 2 and later we see whether you offer me more
A Ok, I offer you contract 2 with 20
A Now to earn the same you have to set R=1
A And we earn
A 27
A What have you decided??
A Hellooo...
Table B1: Frequency of chat combinations

<table>
<thead>
<tr>
<th>Chat combinations</th>
<th>Rigid contracts</th>
<th>Flexible contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-clarification=0</td>
<td>90</td>
<td>43</td>
</tr>
<tr>
<td>Q-clarification=1</td>
<td>11</td>
<td>277</td>
</tr>
<tr>
<td>Friendliness=-1</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td>Friendliness=0</td>
<td>53</td>
<td>146</td>
</tr>
<tr>
<td>Friendliness=1</td>
<td>30</td>
<td>154</td>
</tr>
<tr>
<td>Promises=0</td>
<td>70</td>
<td>156</td>
</tr>
<tr>
<td>Promises=1</td>
<td>31</td>
<td>164</td>
</tr>
<tr>
<td>(0, -1, 0)</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>(0, 0, 0)</td>
<td>35</td>
<td>17</td>
</tr>
<tr>
<td>(0, 1, 0)</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>(0, -1, 1)</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>(0, 0, 1)</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>(0, 1, 1)</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>(1, -1, 0)</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>(1, 0, 0)</td>
<td>3</td>
<td>65</td>
</tr>
<tr>
<td>(1, 1, 0)</td>
<td>2</td>
<td>57</td>
</tr>
<tr>
<td>(1, -1, 1)</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>(1, 0, 1)</td>
<td>3</td>
<td>55</td>
</tr>
<tr>
<td>(1, 1, 1)</td>
<td>1</td>
<td>82</td>
</tr>
</tbody>
</table>

The chat combinations reflect clarification values, friendliness values, and promise values, respectively. Thus, for example, (1, 0, 1) means clarification = 1, friendly = 0, and promises = 1. Numbers in parentheses refer to standard errors, while numbers in brackets give the number of observations.
## Appendix C: OLS regressions

Table C1: Outcomes across endogenous treatments, OLS regressions (parallel to Table 3)

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>(1) Buyer Earnings</th>
<th>(2) Seller Earnings</th>
<th>(3) Total Earnings</th>
<th>(4) Quality^</th>
<th>(5) Total Transfer^</th>
<th>(6) Trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chat</td>
<td>1.859 (1.382)</td>
<td>8.870*** (1.730)</td>
<td>10.729*** (2.682)</td>
<td>0.626*** (0.092)</td>
<td>9.482*** (1.219)</td>
<td>0.461 (0.322)</td>
</tr>
<tr>
<td>Flexible</td>
<td>-1.070*** (0.187)</td>
<td>-0.861 (1.257)</td>
<td>-1.931 (1.323)</td>
<td>-0.103*** (0.032)</td>
<td>-0.522 (0.713)</td>
<td>-0.023 (0.159)</td>
</tr>
<tr>
<td>Chat*Flexible</td>
<td>5.434*** (1.893)</td>
<td>5.124** (2.173)</td>
<td>10.558*** (3.691)</td>
<td>0.430*** (0.115)</td>
<td>2.696** (1.115)</td>
<td>0.898* (0.485)</td>
</tr>
<tr>
<td>Restricted</td>
<td>-2.063** (0.931)</td>
<td>0.009 (1.078)</td>
<td>-2.054 (1.526)</td>
<td>-0.087 (0.095)</td>
<td>-0.432 (1.135)</td>
<td>-0.380 (0.243)</td>
</tr>
<tr>
<td>Restricted*Flexible</td>
<td>4.117*** (0.870)</td>
<td>0.981 (1.493)</td>
<td>5.097*** (1.857)</td>
<td>0.137 (0.091)</td>
<td>-1.402 (1.316)</td>
<td>0.476* (0.260)</td>
</tr>
<tr>
<td>Constant</td>
<td>10.798*** (0.657)</td>
<td>7.815*** (0.834)</td>
<td>18.613*** (1.282)</td>
<td>-0.274*** (0.051)</td>
<td>15.738*** (0.601)</td>
<td>0.453*** (0.101)</td>
</tr>
</tbody>
</table>

N | 1315 | 1315 | 1315 | 996 | 996 | 1315 |

Number of unique sellers | 132 | 132 | 132 | 131 | 131 | 132 |

R^2/Pseudo R^2 | 0.067 | 0.266 | 0.248 | 0.381 | 0.468 | 0.102 |

Specifications (1)-(5) are OLS regressions (6) is a Probit regression. Endogenous no-communication is the omitted treatment. The trade variable is zero if a contract was proposed and not accepted. Session-level cluster-robust standard errors are in parentheses. ***, **, and * indicate significance at \( p = 0.01 \), 0.05, and 0.10 (two-tailed tests), respectively. \( R^2 \) is reported in specifications 1-5, while Pseudo \( R^2 \) is reported for specification (6). Regressions (4) and (5) use data with trade acceptance where quality and total transfers are observed.
Table C2: Tests of conjectures on Table C1 coefficients (OLS parallel of Table 4)

<table>
<thead>
<tr>
<th>Test statistic</th>
<th>(1) Buyer Earnings</th>
<th>(2) Seller Earnings</th>
<th>(3) Total Earnings</th>
<th>(4) Quality^</th>
<th>(5) Total Transfer^</th>
<th>(6) Trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Chat*Flexible + Flexible</td>
<td>0.0408</td>
<td>0.0349</td>
<td>0.0292</td>
<td>0.0129</td>
<td>0.0277</td>
<td>0.0559</td>
</tr>
<tr>
<td>(2) Restricted*Flexible + Flexible</td>
<td>0.00428</td>
<td>0.884</td>
<td>0.0325</td>
<td>0.696</td>
<td>0.110</td>
<td>0.0282</td>
</tr>
<tr>
<td>(3) Chat*Flexible + Chat</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>(4) Chat<em>Flex + Chat – (Res</em>Flex + Res)</td>
<td>0.0328</td>
<td>0.491</td>
<td>0.0905</td>
<td>0.439</td>
<td>0.190</td>
<td>0.650</td>
</tr>
<tr>
<td>(5) Chat</td>
<td>0.000695</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>(6) Chat – Restricted</td>
<td>0.0189</td>
<td>0.000240</td>
<td>0.000334</td>
<td>0.000</td>
<td>0.000</td>
<td>0.0259</td>
</tr>
</tbody>
</table>

The test statistic follows an F distribution; the number of degrees of freedom is then 11 since there are 12 fully independent clusters (3 treatments with 4 sessions each). The $p$-values are two-tailed.
Table C3: OLS variant of Table 5 on outcomes across exogenous treatments

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>(1) Buyer Earnings</th>
<th>(2) Seller Earnings</th>
<th>(3) Total Earnings</th>
<th>(4) Quality(^{\wedge})</th>
<th>(5) Total Transfer(^{\wedge})</th>
<th>(6) Trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chat</td>
<td>2.118 (1.317)</td>
<td>7.525*** (2.129)</td>
<td>9.643*** (2.250)</td>
<td>0.587*** (0.112)</td>
<td>9.001*** (1.935)</td>
<td>0.693*** (0.116)</td>
</tr>
<tr>
<td>Flexible</td>
<td>-0.323 (1.269)</td>
<td>0.677 (1.551)</td>
<td>0.355 (1.740)</td>
<td>0.027 (0.065)</td>
<td>1.605 (1.254)</td>
<td>0.225* (0.134)</td>
</tr>
<tr>
<td>Flexible*Chat</td>
<td>4.327** (1.744)</td>
<td>0.911 (2.412)</td>
<td>5.239* (2.969)</td>
<td>0.197 (0.134)</td>
<td>-1.224 (2.056)</td>
<td>0.449*** (0.157)</td>
</tr>
<tr>
<td>Constant</td>
<td>10.457*** (1.013)</td>
<td>9.916*** (1.111)</td>
<td>20.373*** (0.533)</td>
<td>-0.250*** (0.034)</td>
<td>16.282*** (1.075)</td>
<td>0.373*** (0.086)</td>
</tr>
<tr>
<td>N</td>
<td>1760</td>
<td>1760</td>
<td>1760</td>
<td>1402</td>
<td>1402</td>
<td>1760</td>
</tr>
<tr>
<td>Number of unique sellers</td>
<td>176</td>
<td>176</td>
<td>176</td>
<td>175</td>
<td>175</td>
<td>176</td>
</tr>
<tr>
<td>R(^2)/Pseudo LL</td>
<td>0.058</td>
<td>0.114</td>
<td>0.137</td>
<td>0.218</td>
<td>0.232</td>
<td>0.099</td>
</tr>
</tbody>
</table>

Specifications (1-5) are GLS random-effects regressions and (6) is a random-effects probit; session-level cluster-robust standard errors are in parentheses. The omitted treatment is exogenous rigid with no-communication. ***, **, and * indicate significance at \( p = 0.01, 0.05, \) and 0.10 (two-tailed tests), respectively. \( R^2 \) is reported in specifications 1-5, while Pseudo LL is reported for specification (6).\(^{\wedge}\)Regressions (4) and (5) use data with trade acceptance where quality and total transfers are observed.
Table C4: OLS variant of Table 7 on the effect of chat-category values on total earnings

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>(1) Total earnings</th>
<th>(2) Total earnings</th>
<th>(3) Total earnings</th>
<th>(4) Total earnings</th>
<th>(5) Total Earnings*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexible</td>
<td>3.382 (3.973)</td>
<td>8.247 (3.759)</td>
<td>10.798** (2.377)</td>
<td>7.106** (1.766)</td>
<td>5.398*** (0.556)</td>
</tr>
<tr>
<td>Q-clarification</td>
<td>-0.910 (0.999)</td>
<td>-</td>
<td>-</td>
<td>-1.908 (2.331)</td>
<td>-2.667 (3.167)</td>
</tr>
<tr>
<td>Q-clarification*Flexible</td>
<td>6.141** (1.694)</td>
<td>-</td>
<td>-</td>
<td>5.907* (2.447)</td>
<td>6.875* (2.848)</td>
</tr>
<tr>
<td>pFriendly</td>
<td>-</td>
<td>15.520*** (0.978)</td>
<td>-</td>
<td>13.998*** (1.581)</td>
<td>13.180*** (0.930)</td>
</tr>
<tr>
<td>pFriendly*Flexible</td>
<td>-</td>
<td>-6.436 (3.906)</td>
<td>-</td>
<td>-5.096 (3.811)</td>
<td>-4.722 (3.993)</td>
</tr>
<tr>
<td>Promise</td>
<td>-</td>
<td>-</td>
<td>10.656* (3.575)</td>
<td>8.330* (2.800)</td>
<td>6.078 (3.674)</td>
</tr>
<tr>
<td>Constant</td>
<td>30.456*** (2.416)</td>
<td>25.746*** (1.395)</td>
<td>27.086*** (1.037)</td>
<td>23.850*** (1.036)</td>
<td>25.855*** (2.067)</td>
</tr>
<tr>
<td>N</td>
<td>421</td>
<td>421</td>
<td>421</td>
<td>421</td>
<td>395</td>
</tr>
<tr>
<td>Number of unique sellers</td>
<td>44</td>
<td>44</td>
<td>44</td>
<td>44</td>
<td>43</td>
</tr>
<tr>
<td>R²</td>
<td>0.054</td>
<td>0.151</td>
<td>0.068</td>
<td>0.170</td>
<td>0.140</td>
</tr>
</tbody>
</table>

* Specification (5) uses only matches where both the buyer and seller were Spanish nationals. All specifications are GLS random-effects regressions with session-level cluster-robust standard errors in parentheses. The total number of observations reported is 421 (395 when restricting to matches where both buyer and seller were Spanish nationals), because we do not observe chat categories when both subjects were silent (there were 17 missing chats) and we do not observe contract type in two matches where the buyer did not propose a contract; the chat treatment has 440 matches. ***, **, and * indicate significance at $p = 0.01$, $0.05$, and $0.10$ (two-tailed tests), respectively.