Auctions and Negotiations are Comparable, Aren't They?

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Abstract

Comparative studies of auction and negotiation exchange mechanisms are inconclusive. These studies have typically compared outcomes obtained from the two mechanisms. The question which this paper aims to address is the viability of outcome-based comparisons. Such comparisons assume that both mechanisms produce the same types of outcomes but their values differ. An argument can be made that this is not necessarily the case. Based on several experiments of multi-attribute auctions and two formats of multi-bilateral negotiations the paper argues that both mechanisms produce some outcomes which are the same but other outcomes which are qualitatively different.

Keywords: auctions, multi-attribute auctions, negotiations, multi-bilateral negotiations, socio-economic process, economic process, substantive outcomes, relational outcomes.

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1. Introduction

Auctions and negotiations are well-established exchange mechanisms involving people, firms and governments. Proliferation of internet technologies and ubiquity of the web has led to numerous discussions, including discussions on the role of negotiations in business transactions. The initial sentiment was that auctions would be a new market-based negotiating paradigm and they would replace negotiating skills with market forces (Kumar and Feldman, 1998; Beam et al., 1999; Ströbel, 2000). A discussion during an e-negotiation workshop in Montreal on auctions and negotiations led to the recognition that not all electronic transactions can be coordinated through auctions (Kersten et al., 2000). The workshop resulted, among others, in a framework for the design of e-negotiations (Bichler et al., 2003).

Comparisons of auctions and negotiations are difficult because of significant differences in the assumptions underlying each mechanism, as well as differences in participants' knowledge and behavior. Auctions assume that bidders know the buyer's valuation (price) of the good and follow a strict and fixed protocol. They involve multiple bidders who compete for the same good or service. In contrast, negotiation mechanisms have significantly weaker assumptions; the key assumption is that the parties negotiate in good faith and that the parties have preferences allowing each to compare the alternatives. Furthermore, there is no limitation on communication and no assumptions about the sellers' knowledge of the buyer's valuation.

There are two broad types of negotiations, i.e., bilateral and multilateral, each type can be simultaneous or sequential. Bilateral negotiations have been experimentally compared with auctions (Gattiker et al., 2007; Neeman and Vulkan, 2010) and in the field (Bajari, 1998; Bonaccorsi et al., 2000; Bajari et al., 2009). These studies show that auctions are used when: (1) the exchanged goods (services) are defined by a single attribute (price); (2) several qualified suppliers are available; and (3) discussion on goods specification is not needed. Negotiations are used when these criteria are not met and when there is a strong possibility for future interactions.

Comparative studies of auctions and negotiations are inconclusive. In one of the first comparative studies, Bulow and Klemperer (1996) have shown that simple English auction with N+1 participating bidders (buyers) always yields higher revenue than a scheme they call "negotiation with N participants". Kirkegaard revised Bulow and Klemperer's theory and included non-cooperative bargaining with very limited communication protocol. Manelli and Vincent (1995) showed that the effects of auctions and negotiations vary according to situations; it is difficult to judge the effect of these two mechanisms on a given transaction without considering the overall context, including the goods, participants, market, and so on. An important conclusion in this study was that auction mechanisms are frequently inefficient in a procurement environment.

The difficulty in comparing auctions and negotiations is, among others, the use of different settings and protocols. One reason is that bilateral negotiations (i.e., 1:1) are compared with auctions with N bidders, which removes competition among participants. Thomas and Wilson (2002; 2005; 2012) conducted several experiments in which both mechanisms were structurally similar, that is, there were N participants in auctions and N:1 participants in multi-bilateral negotiations. The results depended on the particular experimental settings, however, the outcomes of auctions were not significantly better than the outcomes of negotiations. Thomas and Wilson experiments were very short (4 min.) and involved a single attribute good (price).

Auction and negotiation outcomes have been typically used to compare these two mechanisms.

The question which this paper aims to address is the viability of outcome-based comparisons. Such comparisons assume that both mechanisms produce the same types of outcomes but their values differ. An argument can be made that this is not necessarily the case.

This paper reports on two studies in which multi-attribute reverse auctions and multi-bilateral negotiations were compared. Each process was conducted over a period of up to ten days. In the first study two experiments show that auctions yield better outcomes for the buyer than negotiations, resulting in a higher buyer's profit. Auctions were also found more efficient. One of the differences between these auctions and negotiations is that the negotiation protocol did not allow the sellers to obtain independent information about the best offer that the buyer received from one of the sellers. While this rule is typical for negotiations, in most auctions the winning (best) offer is displayed to all bid-makers (sellers). Availability of verifiable best offers increases mechanism's transparency and it could place auctions at an advantage over negotiations. This assertion led to the second study in which the system displayed best offers to sellers in auctions and in negotiations.

2. Two studies

Several experiments in which participants used auction and negotiation web-based systems were conducted. These experiments and their results are briefly discussed in this section.

2.1 The case and two systems

The Milika case involves a producer of perishable goods (the buyer) and several logistics service providers. The producer wants to sign a contract with one provider only. The minimum quantity of goods to be transported is a fixed part of the contract. Additionally, there are three negotiated attributes, that is, standard rate of transportation, rush rate for unexpected delivery, and penalty for the non-delivery or delivery of spoiled goods. Each attribute has a discrete number of options, i.e. fifteen per attribute, which results in the total of 3375 possible agreements. All issues are fully specified and they cannot be changed during the experiment.

The system relies on a single criterion used to compare alternative bids and offers such as utility, production, cost and profit functions. In the Milika case the selected function is quasi-linear and it describes profits of the buyer and the sellers. Profit function is different for different participants and its values (normalized between 0 and 100) are not disclosed to anyone.

The sellers are also given breakeven points below which their companies would incur losses. Thus, the sellers should be careful not to cross these levels. Their objective in both the auction and the negotiation is to obtain a contract that maximizes the seller's profit.

The systems used in the experiments were: (1) Imaras (InterNeg multi attribute reverse auction system); and (2) Imbins (InterNeg multi-bilateral negotiation system). Both systems were implemented using the Invite e-negotiation system platform (Strecker et al., 2006).

The systems' interfaces are very similar so that the impact of the IT artifact on the decision-making is minimized (Kersten et al., 2013). These are feature-rich systems reminiscent of situations one can encounter in real-life. The systems together with the case provide a realistic scenario in business context.

2.2 Study 1

We have conducted six different lab and online auction and negotiation experiments. The results of these experiments cannot be easily compared because of differences in: (1) the controlled

variables, e.g., number of sellers (from two to six), number of alternatives (360 vs. 3375), and participation of software agents (in one experiment); and (2) the process design, (e.g., fixed and flexible rounds, introduction of video, tests, and handouts). However, in all but one experiment, the sellers achieved very low profit and the buyers' profit was high. For illustrative purposes we selected two experiments; they are shown in Table 1.

In the auctions the sellers made more offers than in the negotiations. Their average profit was low, 3.9 in Experiment 1 and -7.4 in Experiment 2. In the latter experiment, the sellers, on average, won their auction bid a little below their breakeven value. In comparison, successful negotiators achieved a profit of 19.9 and 23.4, respectively in Experiment 1 and 2. In Table 1 we also observe that buyers achieved higher profit in auctions than they do in negotiations.

Table 1. Study 1: Two online experiments with non-verifiable offers.

	Experiment 1		Experiment 2	
	Auction	Negotiation	Auction	Negotiation
No. of instances	17	40	27	23
No. of sellers	74	151	95	89
No. of offers (avg.)	4.4	3.0	**5.6***	3.1
Agreement (%)	—	95	—	96
Seller's profit	3.9	19.9	**-7.4***	23.4
Buyer's profit	66.9	52.6	**75.7***	47.1
Dominating alt. (%)	6.4	1.9	4.0	4.0

* Significance compared to negotiations, $p < 0.01$

Table 1 also shows that the two mechanisms' efficiency is measured by the percent of alternatives which dominate the agreements. These results are not conclusive. In Experiment 1, auctions were less efficient than negotiations (6.4% of alternatives dominated the winning bids vs. and 1.9% of alternatives dominated agreements), while in Experiment 2 both mechanisms were equaly efficient.

2.3 Subjective and objective concessions

An analysis of the results in Experiment 2 led to verification of a concession-making model in auctions and negotiations in which subjective and objective concessions were proposed (Kersten, Vahidov et al., 2013). The difference between these two types of concessions is the basis of comparison. A subjective concession is determined by two consecutive offers, i.e., made at t_1 and t_3 as shown in Fig. 1, both made by the same concession-maker. An objective concession is determined by two offers, the best offer on the table (market), which the concession-taker received at time t_2 from any concession-maker and the offer made at time t_3.

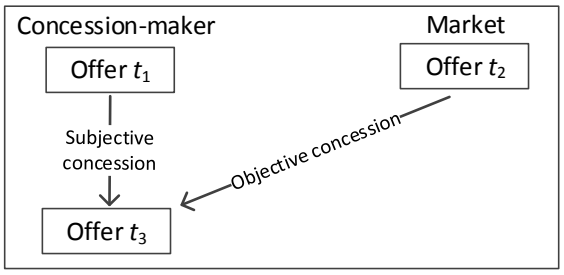

Fig. 1. Objective and subjective concessions.

Subjective concessions occur in bilateral negotiations, in which both the concession-maker and the concession-taker can compare offers made by the same concession-maker. In multi-bilateral negotiations, in which one side is represented by many and the other side by a single negotiator (the case in the scenario presented in Section 2.1), objective concessions are possible. Their use requires significant transparency of the process and fixed protocol, which typically are not employed. We know of only one negotiation study—done by Thomas and Wilson (2005), in which objective concessions were made possible. In their study both the process and the systems were highly stylized and devoid of context.

Objective concessions are typical for these auctions in which the winning bid is shown to the bidders. Every bidder either submits a bid that is better (for the bid-taker) than the winning bid or drops out from the auction. The difference between the winning offer (on the market) and the submitted bid is the objective concession.

The sellers' profits given in Table 2 are the results of concessions they made; in the auctions the sellers' concessions were significantly greater than in the negotiations. The reason could be transparency: in the auctions the sellers knew the best bid, however, this was not the case in the negotiations. In the negotiations, even if the buyer sent information about the best offer she had received, this offer could not have been verified, hence the sellers may consider it as a ploy. This led us to design a negotiation experiment in which a version of the Imbins system displays the best offer on the table in the same way as the Imaras system does.

2.4 Study 2

The results of the second study (Experiment 3) are shown in Table 2. Column "Non-verifiable" results shows situations in which the Imbins system did not display the best offer; the buyer could have shown the best offer but it could not have been verified. The "Verifiable" column shows results of the multi-bilateral negotiations, in which the system displayed the best offer.

Table 2. Study 2: Negotiation experiment with verifiable and non-verifiable offers.

	Experiment 3	
Best offers:	Non-verifiable	Verifiable
No. of instances	13	12
Sellers		
No. of sellers	35	33
No. of offers (avg.)	4.4	4.0
No. of offers w/out message (avg.)	1.2	1.0
No. of messages w/out offers (avg.)	0.6	1.3

Agreement (%)	92	100
Seller's profit	22.3	19.1
Buyer's profit	48.0	53.3
Dominating alt. (%)	4.0	4.0
Buyers		
No. of offers (avg.)	7.2	7.4
No. of offers w/out message (avg.)	1.5	1.0
No. of messages w/out offers (avg.)	1.4	2.9
Buyer's profit	48.0	53.3

There were no significant differences between the two types of negotiations, which contradicts our expectations. We expected the negotiations with verifiable offers to result in significantly better profit for the sellers than the negotiations with non-verifiable offers. The verifiable offer process is very similar to the auction process in terms of the winning offer display and fixed protocol which does not allow the negotiators to add or remove issues and their options.

The restrictions imposed on the negotiation protocol were severe but necessary. Fluid and evolving negotiation process with issues coming and going and preferences changing, cannot be compared with fixed protocol auctions. Verifiable offer negotiations have the same degree of transparency as auctions but they differ in the following three aspects:

1. The negotiating sellers are not forced to make positive objective concessions, i.e., make offers which are better for the buyer than the best offer on the table;
2. The negotiators can exchange messages with and without accompanying offers; and
3. The buyer can make offers.

The impact of the first difference need to be further studied, but it does not appear to have potential for changing the process because both sides know about the best offer. Hence, sellers who (would) submit an offer worse than the best offer (make negative objective concessions) would do it knowing that the buyer has a better offer on the table. There may be, however, a good reason for these seller to do so, for example, if they present/offer some additional benefits for the buyer in the message that accompanies the offer.

The free-text communication with the buyer and the buyer's interaction with the seller are the remaining two key differences between auctions and negotiations (with fixed issues and options). Table 2 shows that in both verifiable and non-verifiable negotiations the sellers sent messages to the buyers (there were as many buyers as instances). About 75% of offers were accompanied by messages. In addition, every seller sent, on average, 0.6 messages in non-verifiable and 1.3 messages, to which no offer was attached.

Buyers used their ability to communicate with the sellers, as shown in Table 2. In the negotiation with non-verifiable best offer they made 7.2 offers, of which, on average, only 1.5 were without a message attached. They also sent 1.4 messages without an offer. The results are similar in the verifiable negotiation, with the exception of messages sent with no offer attached—2.9 on average, i.e., over twice as many as in the non-verifiable negotiation. This difference was caused by two sellers who sent about four times more messages than other sellers. If we remove these two sellers from the dataset, then the averages are similar for both types of negotiations.

The number of offers made by the buyers is much greater than the number made by the sellers because buyers made offers to three sellers, per instance (the number of sellers shown in Table

2 is smaller because inactive sellers were removed from the analysis). Buyers could make an offer and send a message to any subset of sellers (one, two or three), but they often addressed their communique to a single seller.

The data shown in Tables 1 and 2 suggests that verifiable and non-verifiable negotiations produce similar outcomes and that disclosing the best offers does not significantly change the results. One could thus conclude that auctions yield better outcomes for the buyers and worse for the sellers, who must compete for the contract. This indeed would be the case, if the outcomes from auctions and negotiations were the same. In the next section we argue that this may not be the case and that the difference between the two mechanisms is in the presence of social aspects in one and absence of relationship in the other.

3. Discussion

Auctions are economic processes in the sense that nothing except for the attribute values can be submitted. Auction outcomes are thus defined solely by the attributes defined by the bid-takers. These outcomes are known in negotiations as substantive; they are the issues which values are discussed over the course of the process and which constitute the agreement (Thompson, 1990).

In negotiation literature, substantive outcomes have been contrasted with relational outcomes; the roots of this distinction are attributed to an effort to contrast the economic perspective on negotiation with the psychological perspective (Bazerman et al., 2001; Gelfand et al., 2006). The argument which we posit here is that negotiations among market participants and businesses are socio-economic processes and that neither the "social" nor the "economic" aspects can be ignored.

The social exchange theory is concerned with the formulation and evolution of relationship between parties engaged in giving and getting "something", and the rules which govern exchanges between the parties (Cropanzano and Mitchell, 2005; Bottom et al., 2006). There are two main types of rules (Molm, 2010): (1) reciprocity rules; and (2) negotiated rules. The negotiated rules are explicit and simple, they deal with bargaining in which reciprocity is not required. The reciprocity rules are implicit and govern different forms of relationships, which emerge during interactions among people (e.g., trust, empathy, and reputation).

The social exchange theory reduces negotiation exchanges to haggling or double auctions: "reciprocity is a trivial byproduct of a bilateral trade, and the same actions that reduce the risk of loss also increase gain." (Molm, 2003). However, even this narrow perspective on negotiation recognizes reciprocity as an important device used by the negotiators. An action by one party calls for some kind of a response by the counterpart, it creates an obligation. If it is clear that the party makes an effort, provides explanation, proposes a significant concession, and is genuinely interested in getting the contract, then it is only natural for the counterpart to reciprocate. This is one reason why buyers accept outcomes (lower profit) in the multi-bilateral negotiations, which are lower than in auctions.

Participants of our negotiation experiments play roles of buyers and sellers; they perform and interact with others. They may also discuss other issues (e.g., their interests, weather, and universities). The negotiations are anonymous at the outset, but the participants can exchange any information. Participants' discussions may have a subjective value for them. A person may not know her counterpart but during the ten-day long interaction may develop some affinity to him, which can lead her to make a bigger concession than she would have made if she felt animosity. This particular motivation for concession-making can be related to the experimental

settings, however, in real-life situations we also observe parties trading off some substantive values in an effort to achieve higher relational values. In some job markets, for example, the employers engage in multi-bilateral negotiations with several potential candidates in order to determine their trustworthiness, fit to the position and the team, as well as professional skills. If they need to determine skills only, then auction often is the preferred mechanism (Schram et al., 2010). This implies that reciprocity need not be a "trivial byproduct" but a set of complex rules which are invoked when the negotiators realize the potential of achieving important relational outcomes.

Relational outcomes are inherently social and they can be achieved in negotiations. However, they cannot be achieved in auctions in which bid-makers do not interact with one another. This shortcoming of auctions has been recognized and led to augmentation of auction protocols, e.g., with post-auction negotiation in buyer-determined auctions (Engelbrecht-Wiggans et al., 2007).

While non-augmented auctions cannot produce relational outcomes, they can produce game-like outcomes, such as excitement (Adam et al., 2013). Auctions produce winners and losers, the outcome is a win or loss, which can be contrasted with agreement or disagreement achieved through negotiation.

The results discussed here are tentative and more work is required to validate them. They confirm theoretical results that auctions produce better substantive outcomes for bid-takers who decide on the exchange mechanism. The assumption is, however, that the bid-takers are not interested in any other outcomes, relational in particular. The results also point to the necessity to study communication between negotiators. Messages affect offers; if they are ignored then the changes in offers (concessions) cannot be explained.

The data obtained from verifiable and non-verifiable negotiation experiments is inconclusive; the differences in the buyers' and sellers' profit values are not significant. However, this difference is observable and therefore it may suggest that transparency is better for buyers but not necessarily for the sellers (Table 2). Because transparency has been found to have positive effect on trust and other relational outcomes (Hultman and Axelsson, 2007), in some situations verifiable-offer negotiations may be preferred over both auctions and non-verifiable negotiations.

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