CEIS Tor Vergata Research Papers

ISSN 2610-931X

CEIS Tor Vergata

RESEARCH PAPER SERIES

Vol. 19, Issue 7, No. 523 – February 2023

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Transparent Dealing instead of Insider Haggling - Experimentally Analyzing an Institutional Choice for Repeated Trade*

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Abstract

In repeated commercial and organizational interactions, it is not unusual to observe privately informed parties enter long-term transparent deals with their counterparts rather than bargaining in each interaction period while retaining private information. To analyze such institutional choice, we set up an experiment where, in each of two rounds, buyers and sellers are constantly paired for six periods to trade a commodity whose value is privately known to the seller. In each period both parties are aware that there are gains from trade and of how their evaluations are proportionally linked and randomly generated. When choosing transparent dealing, the seller informs the buyer about which surplus share (s)he demands in all periods and, as a consequence, the commodity's actual value in each period. When choosing the default institution, which we denote as insider haggling, the privately informed seller states a price and declares a cheap-talk commodity value in each period. Our results show that sellers opt far more often for transparent dealing, especially when female, although this is on average less profitable. Moreover, we find that the institutional choice is addictive for participants who are sellers in both rounds. Finally, transparent dealing is fairer and significantly enhances trade.

JEL Codes: C73, C92, D82, D90.

1 Introduction

Asymmetric information can undermine welfare enhancing trade even when the same exchange partners interact repeatedly. However, commercial trading partners, who expect to deal with each other on a regular basis, may limit exploitation of less informed trading partners to enhance trade. We refer to this latter institutional alternative as "transparent dealing" whereas we refer to the institutional default option in which sellers retain private information as "insider haggling". We implement an experimental setting in which the privately informed sellers decide which alternative they prefer. Hence, we analyze whether sellers deliberately choose transparent dealing requiring the seller to reveal what (s)he privately knows, instead of insider haggling.

Experiments have mainly analyzed behavior for different bargaining rules in (labor) markets and managerial organizations, e.g., via delegation of responsibilities, or rules to limit strategizing

*This paper replaces the previous version circulated under the title: "Experimental Analysis of Endogenous Institutional Choice: Constantly Revealing Versus Ad-Hoc Contracting".

and how behavior depends on social and distributional concerns. There is clear empirical evidence that behavioral rules can save mental efforts and thus preserve scarce information-processing and decision-making capacities (Cohen and Bacdayan, 1994; Costello, 1996; Egidi and Narduzzo, 1997). As we focus on choosing between institutional characterizations differing in transparency, our analysis is related to the experimental literature investigating different institutional rules and information conditions in bargaining (Plott and Smith, 2008 and Bloomfield and O'Hara, 1999).

Our workhorse is a modified Acquiring-a-Company (AaC) game (Bazerman and Samuelson, 1983, and Samuelson and Bazerman, 1985) in which a seller and a buyer can trade a company whose actual value is randomly determined and known only by the seller. We modify the original AaC by letting the seller propose the price and the trading partners interact repeatedly. Moreover, at the beginning of each round of the repeated trading the seller can choose the institution to be applied to all periodic interactions with the same buyer.[1]

To test how experience tends to affect the institutional choice participants encounter such repeated interaction twice with different partners. When choosing transparent dealing (TD), the seller informs the buyer about which surplus share (s)he demands in all periods and consequently reveals the commodity's actual value in each period. When choosing insider haggling (IH), the privately informed seller states a price and declares a cheap-talk commodity value in each of the six successive periods. We find that sellers strongly prefer TD, and that this preference is addictive for participants who remain sellers in both rounds. Instead participants who are buyers (sellers) in the first (second) round generally reveal some inertia but prefer TD. Overall TD is preferred to IH in spite of being on average less profitable for sellers. Moreover, TD is fairer and trade enhancing.

The paper consists of five main sections. Section 2 describes the game model, its benchmark solution, the behavioral hypotheses, and the experimental protocol. Sections 3 and 4 present data analysis. Section 5 concludes.

2 The institutional choice model

The seller's company has monetary value v with $0 < v \leq 1$ for the buyer (henceforth B) and only qv with $0 < q < 1$ for the seller (henceforth S), where q is the undervaluation coefficient. Whereas the parameter q is known to both, only S is aware of v. Buyer B instead expects v to be randomly and uniformly selected from the interval $(0, 1]$ what S knows. S proposes the price p with $0 \leq p \leq 1$ for selling the company to B. Because of $v > qv$ for all v, selling to B generates a positive surplus from trade, $(1-q)v$. Denoting by $\delta = \delta(p) = 1$ when B accepts the price proposal p, and by $\delta = \delta(p) = 0$ when not, the payoffs are $\delta(p - qv)$ for S and $\delta(v - p)$ for B.

The same pair interacts for 6 successive periods with new random draws of v in each period and receives information after each period about the own payoff. This, in our view, seems realistic for many industries with stable trading relations although their market conditions vary often across time.

[1] Many experimental works adopted the AaC game to analyze bargaining in different information settings but these do not allow participants to choose between them (see for instance, Dittrich et al., 2012, Selten et al., 2005, Foreman and Murnighan, 1996, Ball et al., 1991, Di Cagno et al., 2017, Angelovski et al., 2020, and Di Cagno et al., 2022). Closer to our setting is the study of Güth et al. (2019) that analyzes the effect of (compulsory) disclosure of private information in an AaC experiment. As we do in our setup, they find that disclosure of information enhances trade.

The institutional default, IH, means that in each period $t = 1, \ldots, 6$:

- S, aware of the randomly selected value v_t, demands a price p_t and sends a (true or false) value message $\hat{v}_t = \hat{v}_t(v_t)$ to B;
- B, aware of $\hat{v}_t$ and p_t, either accepts, $\delta_t = 1$, or rejects, $\delta_t = 0$, the proposal of S. So S earns $\delta_t(p_t - qv_t)$ and B gains $\delta_t(v_t - p_t)$.

Under the alternative institution TD:

- S states her own constant surplus demand share ($\alpha \in [0, 1]$) before the first value v_1 is drawn, which determines the proposed price $p_t(v_t)$ for each newly selected random realization v_t via:

$$p_t(v_t) = q \cdot v_t + \alpha(1 - q)v_t = [q + (1 - q)\alpha]v_t. \quad (1)$$

- B, aware of both q, α and p_t, and thus able to deduce v_t, either accepts ($\delta_t = 1$) or rejects ($\delta_t = 0$) in each of the 6 successive trade periods with the same seller. So, in period t S earns $\delta_t(p_t - qv_t)$ and B gains $\delta_t(v_t - p_t)$.

In each period t both institutions, TD and IH, inform the buyer about the price p_t. In IH the seller directly chooses the price which in TD is determined by α via equation (1) and communicated to B. By choosing $\alpha = 1$, i.e., $p_t(v_t) = v_t$ for all $t = 1, \ldots, 6$, sellers can claim the whole surplus from trade whereas α equal to 0 would grant the whole surplus to B. Moreover, when S commits to TD and announces α, buyer B can infer v_t from $p_t(v_t)$ (see Equation 1) in all successive periods $t = 1, \ldots, 6$. Hence, S willingly refrains from ultimatum bargaining with private information as experimentally studied, for instance, by Mitzkewitz and Nagel (1993). When adopting IH, seller S instead proposes a price $p_t(v_t)$ after learning about v_t in the periods $t = 1, \ldots, 6$ with the same B and only sends a cheap-talk value message, $\hat{v}_t(v_t)$. In case of $\hat{v}_t(v_t) \neq v_t$, seller S risks to be found out lying, especially when sending a value message $\hat{v}_t$ together with a price p_t suggesting that acceptance let B gain $\hat{v}_t - p_t$ via $\hat{v}_t > p_t > v_t$ although, due to $p_t > v_t$, buyer B would lose $v_t - p_t (< 0)$ when accepting.[2]

It is useful to stress that the two trading institutions differ in some crucial aspects. TD lets the seller choose an ultimatum offer which reveals the proposed surplus sharing for all six interaction periods before the seller is informed about the successive value realizations. So buyers know the prices before deciding, in a possibly value or time dependent way, whether to accept or reject.[3]. IH instead retains private information of the seller and implies repeated negotiations of the privately informed seller with the same buyer who has learned about the own past payoffs. Since IH lets the buyer only know the value message and the proposed price but not the values, unlike in TD their profits may even be negative. Whereas TD allows the seller for only a constant and transparent surplus demand for all successive periods, IH features repeated dealings with private information.

One may ask why we confront such different institutions between which only the privately informed party can decide. One reason has been the growing interest in banning or at least limiting exploitation by traders with insider information.[4] IH resembles buying experience or credence goods

[2]Knowing p_t and q, the buyer can always deduce v_t (and own surplus share) from own payoff when accepting.

[3]How surplus sharing offers are related to information is also discussed in Jackson et al. (2018) who also focus on negotiations under uncertainty

[4]Actually, some regulation (see the Directives EU (European Union) 2004/109/EC and 2004/25/EC) tries to induce

of stochastically varying quality, TD instead lets sellers sacrifice their insider advantage. Hoping to exclude experience or credence goods altogether (see, for instance, Dulleck et al., 2011) seems futile. Instead we focus on repeated dyadic interactions whose dynamics involve either only one party, the buyer in TD, or both parties in IH. Producing economic goods may or not require production factors whose quality should be transparent as in TD (but not in IH). Another reason is that we experience such complex institutional choices not only in professional, but also in private life.[5]

2.1 Benchmark behavior

In case of TD in each period the buyer knows p_t and α, can deduce v_t and, by accepting, gets:

$$v_t - p_t = \left(\frac{1}{q + (1-q)\alpha} - 1\right) p_t = \frac{(1-q)(1-a)}{q + (1-q)\alpha} p_t, \tag{2}$$

and thus cannot lose due to $\alpha \leq 1$. Anticipating B's acceptance renders the largest $\alpha = 1$ optimal for S (when B accepts in case of indifference). So S exploits ultimatum power via $\alpha^* = 1$ but protects B against losses due to $v_t \geq p_t(v_t)$ for all values $v_t \in (0, 1]$.[6]

Since IH preserves private information of S about v_t, the risk neutral B would expect to earn in each period t the profit

$$\int_0^{p_t/q} (v_t - p_t) dv = \frac{p_t^2}{q} \left(\frac{1}{2q} - 1\right) \tag{3}$$

when anticipating that the rational seller abstains from price proposals p_t with $p_t < qv_t$. Since $1/2q < 1$ is equivalent to $1/2 < q$, accepting a positive price p_t in case of $q > 1/2$ would let B lose although the surplus from trade, $(1-q)v_t$, is always positive. So B should not accept positive prices p_t and exclude trade when $q > 1/2$.[7] For $q \leq 1/2$ all prices p_t with $p_t \geq q$ imply $p_t \geq qv_t$ for all $v_t \in (0, 1]$. Accepting such prices p_t would yield $\int_0^1 (v_t - p_t) dv = 1/2 - p_t$ for B. Hence the optimal price proposal of S is $p_t^* = 1/2$ for $q \leq 1/2$. As via $\alpha = 1$ in case of TD, when $q \leq 1/2$ seller S would exploit ultimatum power and earn $1/2 - qv_t$. Instead IH yields for buyer B, on average, nil.

IH lets the informed party, the seller, offer the price p_t which could signal to B what S privately knows. Equation (3) assumes that $p_t(> 0)$ only excludes values v_t with $p_t < qv_t$ or $v_t > p_t/q$, i.e., the buyer infers only that the seller will not voluntarily incur a loss. Additionally v_t-realizations with $v_t < p_t/q$ are expected to be equally likely since for all v_t-realizations in this range the same "pooling price" applies.[8] For $q \leq 1/2$ the optimal price is $p_t^* = 1/2$ due to general acceptance of all prices not exceeding $1/2$ what describes the best pooling equilibrium for the seller. For $q > 1/2$ even

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such TD-like private value revelation, so far mainly for financial and take-over markets as, for instance, captured in a stylized way by the AaC-game.

[5] Without overstressing the latter, marriage should at least appeal (without necessarily denying unfaithful behavior) to TD whereas IH resembles a constant private partnership without transparency about what it means for either party.

[6] A loss of B would require $v_t < p_t(v_t) = [q + (1-q)\alpha]v_t$ or $q + (1-q)\alpha > 1$, i.e., $\alpha > 1$.

[7] For $q > 1/2$ seller S with a value v_t close to 1 might want to share the—for q slightly above $1/2$—considerable surplus $(1-q)v_t$ with buyer B by proposing a price p_t satisfying $qv_t < p_t < v_t$. If B accepts such price proposals p_t, however, this would be even more profitable for seller S with values v_t close to 0. This illustrate that buyer B should not accept positive prices in case of $q > 1/2$ although trade would be very efficient.

[8] This could be theoretically justified by solving uniformly perturbed games and letting the perturbation vanish (Selten, 1975).

the price $p_t = q$ would let the buyer lose in expectation like all lower positive prices (see Equation 3): the buyer rejects all positive prices since the seller cannot reliably signal via p_t that $v_t > p_t$ holds.

Altogether TD seems clearly the better institutional choice for the seller: it allows for welfare enhancing trade when $q > 1/2$ and extracting the entire surplus from trade for $0 < q < 1$. Behaviorally the seller may fear that large α-choices, close to 1, will trigger frequent rejections, at least by buyer participants who are strongly fairness minded (see Bolton et al., 1998 and Fehr and Schmidt, 1999, as well as Bolton and Ockenfels, 2000, who systematically review the evidence of such concerns for complete information experiments). Similarly, the seller could expect to earn even more via opting for IH when believing that the buyer would not avoid the winner's curse, for instance, by accepting prices p_t with $0 < p_t < 1/2$ in case of $q > 1/2$ (see Güth et al., 2020 and Huang et al., 2020 who discuss whether and how incomplete information weakens and even crowds out other regarding concerns).

The IH-analysis above has considered the IH-interactions as a sequence of independent static games what can be justified by backward induction. There is, of course, experimental evidence of cooperation in finite-horizon supergame experiments up to endgame behavior in the tradition of reputation equilibria (Kreps and Wilson, 1982). Unlike IH these studies focus on just one initial chance move about which only one party becomes informed and may reveal across time what it privately knows. In IH instead there is new private v_t-information provided to the seller in each of the six periods. So reputation concerns should matter more behaviorally, e.g., when buyer participants initially suffer losses and thereby learn to avoid the winner's curse, for instance, by rejecting positive prices in case of $q > 1/2$.Note also that reputation concerns, reported in the literature on supergame experiments, usually are confirmed for longer finite time horizons.

So far we have neglected that IH allows the seller to send "cheap talk" value messages after learning about v_t in the six successive periods $t = 1, ..., 6$. If such messages were true and believed, they would imply the transparency of the TD-institution. An even closer type of messages would be surplus messages $\hat{\alpha}_t$, possibly restricted as α in TD. Experiencing a loss after receiving an $\hat{\alpha}_t$ message with $\hat{\alpha}_t < 1$ would be an annoying experience for buyer participants. Our design has avoided "blunt $\hat{\alpha}_t$ lying" by value messages which also would qualify as lies in case of $\hat{v}_t > p_t > v_t$ but seen less "blunt".

Earlier AaC experiments with value messaging have confirmed growing dominant shares of misreporting but do not deny significantly positive shares of truth reporting and non-strategic underreporting (Di Cagno et al., 2017, Angelovski et al., 2020 and Di Cagno et al., 2022 where the latter allows for leaking v_t-information and liar detection). Due to repeated v_t realizations about which only the seller becomes informed there is at best only little evidence suggesting reputation concerns for short dyadic IH supergames.

2.2 Behavioral hypotheses

The analysis above assumes a uniform distribution of the values v_t and constant as well as commonly known q-values for each dyadic supergame with six successive periods. The experimental setup frames TD as the institutional alternative for the default IH option. By choosing TD sellers commit to transparent dealing which seems fairer and more efficient at least for $q > 1/2$. In fact, in case of IH, seller S also sends a true or false value message. Will IH-sellers confronting the same B for 6 successive periods t propose $(p_t, \hat{v}_t)$ with $q\hat{v}_t < p_t < \hat{v}_t$ suggesting that both gain from trade or rely on truth telling? We did not expect strong truth telling inclinations in IH of seller S who have rejected transparent α-surplus sharing implied by TD. The experimental evidence of fair proposals in deterministic ultimatum experiments is mainly due to fairness monitoring which is made impossible in the presence of private information as in IH. Only strong intrinsic fairness inclinations would allow for fair sharing without monitoring and exploitation of ultimatum power. By adopting TD a seller reveals transparency inclinations and allows for monitoring the proposed surplus sharing. This likely explains TD-preference of especially female seller participants.

What triggered our interest in the effect of gender is, from the very beginning, the private-life resemblance of TD to faithful—but in case of α close to 1 quite unfair—marriages and the observation that females tend to avoid competitive tasks (see Niederle and Vesterlund, 2007 and Buser and Yuan, 2019). The gender effect could also be explained by females less likely wanting to deceive their partners (see, for instance, Dreber and Johannesson, 2008, Erat and Gneezy, 2012, and Grosch and Rau, 2017), and by preferring fully transparent contracts, e.g., to reduce their responsibility (see, for instance, Ertac et al., 2020). To assess the gender effect in institutional choice without controlling for the gender composition of the seller-buyer pair suggested that only the seller decides between TD and IH. We do not deny that often both parties are responsible and only claim that institutional choices are also taken by only one party, e.g., on markets by the seller who first recognizes that bilateral trade would be welfare enhancing. We did not expect, however, that the preference of especially female sellers would be maintained after experiencing TD as less profitable. Allowing only for one supergame repetition can, however, only hint at the direction in which path dependence affects the institutional dynamics. Based on "the fairer sex being fairer" (Andreoni and Vesterlund, 2001) we expect more female than male sellers to prefer TD over IH. If one does not want to hide what one privately knows and to openly state what one claims, respectively offers, TD seems clearly better.

Concerning the institutional choice of S between TD and IH we thus predict: (i) TD to be dominant, especially for $q > 1/2$, when B should reject all offers under IH, and only moderate TD-exploitation by α with $1/2 < \alpha < 1$, but possibly close to 1; (ii) TD to be dominant for female sellers; (iii) a higher acceptance rate for TD than IH rendering TD as trade enhancing; and (iv) IH adoption mainly to maximize profits by exploiting private information advantages.

2.3 Experimental protocol

At the beginning of each round participants are randomly assigned to a role (either buyer or seller) and then matched with another participant in the other role based on matching groups of four participants each. Role and pairings stay the same throughout the 6 periods of the round; at the end of the round participants are randomly reassigned to a role and rematched to play again for 6 periods with a newly selected partner. Then the undervaluation coefficient q is randomly selected at pair level by the computer and communicated to both seller and buyer, i.e., it is common knowledge. In the experiment we consider low q ($\underline{q}$ with $\underline{q} \in \{0.23, 0.25, 0.27\}$) and high q ($\bar{q} \in \{0.58, 0.60, 0.62\}$) values, all values being equally likely, to test the different theoretical predictions related to threshold

$q = 1/2$ in IH. Slightly changing low, respectively high q-parameters is used to assess the effect of q on institutional choice: for low (high) q-levels the expected surplus from trade is about 3/8 (1/5), i.e., we vary the expected stakes of trade.

Next, sellers choose the institution they want to adopt for trading in the 6 periods of the round by typing in a box either an integer value for α with $1\% \leq \alpha \leq 99\%$ for TD or N for IH. If they do not choose within two minutes, IH is chosen by default. In case of TD the chosen α represents the share of surplus S asks in every period of the round. The buyer is informed of the institution chosen by the seller and, in case of TD adoption, of the value of α. Then, in every period, the computer randomly selects the value of the company (v_t) which can vary independently in each period according to the uniform density across all integers in $(0, 100]$ which is known by both buyers and sellers. The seller privately receives the realization v_t.

In case of TD adoption, the chosen α determines the trading price p_t according to (1) which B can either accept or reject. If (s)he accepts trade occurs at the price proposed by the seller and surplus is divided between S and B on the basis of the share α. If (s)he rejects no trade occurs and both get zero.

If IH has been chosen, in each period the seller sends a value message to the buyer ($\hat{v}_t(v_t)$), that could be true or false, and sets the price (p_t) for trading which the buyer can either accept or reject. If (s)he accepts trade occurs at the proposed price and payoffs are determined, if (s)he rejects no trade occurs and both get zero.

At the end of each period participants receive information about their own payoff in that period. Therefore, in case of acceptance the buyer can infer whether S lied in the current period in IH, by observing that her payoff is different from $\hat{v}_t - p_t$.[9] So there is no difference between the two institutions in terms of information which can be extracted from the end-of-period feedback information.

At the end of the experiment one period of one round is randomly selected to determine the actual payment. In order to induce risk neutrality we employ binary lottery incentives translating the randomly drawn payoffs in percentage probabilities of winning either 4 or 14 euro according to the formula reported in the Instructions. Then a wheel of fortune determines the payment from the experiment to which a participation fee of 6 euro is added.

After the experiment participants completed a non-incentivized questionnaire eliciting demographics, risk, loss, and ambiguity aversion, as well as cognitive reflection abilities and other psychological characteristics.

The experiment was run in February 2021 using Luiss Virtual Lab and involved 128 participants (for the experimental methodology see Buso et al., 2021). The 6 sessions consisted of two successive rounds, each with 6 periods, but varied in the numbers of participants (16 and 20 in one, respectively two sessions, and 24 in three sessions). Sessions lasted, on average, 1 hour and 40 minutes with average payment of 16.25 euro (including the participation fee of 6 euro). Participants were paid via Prolific. None participated in more than one session. The English version of the Instructions is in the Supplementary Materials. The experiment was programmed in oTree (Chen et al., 2016) and involved students of Luiss Cesare Lab, recruited via ORSEE (Greiner, 2015) among students of

[9] More specifically, the buyer is able to infer the true value of the company from its payoff in case of acceptance.

Economics (55.47%), Law (21.09%) and Political Science (14.84%). Overall, 58% of subjects were female with little variation across sessions; female were 63.3% of sellers and 53.3% of buyers.

3 Data analysis

Our analysis begins with the institutional choice of sellers between TD and IH, then focuses on what sellers propose and how buyers respond before concluding with some of the outcome variables like likelihood of trade, profits, and surplus distribution in the two institutions.

3.1 Transparent dealing or insider haggling?

As predicted in the previous section, we find strong preference for TD over IH in both rounds. This is shown in Table 1 which reports the frequency and share of TD and IH choices separately for rounds 1 and 2 and for $\underline{q}$ and $\bar{q}$ (the percentages of TD adoption are respectively 78.38% and 81.48% in round 1, and 75.86% and 80% in round 2). TD is slightly less preferred in round 2 whereas larger q-levels enhance TD-frequencies, but not significantly.[10]

	Round 1			Round 2		
	$\underline{q}$	$\bar{q}$	Total	$\underline{q}$	$\bar{q}$	Total
TD	29	22	51	22	28	50
%	78.38	81.48	79.69	75.86	80.00	78.12
IH	8	5	13	7	7	14
%	21.61	18.52	20.31	24.14	20	11.88
Total	37	27	64	29	35	64
%	100	100	100	100	100	100

Table 1: Sellers choosing TD by round and q (IH data in parenthesis).

In order to further explore our behavioral predictions, Table 2 additionally distinguishes contract choices by round and gender. Female sellers adopt TD more often than males in both rounds and for both q-levels (85.71% and 87.18% of females, and 68.18% and 64% of males choose TD respectively in rounds 1 and 2), as predicted.[11]

[10] A Chi-squared test comparing the distributions of contract choices across rounds, but separately for $\underline{q}$ and $\bar{q}$, yields for $\underline{q}$ a p-value=0.809 (not significant) and for $\bar{q}$ a p-value=0.884 (not significant). Hence, we do not confirm statistically significant differences in contract choices.

[11] The Chi-squared test comparing the distributions of contract choice across gender exhibits a p-value=0.006 (**). Comparing the distributions of contract choice across gender for both parameters $\underline{q}$ and $\bar{q}$, and rounds yields for all rounds, $\underline{q}$: p-value=0.266 (not significant) and $\bar{q}$: p-value=0.0045 (**). Round 1, $\underline{q}$: p-value=0.320 (not significant). Round 1, $\bar{q}$: p-value=0.161 (not significant). Round 2, $\underline{q}$: p-value=0.590 (not significant). Round 2, $\bar{q}$: p-value=0.011 (*). All significant differences but the last one are also robust to Bonferroni correction.

	Round 1			Round 2		
	$\underline{q}$	$\bar{q}$	Total	$\underline{q}$	$\bar{q}$	Total
TD	20 (9)	16 (6)	36 (15)	12 (10)	22 (6)	34 (16)
%	83.33 (69.23)	88.89 (66.67)	85.71 (68.18)	80.00 (71.43)	91.67 (54.55)	87.18 (64.00)
IH	4 (4)	2 (3)	6 (7)	3 (4)	2 (5)	5 (9)
%	16.67 (39.77)	11.11 (33.33)	14.29 (31.82)	20.00 (28.57)	8.33 (45.45)	12.82 (36.00)
Total	24 (13)	18 (9)	42 (22)	15 (14)	24 (11)	39 (25)
%	100	100	100	100	100	100

Table 2: Choice by gender (male data in parenthesis).

	(1)	(2)
$\bar{q}$	0.017	0.019
	(0.066)	(0.071)
Female	0.202*	0.227*
	(0.094)	(0.100)
Round 2	–0.008	0.003
	(0.057)	(0.058)
Risk Aversion		0.003
		(0.028)
Loss Aversion		0.008
		(0.102)
Ambiguity Aversion		–0.077
		(0.073)
CRT		0.058
		(0.137)
Observations	128	128

Robust standard errors clustered at matching group level are reported in parentheses.
*p<.05; **p<.01; ***p<.001

Table 3: Determinants of TD adoption (logit).

To assess the robustness of the preliminary evidence we employ a logit model to investigate the determinants of contract choice. In specification (1) of Table 3 we include a dummy variable equal to 1 if the structural parameter q is larger than 0.5, gender, and round fixed effects (`Round 2`), while in (2) we additionally control for self-reported loss, risk, and ambiguity aversion, and for a dummy accounting for the subjects' performance in the cognitive reflection test (`CRT`).[12]

Finding 1. *TD adoption is predominant but unexpectedly not significantly more likely for $\bar{q}$ in both rounds. Furthermore, TD is significantly more frequent for female sellers.*

[12] See Frederick (2005).

The results confirm that the `Female` dummy increases the probability of TD adoption by more than 20%, whereas neither the structural parameter q nor the sociodemographic variables are significant. On the basis of our predictions we would have expected high q-levels to significantly and positively affect TD adoption since buyers should reject any offer in case of IH when $q = \bar{q}$. However, the estimated coefficient of $\bar{q}$ is not statistically significant.

3.1.1 Path dependence of contract choice

To shed light on learning and experience effects we now focus on round 2-data. Table 4, which reports contract choices in round 2 disaggregated by role and contract experience in round 1, highlights that round 2-sellers, who have been TD sellers in round 1, adopt TD in round 2 more often (91.67%) than those who have been IH-sellers in round 1 (25%). Round 2-sellers, who have been buyers in round 1, instead tend to adopt TD in round 2 regardless of their contract experience in round 1, and especially after experiencing TD (83.33%). In general there is some contract inertia also for round-1 buyers.[13]

	Seller in round 1		Buyer in round 1	
	IH in round 1	TD in round 1	IH in round 1	TD in round 1
TD-adoption	2	22	6	20
%	25	91.67	75	83.33

Table 4: Sellers choosing TD in round 2 by role and contract experience in round 1.

Table 5 displays round-2 data by gender, suggesting that the stronger TD preference of females partly depends on previous experience: both male and female buyers with TD experience in round 1 choose TD more often in round 2.

	IH in round 1	TD in round 1	Total	IH in round 1	TD in round 1	Total
TD	1 (1)	17 (5)	18 (6)	2 (4)	14 (6)	16 (10)
%	33.33 (20)	89.47 (100)	81.82 (60)	66.67 (80)	100 (60)	94.12 (66.67)
IH	2 (4)	2 (0)	4 (4)	1 (1)	0 (4)	1 (5)
%	66.67 (80)	10.53 (0)	18.18 (40)	33.33 (20)	0.00 (40)	5.88 (33.3)
Total	3 (5)	19 (5)	22 (10)	3 (5)	14 (10)	17 (15)
%	100	100	100	100	100	100

Table 5: Choice in round 2 by gender (male data in parenthesis).

For TD adoption in round 2 we test whether, after controlling for one's role and experience, the female inclination for TD is still significant. The econometric specifications in Table 6 include two

[13]The Chi-squared test comparing the distributions of contract choice in round 2 given experience and role in round 1 confirms that the distribution of contract choice in round 2 is significantly different for sellers who were sellers also in round 1: p-value<0.001 (***), robust to Bonferroni correction, whereas the distributions of contract choice in round 2 do not significantly differ for sellers who were buyers in round 1: p-value= 0.601 (not significant).

dummies, `TD in R1` and `Seller in R1`, respectively equal to 1 if round-2 sellers experienced a TD contract in round 1 and if the seller has the same role as in round 1, their interaction, and gender. As in Table 3, specification (2) further includes self-reported loss, risk, and ambiguity aversion, and a dummy accounting for the subjects' performance in the cognitive reflection test (`CRT`).

Being seller in round 1 significantly reduces the probability of TD in round 2. The positive and significant coefficient of the interaction term shows that a round-2 seller, who has chosen TD in round 1, is more likely to adopt TD in round 2. The `Female` dummy, however, is not anymore significant even though the coefficient is comparable with the one estimated for both rounds.

	(1)	(2)
$\bar{q}$	0.027	0.017
	(0.087)	(0.079)
TD in R1	0.042	0.065
	(0.157)	(0.139)
Seller in R1	–0.337*	–0.344*
	(0.136)	(0.143)
TD in R1 × Seller in R1	0.356*	0.456*
	(0.152)	(0.196)
Female	0.132	0.225
	(0.112)	(0.137)
Risk Aversion		–0.023
		(0.022)
Loss Aversion		–0.086
		(0.097)
Ambiguity Aversion		0.100
		(0.113)
CRT		0.221
		(0.135)
Observations	64	64

Robust standard errors clustered at matching group level are reported in parentheses.
*p<.05; **p<.01; ***p<.001

Table 6: Determinants of TD adoption in round 2 (logit).

Finding 2. *Controlling for contract experience in round 1 shows that TD is addictive for sellers.*

TD-addictiveness had to be expected. If adopting TD in round 1 had the purpose of avoiding the cognitive burden of dealing with private information and sending true or false value messages or wanting to guarantee transparency, it seems natural to stick to this in round 2. Sellers dissatisfied with their profits in round 1 (see the negatively significant coefficient of `Seller in R1`) can adapt their α in round 2 instead of switching to IH.

3.2 Behavior under TD

TD-sellers should choose α by anticipating the expected acceptance of B, especially considering that a large α may trigger more rejections. Will buyers, annoyed by a too large α, engage in sanctioning and will they do so when v_t is large or small? That is, will the buyer sanction when this is more costly for the seller (and also for himself) or less costly for himself (but also for the seller)? Moreover, will TD-sellers, after experiencing such sanctioning in round 1 as sellers or buyers, choose lower α-levels in round 2?

3.2.1 α-choices

Table 7 reports the average α for TD-sellers in both rounds, separately for $\underline{q}$ and $\bar{q}$. The average is larger in round 2 for both q-levels but not significantly.[14] α-choices are path dependent by being less generous in round 2, especially for sellers in both rounds.[15]

	$\underline{q}$		$\bar{q}$	
	All participants	Participants who are sellers and choose TD in both rounds	All participants	Participants who are sellers and choose TD in both rounds
Round 1	56.38	61.42	49.77	42
Number of subjects	29	14	22	8
Round 2	59.23	82.28	56.5	66.8
Number of subjects	22	7	28	15

Table 7: Average α by round and q.

Although acceptance is theoretically predicted in case of TD, behaviorally it depends on α, i.e., on fairness in surplus sharing. For the two rounds, Figure 1 partitions α-offers in 10 classes ranging from 1% to 10%, 11% to 20%, etc., breaking down acceptances and rejections. Male and female α-distributions look different: male α-choices are more concentrated around 50%, whereas female α-choices display fatter tails (the variance for female sellers is significantly larger than for male sellers).[16] The fact that females choose TD more often, hence, can be due to their stronger transparency concerns.

3.2.2 Acceptance under TD

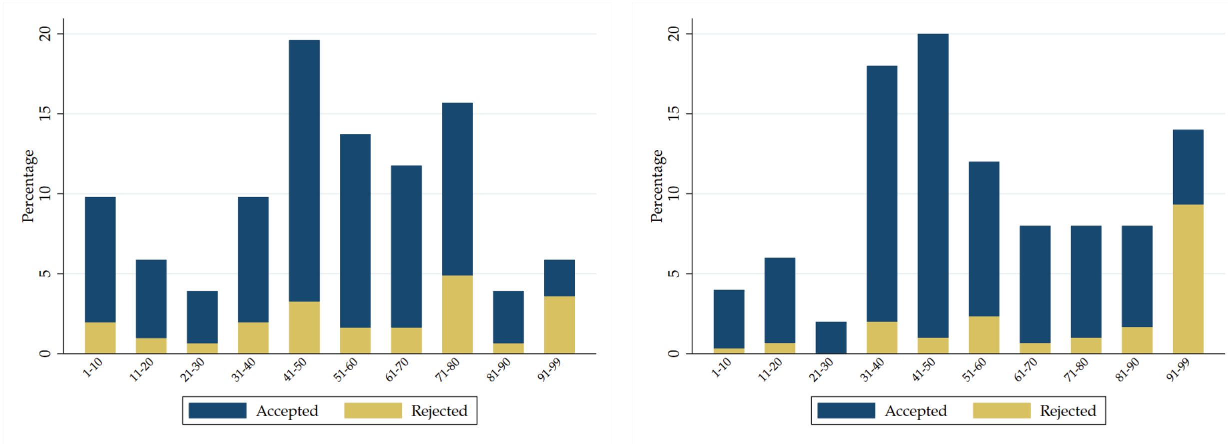
Do fair or low α-levels imply acceptance irrespective of v_t? Do larger (than 1/2) α-levels trigger rejection mainly when v_t is low, i.e., when sanctioning is cheap for B, or when v_t is large and more harmful for S? The graphical illustrations in Figure 1 and Figure 2 suggest that buyers reject often

[14] For $\underline{q}$, t-test: p-value=0.7, whereas for $\bar{q}$, t-test: p-value=0.36.

[15] t-test statistic has p-value<0.001 (***).

[16] According to the t-test (p-value in gender=0.443) averages do not significantly differ whereas for standard deviation the difference is statistically significant 2*Pr(F < f) = 0.029 (*). See also Figure 1 of Supplementary Materials.

when α is very high (sellers demand nearly 100% of the surplus) and less often when v_t is low. So, altruistic sanctioning occurs when it is cheap for buyers or expensive for sellers.



a. Round 1. **b.** Round 2.

Figure 1: Buyer's choice in case of TD given α.

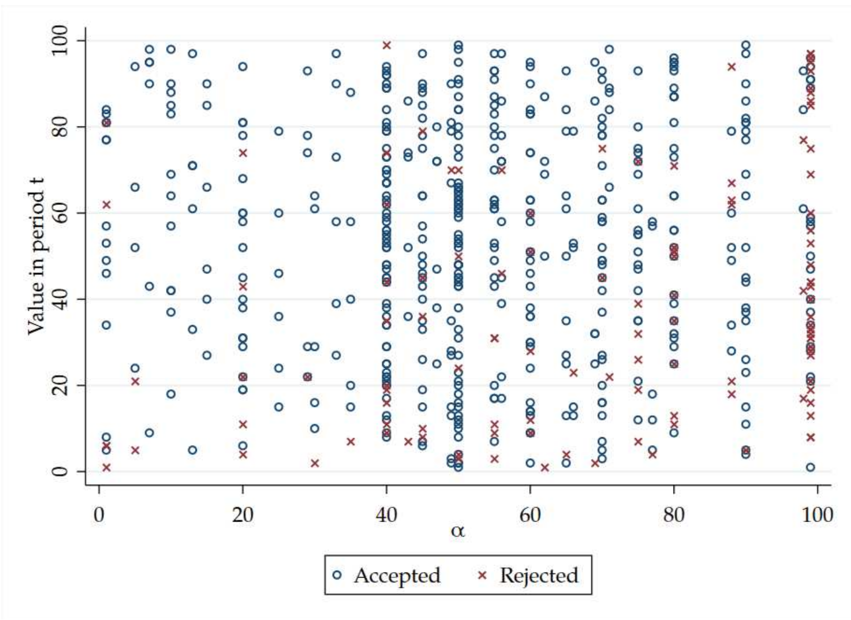


Figure 2: Buyer's choice in case of TD given v_t and α.

The random-effects logit regressions of Table 8 confirm that a larger α renders acceptance significantly less likely while the acceptance probability increases with the value v_t.

Finding 3. *Like in deterministic ultimatum experiments there is significant altruistic sanctioning of TD-sellers by buyers who time their sanctioning when it is cheap for them, i.e., when* α *is particularly high.*

Notice that opting for TD does not render the repeated interaction of the same seller and buyer a deterministic game due to six successive random events v_t for $t = 1, \ldots, 6$. TD avoids private information which has been shown to crowd out altruistic sanctioning and rewarding (see Güth et al., 2020). So, Finding 3 shows that altruistic sanctioning survives stochasticity when it does not imply private information.

	(1)	(2)
α	–0.004***	–0.004***
	(0.001)	(0.001)
v_t	0.003***	0.003***
	(0.001)	(0.001)
$\bar{q}$	–0.040	–0.032
	(0.038)	(0.040)
Female	0.032	0.035
	(0.051)	(0.053)
Round 2	0.038	0.031
	(0.037)	(0.035)
Risk Aversion		0.011
		(0.012)
Loss Aversion		–0.063
		(0.040)
Ambiguity Aversion		–0.013
		(0.049)
CRT		0.016
		(0.059)
Period dummies	✓	✓
Observations	603	603

Robust standard errors clustered at matching group level are reported in parentheses.
*p<.05; **p<.01; ***p<.001

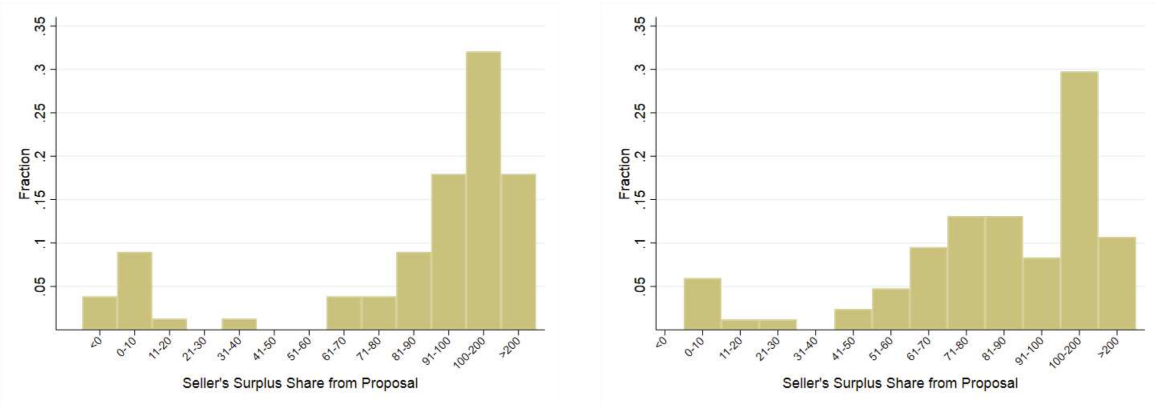
Table 8: Buyer's acceptance in case of TD (random-effects logit).

3.3 Behavior under IH

IH-sellers make six vector choices $(\hat{v}_t, p_t)$ in the six successive periods $t = 1, \ldots, 6$ with the same buyer with only S being aware of the independent v_t-realizations when choosing $(\hat{v}_t, p_t)$. We expect buyers to accept or reject depending on their experiences with the same seller.

3.3.1 Seller Proposals

Figure 3 shows that the proposed surplus sharing of IH-sellers, i.e., $(p_t - qv_t)/(v_t(1-q))$,would partly imply losses for buyers when accepted and that this occurs less often in round 2 (see the right panel of the figure). Moreover, such exploitative offers are adopted not only in the last period of the round but also in the first ones.[17]



a. Round 1. **b.** Round 2.

Figure 3: Seller's surplus share implied by IH-proposal.

Finding 4. *The surplus demands of IH-sellers mostly try to exploit the buyer, e.g., by exceeding 80% and even 100%, not only in the last periods of both rounds, as expected endgame effects, but also in first periods.*

The dominance of exploitative seller behavior is quite striking, especially its persistence across 6 periods of the same round and both rounds. So one wonders whether the endogenous self-selection of IH is predominantly based on selfishness which in view of the significant gender effect seems more "malish" (see Niederle and Vesterlund, 2007).

3.3.2 Acceptance under IH

Consciously abstaining from revealing one's private information and surplus sharing nearly doubles the average rejection rate which is 37.09% for IH and 19.73% for TD.[18] Rejection rates differ across q-levels and rounds between 20% and 47.5% (see Table 9). So Figure 4 illustrates, without controlling

[17]See Figure 2 in the Supplementary Materials. Very low surplus shares for the sellers are mainly due to first-period proposals.

[18]The difference in the distribution of rejections is statistically significant, p-value<0.001 (***). Also the one-sided t-test for larger mean is statistically significant as well, p-value<0.001 (***). This also holds separately for each q-level.

for period, how acceptance and rejection depend on $\hat{v}$ and p, and their positive correlation. Offers concentrate around, mainly above, the 45-degree line. Acceptance increases with $\hat{v}_t$ for any given p_t.

Buyer's choice	Round 1			Round 2			Both rounds		
	$\underline{q}$	$\bar{q}$	Total	$\underline{q}$	$\bar{q}$	Total	$\underline{q}$	$\bar{q}$	Total
Reject	17	12	29	8	19	27	25	31	56
%	36.96	48	40.85	20	47.5	33.75	29.07	47.69	37.09
Accept	29	13	42	32	21	53	61	34	95
%	63.04	52	59.15	80	52.5	66.25	70.93	52.31	62.91
Total	46	25	71	40	40	80	86	65	151
%	100	100	100	100	100	100	100	100	100

Table 9: Buyer's behavior in IH.

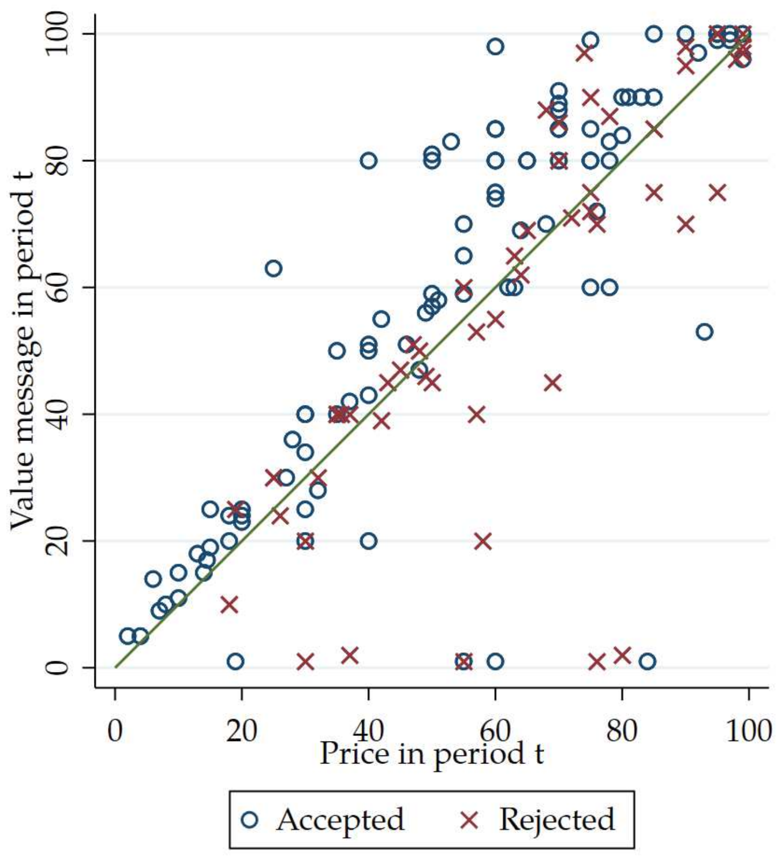


Figure 4: Buyer's choice in IH given $\hat{v}_t$ and p_t.

Acceptance of $(\hat{v}_t, p_t)$ in period t may independently react to $\hat{v}_t$ and p_t, but also to their interaction $(\hat{v}_t/p_t)$ and be strongly path dependent, e.g., captured by the dummy related to a previous buyer loss $v_\tau < p_\tau$ in spite of $\hat{v}_\tau > p_\tau$ for $\tau < t$ in any of the previous periods of the round (`Previous Loss`). Due to the strong positive correlation between $\hat{v}_t$ and p_t, highlighted in Figure 4, we only consider the interaction term $(\hat{v}_t/p_t)$ and not separately the two terms. Table 10, exploring the determinants of IH acceptance, confirms a significantly positive effect of the $\hat{v}_t/p_t$-ratio, and a significantly negative effect of accepted past loss of the buyer in spite of a gain "signal" (`Previous Loss`); risk and loss aversion significantly render acceptance less likely.

	(1)	(2)
$\hat{v}_t/p_t$	0.386**	0.394**
	(0.147)	(0.124)
$\bar{q}$	–0.157	–0.179**
	(0.090)	(0.060)
Female	0.007	–0.057
	(0.083)	(0.080)
Previous Loss <0	–0.215**	–0.220***
	(0.076)	(0.061)
Round 2	0.078	0.128*
	(0.053)	(0.057)
Risk Aversion		–0.029*
		(0.011)
Loss Aversion		–0.150*
		(0.069)
Ambiguity Aversion		0.110
		(0.105)
CRT		–0.149
		(0.131)
Period dummies	✓	✓
Observations	128	128

Robust standard errors clustered at matching group level are reported in parentheses.
*p<.05; **p<.01; ***p<.001

Table 10: Determinants of buyer's acceptance in IH (random effects logit).

In specification (2), differently from our previous analysis, the structural parameter (q) significantly reduces the buyers' acceptance under IH. This effect is in line with the theoretical predictions of our model, indeed, in equilibrium buyers should anticipate that with $\bar{q}$ acceptance would, on average, imply a loss and therefore should reject any offer.

Finding 5. *Loss experiences are sticky by triggering lower acceptance probabilities in all later periods with the same seller; nevertheless, higher ratios $\hat{v}_t/p_t$ enhance acceptance chances. Moreover, acceptance is lower for $\bar{q}$.*

4 Is TD efficiency enhancing or payoff dominant?

We finally compare TD and IH institutions across three outcome dimensions: (i) ex-post efficiency, measured by trade frequency; (ii) average profit; (iii) fairness, measured by the average positive distance of the seller surplus from 50:50 sharing.

4.1 Efficiency

Table 11 reports the percentage of trades by institution, structural parameter q, and rounds. It appears that trades are much more likely under TD than IH for all subsamples.

Sample	TD	IH
Whole sample	79.87%	58.64%
$\underline{q}$	80.39%	67.78%
$\bar{q}$	79.33%	47.22%
Round 1	78.76%	53.85%
Round 2	81.00%	63.10%

Table 11: Acceptance Probabilities.

To analyze how the institutional choice affects the likelihood of trade, in Table 12 we employ a random effect logit model and focus on the following determinants: in specification (1) we include the institutional choice (`TD`), the structural parameter ($\bar{q}$), their interaction (`TD`$\times\bar{q}$), a round dummy for Round 2, and period dummies; in specification (2) we add also the main characteristics of the buyers (risk, loss and ambiguity aversion, and their cognitive reflections abilities); finally in specification (3) we include the main characteristics of both buyers and sellers. We confirm a significant and positive effect of TD either directly, in specification (1) and (2), or via the interaction term `TD`$\times\bar{q}$ in specification (2) and (3). The significant and negative coefficients of $\bar{q}$ indicate that high q-levels decrease the probability of trade with respect to the baselines of our specifications, that consider IH adoption. This evidence is in line with our previous findings and theoretical prediction.

	(1)	(2)	(3)
$\bar{q}$	–0.130*	–0.136**	–0.149**
	(0.052)	(0.052)	(0.054)
TD	0.109*	0.103*	0.083
	(0.049)	(0.048)	(0.058)
TD $\times$ $\bar{q}$	0.104	0.117*	0.140*
	(0.060)	(0.059)	(0.055)
Round 2	0.047	0.046	0.046
	(0.036)	(0.036)	(0.037)
Period dummies	✓	✓	✓
Buyers' characteristics		✓	✓
Sellers' characteristics			✓
Observations	754	754	754

Robust standard errors clustered at matching group level are reported in parentheses.
*p<.05; **p<.01; ***p<.001

Table 12: Determinants of trade occurrence (random-effects logit).

4.2 Profitability

Table 13 shows that, on average, sellers earn more when opting for IH, irrespective of q-level and round. Moreover, the standard deviation of profits is much higher for IH- than TD-sellers, irrespective of q and round. This is at least partly due to the fact that TD-sellers cannot make proposals that imply losses for the buyer.

In Table 14 we investigate the determinants of sellers' profits including the same regressors as in Table 12. TD significantly reduces the profits of the sellers. The negative effect of $\bar{q}$ is due to the fact that, on the one hand, it decreases the gains from trade while on the other it reduces the probability of trading under IH.

Sample	Average		Standard Deviation	
	TD	IH	TD	IH
Whole Sample	13.01	20.16	13.60	23.862
$\underline{q}$	16.98	27.05	16.04	26.05
$\bar{q}$	8.96	11.55	8.91	17.46
Round 1	13.21	19.81	14.32	25.82
Round 2	12.8	20.49	12.85	22.04

Table 13: Average and standard deviation of seller's payoffs.

	(1)	(2)	(3)
$\bar{q}$	−16.020***	−16.381***	−16.503***
	(3.613)	(3.642)	(3.685)
TD	−10.892***	−10.916***	−11.400***
	(3.131)	(3.176)	(3.327)
TD×$\bar{q}$	7.087	7.557	7.952
	(4.091)	(4.010)	(4.101)
Round 2	0.142	0.402	0.164
	(1.261)	(1.341)	(1.358)
Period dummies	✓	✓	✓
Buyers' characteristics		✓	✓
Sellers' characteristics			✓
Observations	757	757	757

Robust standard errors clustered at matching group level are reported in parentheses.
*p<.05; **p<.01; ***p<.001

Table 14: Determinants of seller's profits (random-effects).

4.3 Equity

Table 15 reveals that IH triggers more exploitation via a larger difference of the average sellers' surplus share from 50:50 as well as larger standard deviations.[19]

Following our previous analysis, in Table 16 we explore the determinants of the distance of the seller's surplus share from equal sharing. The table confirms a significant and negative role for TD, which remarks the stronger exploitative behavior of sellers in IH.

Sample	Average		Standard Deviation	
	TD	IH	TD	IH
Whole Sample	0.18	1.47	0.153	3.776
$\underline{q}$	0.19	0.86	0.153	1.513
$\bar{q}$	0.168	2.71	0.152	6.098
Round 1	0.175	1.33	0.139	2.2002
Round 2	0.184	1.581	0.167	4.759

Table 15: Excess of seller's surplus share from equal sharing.

[19] We are reluctant to interpret all surplus demands below 50:50 by sellers as intentional generosity and therefore focus on surplus demands above 50%.

	(1)	(2)	(3)
$\bar{q}$	0.559	0.583	0.593
	(0.432)	(0.423)	(0.440)
TD	–0.432*	–0.419*	–0.414*
	(0.193)	(0.182)	(0.209)
TD×$\bar{q}$	–0.579	–0.629	–0.617
	(0.437)	(0.433)	(0.448)
Round 2	0.063	0.080	0.116
	(0.085)	(0.093)	(0.131)
Period dummies	✓	✓	✓
Buyers' characteristics		✓	✓
Sellers' characteristics			✓
Observations	549	549	549

Robust standard errors clustered at matching group are presented in parentheses

*p<.05; **p<.01; ***p<.001

Table 16: Determinants of the excess of seller's surplus share from equal sharing (random-effects).

Finding 6. *Overall TD is more efficient and fairer in surplus sharing; nevertheless TD-sellers earn significantly less.*

The larger probability of trade when sellers rely on TD seems to justify political initiatives of limiting trade with private information. However, as privately informed sellers gain more by adopting IH, mainly due to exploitative proposals (see Finding 6), they may suffer from these initiatives. This occurs even though buyers who have suffered a loss with the same seller lose trust and seek for revenge (see Finding 5). Overall, possible explanations for TD-preference could be sellers' efficiency concerns, preference for transparent bargaining procedures, or their shying away from the cognitive burden of IH.

5 Conclusions

We investigate the choice of sellers between two institutions in a repeated modified AaC-game. Although both institutions result in ultimatum bargaining, TD triggers a deterministic ultimatum bargaining in which the seller demands a constant surplus share which determines the 6 successive price offers with the same buyer. Insider haggling instead induces a repeated (six-period) ultimatum supergame with a repeated privately informed seller, who also sends a cheap-talk value message to the buyer in each period.

Our experimental results show that sellers opt far more often for transparent dealing, especially when female, although this institution is on average less profitable for them. This preference is addictive for participants who remain sellers in both rounds; instead participants who are buyers (sellers) in the first (second) round, reveal some inertia but prefer TD as sellers. Moreover, transparent dealing is both trade enhancing and fairer in surplus sharing. Buyers partly sanction sellers who exploit ultimatum power in transparent dealing and private information in insider haggling, especially when they suffer a loss due to cheating in previous periods with the same seller.

These results should be analyzed with caution. First of all, seller participants select one of the two institutions. As a consequence, those opting for TD may significantly differ from those choosing IH. Female sellers, for instance, opt more often for constant transparency via revealing what they privately know and also their surplus sharing. This gender effect could be explained by females less likely wanting to deceive their partners.[20]

The clear and striking dominance of TD in spite of IH's significantly larger profitability could be attributed to strong transparency and efficiency concerns of seller participants (the TD-acceptance rate is significantly higher). We further propose three additional explanations. First, seller participants tend to avoid bargaining with private information.[21] Second, they can avoid the troublesome conditioning of price offers and sending dubious cheap-talk messages for varying values by demanding just once and openly an own surplus share. Finally, they can perceive revealing private information as "fair playing rules", especially since TD protects buyers against losses.

Future research will focus on attempts to confront less distant institutional alternatives: transparency would, for instance, also be guaranteed by repeated, rather than only one α-choices in two ways, via letting seller S choose α_t before, respectively after, v_t is revealed in periods $t = 1, ...6$. Similarly, IH could inform about both past profits and grant thereby verifiability of past surplus sharing in IH. It is definitely planned to complement the present analysis by such studies.

References

[1] Andreoni, J. and L. Vesterlund (2001): "Which is the fair sex? Gender differences in altruism", *The Quarterly Journal of Economics*, Vol. 116, No. 1, pp. 293–312.

[2] Angelovski, A., D. Di Cagno, W. Güth, and F. Marazzi (2020): "Telling the other what one knows? Strategic lying in a modified acquiring-a-company experiment with two-sided private information", *Theory and Decision*, Vol. 88, No. 1, pp. 97–119.

[3] Ball, S. B., M. H. Bazerman, and J. S. Carroll (1991): "An evaluation of learning in the bilateral winner's curse", *Organizational Behavior and Human Decision Processes*, Vol. 48, No. 1, pp. 1–22.

[4] Bazerman, M. H. and W. F. Samuelson (1983): "I won the auction but don't want the prize", *Journal of Conflict Resolution*, Vol. 27, No. 4, pp. 618–634.

[20] The finding that female sellers adopt TD significantly more often than male sellers should be explored in the light of more data, based on (variants of) our setup or related ones, before claiming far-reaching conclusions. More rounds could test how long this strong female preference persists. Providing feedback information on average profits of female and male sellers, similar to what is discussed in the media based on field data, could question the preference, at least for more experienced participants.

[21] In view of the significant gender effect one might add to the usual suspects of risk, ambiguity, and inequality aversion, the aversion to dealing when being privately better informed.

[5] Bloomfield, R. and M. O'Hara (1999): "Market transparency: Who wins and who loses?", *The Review of Financial Studies*, Vol. 12, No. 1, pp. 5–35.

[6] Bolton, G. E., J. Brandts, and A. Ockenfels (1998): "Measuring motivations for the reciprocal responses observed in a simple dilemma game", *Experimental Economics*, Vol. 1, No. 3, pp. 207–219.

[7] Bolton, G. E. and A. Ockenfels (2000): "ERC: A theory of equity, reciprocity, and competition", *American Economic Review*, Vol. 90, No. 1, pp. 166–193.

[8] Buser, T. and H. Yuan (2019): "Do women give up competing more easily? Evidence from the lab and the Dutch math olympiad", *American Economic Journal: Applied Economics*, Vol. 11, No. 3, pp. 225–52.

[9] Buso, I. M., D. Di Cagno, L. Ferrari, V. Larocca, L. Lorè, F. Marazzi, L. Panaccione, and L. Spadoni (2021): "Lab-like findings from online experiments", *Journal of the Economic Science Association*, Vol. 7, No. 2, pp. 184–193.

[10] Chen, D., M. Schonger, and C. Wickens (2016): "oTree—An open-source platform for laboratory, online, and field experiments", *Journal of Behavioral and Experimental Finance*, Vol. 9, No. C, pp. 88–97.

[11] Cohen, M. D. and P. Bacdayan (1994): "Organizational Routines Are Stored as Procedural Memory: Evidence from a Laboratory Study", *Organization Science*, Vol. 5, No. 4, pp. 554–568.

[12] Costello, N. (1996): "Learning and routines in high-tech SMEs: Analyzing rich case study material", *Journal of Economic Issues*, Vol. 30, No. 2, pp. 591–597.

[13] Di Cagno, D., A. Galliera, W. Güth, N. Pace, and L. Panaccione (2017): "Experience and gender effects in acquisition experiment with value messages", *Small Business Economics*, Vol. 48, No. 1, pp. 71–97.

[14] Di Cagno, D., W. Güth, T. Lohse, F. Marazzi, and L. Spadoni (2022): "Who cares when value (mis)reporting may be found out?", *CEIS Working Paper*, No. 531.

[15] Dittrich, D., W. Güth, M. G. Kocher, and P. Pezanis-Christou (2012): "Loss aversion and learning to bid", *Economica*, Vol. 79, No. 314, pp. 226–257.

[16] Dreber, A. and M. Johannesson (2008): "Gender differences in deception", *Economic Letters*, Vol. 99, No. 1, pp. 197–199.

[17] Dulleck, U., R. Kerschbamer, and M. Sutter (2011): "The economics of credence goods: An experiment on the role of liability, verifiability, reputation, and competition", *American Economic Review*, Vol. 101, No. 2, pp. 526–55.

[18] Egidi, M. and A. Narduzzo (1997): "The emergence of path-dependent behaviors in cooperative contexts", *International Journal of Industrial Organization*, Vol. 15, No. 6, pp. 677–709.

[19] Erat, S. and U. Gneezy (2012): “White lies”, *Management Science*, Vol. 58, No. 4, pp. 723–733.

[20] Ertac, S., M. Gumren, and M. Y. Gurdal (2020): “Demand for decision autonomy and the desire to avoid responsibility in risky environments: Experimental evidence”, *Journal of Economic Psychology*, Vol. 77, No. C.

[21] Fehr, E. and K. M. Schmidt (1999): “A theory of fairness, competition, and cooperation”, *The Quarterly Journal of Economics*, Vol. 114, No. 3, pp. 817–868.

[22] Foreman, P. and J. K. Murnighan (1996): “Learning to avoid the winner’s curse”, *Organizational Behavior and Human Decision Processes*, Vol. 67, No. 2, pp. 170–180.

[23] Frederick, S. (2005): “Cognitive Reflection and Decision Making”, *Journal of Economic Perspectives*, Vol. 19, No. 4, pp. 25–42.

[24] Greiner, B. (2015): “Subject pool recruitment procedures: organizing experiments with ORSEE”, *Journal of the Economic Science Association*, Vol. 1, No. 1, pp. 114–125.

[25] Grosch, K. and H. A. Rau (2017): “Gender differences in honesty: The role of social value orientation”, *Journal of Economic Psychology*, Vol. 62, No. C, pp. 258–267.

[26] Güth, W., F. Marazzi, and L. Panaccione (2020): “Eploiting ultimatum power when responders are better informed - Theoretical and experimental analysis of conflict resolution”, *Mimeo*.

[27] Güth, W., K. Pull, M. Stadler, and A. K. Zaby (2019): “Compulsory disclosure of private information: Theoretical and experimental results for the acquiring-a-company game”, *Journal of Institutional and Theoretical Economics*, Vol. 175, No. 3, pp. 502–523.

[28] Huang, J., J. B. Kessler, and M. Niederle (2020): “Fairness concerns are less relevant when agents are less informed”, *Mimeo*.

[29] Jackson, M. O., H. Sonnenschein, Y. Xing, C. Tombazos, and O. Al-Ubaydli (2018): “The efficiency of negotiations with uncertainty and multi-dimensional deals”, *Johns Hopkins Carey Business School Research Paper*, No. 21-14.

[30] Kreps, D. M. and R. Wilson (1982): “Reputation and imperfect information”, *Journal of economic theory*, Vol. 27, No. 2, pp. 253–279.

[31] Mitzkewitz, M. and R. Nagel (1993): “Experimental eesults on ultimatum games with incomplete information”, *International Journal of Game Theory*, Vol. 22, No. 2, pp. 171–98.

[32] Niederle, M. and L. Vesterlund (2007): “Do women shy away from competition? Do men compete too much?”, *The Quarterly Journal of Economics*, Vol. 122, pp. 601–630.

[33] Plott, C. R. and V. L. Smith (2008): *Handbook of experimental economics results*, Vol. 1: Elsevier.

[34] Samuelson, W. and M. Bazerman (1985): "The winner's curse in bilateral negotiations", in V. Smith ed. *Research in Experimental Economics*, Vol. 3: Greenwich, CT: JAI Press.

[35] Selten, R. (1975): "Reexamination of the perfectness concept for equilibrium points in extensive games", *International Journal of Game Theory*, Vol. 4, No. 1, pp. 25–55.

[36] Selten, R., K. Abbink, and R. Cox (2005): "Learning direction theory and the winner's curse", *Experimental Economics*, Vol. 8, pp. 5–20.

Appendix A. Instructions[22]

Welcome to this experiment.

Please read the following instructions carefully. All participants are reading the same instructions and take part in this experiment for the first time.

In this experiment you and the other participants will be asked to make some choices. Your as well as the other participants' choices will determine your earnings from the experiment, calculated as explained below.

At the end of the experiment all the experimental units you have earned will determine your probability to earn 4 or 14 euro from the experiment. A participation fee of 6 euro will be added to these earnings.

The experiment is completely computerized. From this moment on, and for the whole duration of the experiment, any communication among the participants is forbidden, as well as the use of mobile phones. Those who violate these rules will be excluded from the experiment and will receive no payment. If you have doubts regarding the experiment, please contact via chat the experimenters, who will answer immediately and privately to your questions.

At the end of the experiment, you will be asked to complete a short questionnaire whose answers are strictly confidential and anonymous, and will be used exclusively for research purposes.

The experiment is composed of 2 rounds, each consisting of 6 periods. In each period you will interact with another participant in this session of the experiment with whom you will be randomly matched.

At the beginning of each round the computer will assign you to the role of **Buyer** or **Seller** with probability of 1/2 and will match you with another participant to the session assigned to the opposite role.

Each pair will interact keeping the same roles (meaning that you will retain the role of Seller or Buyer) for all 6 periods of the round. At the beginning of the second round the computer will assign you again to a role and match you with a partner, who will stay constant for the 6 periods of the round. So, in round 2 you may be assigned to a different role, or to the same role as in round 1, and you will interact with a new partner for the next 6 periods. Your partner in round 2 cannot be the same as the one you were matched with in round 1.

For the payment, the computer will randomly select one round and a period in that round. Your payoff in the selected period will be converted in the probability that you have to earn 4 or 14 euro. So, your effective earnings for the experiment will depend on your decisions, on your partner's decisions, and on chance.

[22] The experiment was run in Italian, here we present an English version of the instructions.

Round and Period Structure

Each of the 2 rounds of the experiment takes place as follows.

At the beginning of each round, the computer will assign you to the role of **Seller** or **Buyer** with a probability of 1/2 and will randomly match you with another participant in the session, who is assigned to the opposite role.

Each pair, made by a Seller and a Buyer, will interact for 6 Periods. At the beginning of Round 2 the computer will form new pairs in the same way.

In each period, the Seller owns a company that the Buyer can decide to buy or not. The Seller and the Buyer have different valuations of the company. We call v the value of the company to the Buyer and qv the value of the company to the Seller. So, q represents the percentage of disparity between the valuation of the company to the Buyer and to the Seller. q is known to both ad remains constant for all the 6 periods of each round.

Please note that, in each period, the value v is selected randomly by the computer, and it is a number between 1 and 100 (including extremes). The value q will also be selected randomly by the computer and may take values 23, 25, 27, 58, 60, or 62 percent (these values are all equally likely).

At the beginning of the first period of each Round (and before knowing the value v selected by the computer from the distribution of possible values) the Seller in each pair decides whether or not to adopt a contract that determines the sale price so to assign a constant surplus share (α) to the Seller (CS-contract). The possible values of α are expressed in percentage terms and go from a minimum of 1% to a maximum of 99%, with intervals of 1% (i.e., 1%, 2%, 3%, ..., 9%). How α determines the sale price is explained in the next paragraph. If the Seller decides not to adopt a CS-contract, he/she must set $\alpha = N$.

Pay attention: if the Seller does not make its choice in 2 minutes, the software will automatically set $\alpha = N$, i.e., it will apply the decision not to adopt a CS-contract in price-setting by default.

The value α chosen by the Seller will then be communicated to the Buyer.

The Interaction Between Seller and Buyer

The way in which the Seller and the Buyer interact in each of the 6 periods depends on whether the Seller decided to adopt or not a CS-contract, i.e., setting $\alpha > 0$ or $\alpha = N$.

If $\alpha > 0$, the price-setting process proceeds according to the chosen α in each of the 6 periods as follows:

- the computer selects the value of the company v and communicates it to the Seller;
- the computer calculates the price on the basis of the $\alpha > 0$ chosen by the Seller according to this formula:

$$p_\alpha(v) = qv + \alpha(1-q)v \ \ with \ \ 0 < \alpha < 1.$$

Notice that α determines how the benefits from trade will be shared among the Seller and the Buyer in case of acceptance. These benefits are given by the difference between the valuations of the Buyer and the Seller, that is the benefits are equal to $v - vq$. The chosen α grants a share α of the surplus from trade to the Seller ($\alpha(1-q)v$) and to the Buyer the residual share of the surplus ($(1-\alpha)(1-q)v$). The price $p_\alpha(v)$ replicates exactly this distribution of resources for every value of the company. The formula for price determination is applied to the value v of the company.

- The Buyer is informed of the price and decides whether to acquire or not the company at that price.

  Please note that the Buyer has 2 minutes to decide whether to acquire or not the company at that price. If the choice does not occur in these 2 minutes, there will be no trade in that period.

  In case of acceptance, the trade occurs at the established price, otherwise no trade occurs in that period.

  The computer will compute the payoffs relating to both situations for the Seller and the Buyer, in particular:
  - if the Buyer refuses to acquire the company at the price demanded by the Seller, both earn nothing in that period.
  - if the Buyer accepts to acquire the company at the price demanded by the Seller:
    (a) the Buyer earns the value of the company (v) minus the selling price (p);
    (b) the Seller earns the price resulting from α minus the value of the company net of the depreciation coefficient (qv).

  Example: suppose that the value of the company for the Buyer, v, is 45 and that the depreciation coefficient q is 60% (and, consequently, the valuation of the firm for the Seller is $27 = 45 \times 60\%$*) and that the Seller proposes an* $\alpha = 40\%$*. If the Buyer accepts, he/she earns* $((1-\alpha)\cdot(1-q)v) = (1-0.4)\cdot(1-0.6)45) = 0.6\cdot 0.4\cdot 45 = 10.8$ *and the Seller* $\alpha(1-q)v = 0.4\cdot 0.4\cdot 45 = 7.2$*. If the Buyer rejects, both get zero.*

  At the end of the period the computer will communicate privately to both, Seller and Buyer, their payoffs.

If $\alpha = N$, the price-setting process in each of the 6 Periods proceeds as follows:

- the computer selects the value of v and communicates it to the Seller;
- the Seller communicates the price (p) demanded to the Buyer to sell the company and a value for the company $\hat{v}$. The value $\hat{v}$ can be equal to or different from the company's value v that the computer has randomly selected and communicated to the Seller.

  Please note that the Seller has 2 minutes to communicate $\hat{v}$ and the company's selling price to the Buyer. If this communication does not take place by the 2 minutes, no trade occurs in that period.

- The Buyer gets to know the price demanded by the Seller and of $\hat{v}$, without knowing the value v.

  Please note that the Buyer has 2 minutes to acquire or not the company at the price demanded by the Seller. If this communication does not occur in these 2 minutes, no trade occurs in that period.

  In case of acceptance the trade occurs at the price proposed by the seller, otherwise there is no trade in that period.

  The computer will determine the payoffs for the Seller and the Buyer, in particular:

  - If the Buyer refuses to acquire the company at the price demanded by the Seller, both earn nothing in that period.
  - If the Buyer accepts to acquire the company at the price demanded by the Seller:
    (a) the Buyer earns the value of the company (v) minus the selling price (p);
    (b) the Seller earns the price proposed minus the value of the company net of the depreciation coefficient (qv).

  Example: suppose that the value of the company for the Buyer v is 45 and that the depreciation coefficient q is 60% (and, consequently, the valuation of the firm for the Seller is $27 = 45 \times 60\%$*) and that the Seller proposes a price of 40. If the Buyer accepts, he/she earns* $45 - 40 = 5$ *and the seller* $40 - 27 = 13$*. If the Buyer rejects, both get zero.*

  At the end of the period the computer will communicate privately to both, Seller and Buyer, their payoffs.

Your Earnings from the Experiment

The payoff obtained in the round and in the period selected for payment will determine the probability that both the Buyer and the Seller earn the maximum from the experiment (i.e., 14 euro) and the complementary probability to earn the minimum from the experiment (i.e., 4 euro), as explained below.

Your payoff will be transformed by the computer in probability points to earn 4 or 14 euro in the way presented by the following example.

Please note that the probabilities are calculated in a way to ensure that, even if your payoff in the selected period is very high, your probability to receive the minimum earning is positive, and if your payoff in the selected period is very low, your probability to earn the maximum is positive.

Suppose your payoff in the period randomly selected by the computer for payment is π.

Please note that the following calculation method applies to both the Seller and the Buyer.

Your probability to earn 14 euro is given by:

$$[(125 + \pi) \times 100/250]\%$$

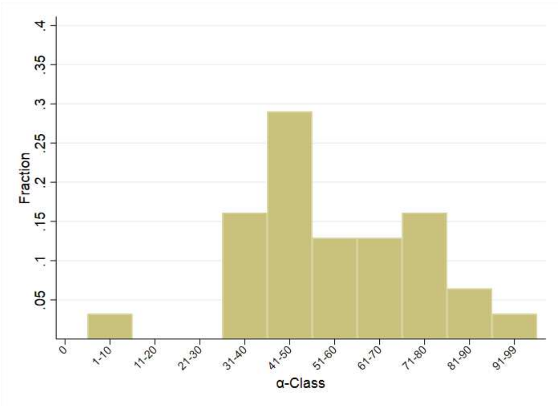
and your probability to earn 4 euro is given by:

$$100\% - [(125 + \pi) \times 100/250]\%.$$

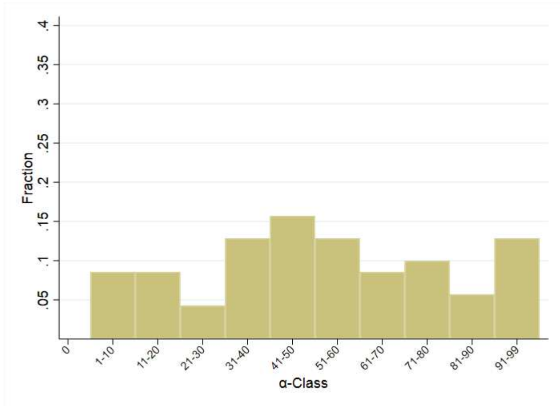
Once the computer has calculated these probabilities, a fortune wheel will appear on your screen and draw your effective earning from the experiment. The 6-euro participation fee for participating in the experiment will be added to these earning.

Good luck.

Appendix B. Additional Tables

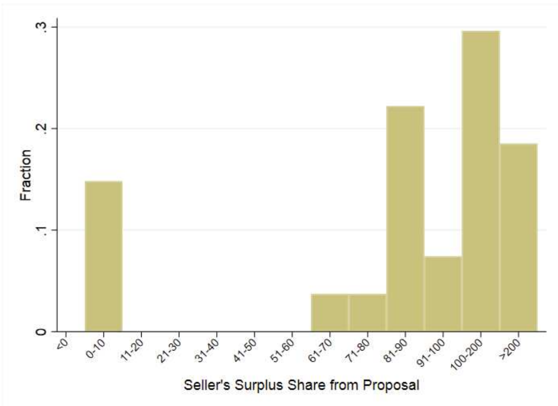


a. Male.

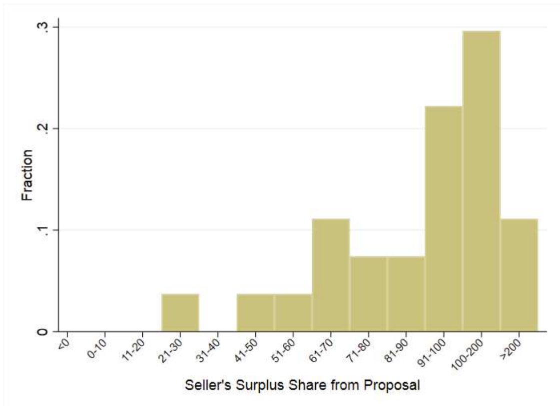


b. Female.

Figure B..1: α-distributions by gender.



a. Period 1, both rounds.



b. Period 6, both rounds.

Figure B..2: Seller's surplus share implied by IH-proposal, periods 1 and 6 (both rounds).

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