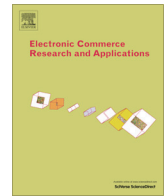




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Concession-making in multi-attribute auctions and multi-bilateral negotiations: Theory and experiments

Gregory E. Kersten*, Rustam Vahidov, Dmitry Gimon

InterNeg Research Centre, Concordia University, Montreal, Canada

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ABSTRACT

Concession-making behavior is an essential process in negotiations and auctions and has critical impact on the outcomes of an exchange. In auctions, concessions relate to deciding on the next bid by bid-makers, while in negotiations they involve proposing next offers by both parties. The purpose of this paper is twofold: (1) present a theory of concessions which could be applied to both auctions and negotiations and (2) provide experimental verification of the theory. The concession model identifies nine types of concessions derived from the preference structures. The occurrence of all nine types has been confirmed in experiments. The model also identifies two concession categories which are associated with the process transparency. The theory-based assessment of the concession-making in multi-attribute auctions and multi-issue multi-bilateral negotiations allows for their comparison. To this end, two systems implemented on the Invite e-negotiation platform are used. One of the major findings suggests that auctions induce concession-making that is more likely to lead to Pareto-optimal agreements. This study also suggests that greater transparency in negotiations is likely to lead to better agreements.

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1. Introduction

Auctions and negotiations are the two pivotal mechanisms that allow the parties to agree on exchange goods and services. In search of acceptable agreements the parties need to constantly make decisions on how much value they would be ready to forgo when making or accepting an offer. This concession-making determines the outcomes of exchange instances.

A concession is the act or process of giving something of value to a person who asked for it. A concession may also mean a thing of value that is being given. To distinguish between these two meanings we use the terms “concession-making” to describe an activity and “concession” do describe the activity’s value which can be measured. Furthermore, we note that one does not need to be asked directly in order to make a concession. A person may imply or expect that a concession be made. It is also possible that one makes a concession in order to get something in return.

Concession-making is a typical activity in both auctions and negotiations. However, there is a difference between concession-making in auctions and in negotiations. In auctions one is not asked to make a concession—the bid-maker either makes a concession in the form of a revised bid or she drops out of the auction. In negotiations, concessions are asked for, implied or expected.

In negotiations, concession-making has been extensively studied both experimentally and in the field (e.g., Cialdini et al. 1975, Esser and Komorita 1975, Kwon and Weingart 2004). Negotiators make concessions in order to move towards an agreement, to prevent the counterpart from leaving the negotiation, and to encourage the counterpart to reciprocate (Bateman 1980, Komorita and Esser 1975, Smith et al. 1982).

Concession-making is focused around the issues on the table. There may be more to negotiation than concessions, with learning being the key to reaching an agreement (Spector 2007, Zartman 1977). For example, during the process the parties may realize that they are not in opposition and there are alternatives which satisfy everybody’s needs (Raiffa et al. 2003, Schneider 2002). In many economic transactions, however, concessions are necessary to reach an agreement. Despite the importance of concession-making, we know of no comprehensive theory in which this activity, its constraints, and possible outcomes are formally represented.

Many negotiations involve one party negotiating with several parties (e.g., a car buyer versus car dealers) over the same issues. These are *multi-bilateral multi-attribute negotiations* and they can be compared with *multi-attribute auctions* because in both mechanisms: (1) there is a single-party side (e.g., the buyer) and the multi-party side (e.g., the sellers) and (2) the subject of the exchange (e.g., the goods) is multi-attribute. These two mechanisms are the key to business exchanges, including procurement (Bajari et al. 2009, Kraljic 1983).

* Corresponding author.

E-mail addresses: gregory@jmsb.concordia.ca (G.E. Kersten), rvahidov@jmsb.concordia.ca (R. Vahidov), dgimon@jmsb.concordia.ca (D. Gimon).

The multi-attribute problem is selected because this type of problem often occurs in business negotiations and is typical in procurement (Beil and Wein 2003, Ferrin and Plank 2002), a business domain in which auctions, including multi-attribute auctions, have been employed in various configurations (Adomavicius et al. 2012, Huang et al. 2011, Rao et al. 2012).

Auctions are widely used and yet despite their acknowledged efficiency as well as perceived transparency – features sought by both businesses and governments – negotiations remain an accepted and commonly used exchange mechanism. At the same time, multi-attribute auction mechanisms, which are similar to multi-issue negotiations, have been designed and implemented (Kersten et al. 2012c, Sandholm 2007). A more detailed study of both mechanisms may help us to understand their strengths and weaknesses. It may also give us insight into the ongoing use of negotiations despite the fact that the process is slow, difficult, and nontransparent. Observation of bidders' and negotiators' behavior provides insights into each mechanism use and the relationship between users' actions and process outcomes. We propose to study sellers' behavior in auctions and in negotiations not as a series of individual concession processes, but as processes which are interdependent and which lead a group of sellers to a collective result.

This paper proposes a formal theory of concession-making which can be used in the design of both auction and negotiation mechanisms. The theory builds on the concession taxonomy (Kersten and Gimon 2012; Kersten et al. 2012a). We show how it can be used to study and compare two mechanisms and to provide new insights useful for mechanism designers and users. As far as we know this is the first work in which concession-making behavior is systematically compared and shown to lead to different outcomes.

In this paper auctions and negotiations are compared based on the concession-making behavior rather than on outcomes. In auction literature theoretical comparisons of auctions and negotiations focused on revenue generation, efficiency, and surplus (Bulow and Klemperer 2009, Kirkegaard 2004). Behavioral comparisons of auctions and negotiations focused on the impact of mechanisms' parameters on the outcomes (Bajari et al. 2009, Fluck et al. 2007, Gattiker et al. 2007). With few exceptions (Galinsky et al. 2009, Subramanian 2010), negotiation literature, tends to ignore auctions. While there have been many comparative studies, in most of them negotiations are bilateral. Multi-bilateral negotiations have been compared with auctions; however, these studies considered only single-attribute goods (Thomas and Wilson, 2002, 2005). This paper compares auctions and multi-bilateral negotiations with multi-attribute goods. In these situations concession-making is more difficult and may lead to qualitatively different solutions (Bazerman and Neale 1992, Thompson 2005).

We focus on concession-making because this behavior is the key activity common to bidding and negotiating. We are primarily interested in B2B and G2B exchanges, therefore we study *reverse auction* which is the best-known type of electronic sourcing system. In order to study the behavior of the mechanism's users, we consider the sellers' behavior only because in reverse auctions only they actively participate in the process. A comparison of face-to-face multi-issue negotiation in which one buyer needs to interact with several sellers with multi-attribute reverse auction is inappropriate because the former is a sequential process while the latter is simultaneous. Therefore, we study *online multi-attribute reverse auctions* and *multi-bilateral multi-attribute electronic negotiations* in which several sellers compete in order to obtain a contract from the buyer.¹

The next section reviews auction and negotiation literature on concessions. In Section 3 we build on the common understanding of concessions and formulate concession models which allow us to propose a typology, which is based on two distinct perspectives: (1) the concession-maker and the concession-taker perspective and (2) subjective perspective of the concession-maker vs. objective market perspective. In Section 4 we present experiments which were designed to study concession-making in multi-attribute auctions and multi-bilateral negotiations. The experiments' general results and a comparison of theoretical and actual winners are also discussed in this section. An analysis of concession-making is given in Section 5. A comparison of subjective and objective concessions shows not only significant differences but it also gives grounds to postulate a greater transparency in multi-bilateral negotiations. In this section we also show that the types of concessions made by bidders in auctions depend on the auction rule which limits the number of bids in a round. Lastly, Section 6 summarizes the results, presents their implications, and suggests directions for future research.

2. Review of concession-making in auctions and negotiations

2.1. Face-to-face negotiations

Conceptually, concession-making may appear to be a simple process – a change of the negotiator's position that reduces the level of benefit sought by her and is seen as an improvement by the counterpart (Pruitt 1981). The underlying assumption for concession-making is that when it is made by both or by one party, then it leads towards an agreement. This assumption holds in single-attribute negotiations when it is clear that the parties' interests are in strict opposition; in such a case every concession gets the parties closer to a Pareto-optimal agreement (Kersten and Noronha 1998). However, when negotiators have no information about each other's preferences, then concession-making may lead to no agreement (or a very bad one) even in a single-attribute negotiation (Fisher and Ury 1983, Follett 1940).

In business, concession-making is often expected irrespectively of the first offer. A strategy known as Boulwarism, after L.R. Boulware, VP of GE, introduced in 1957, entailed a reasonable first offer and no concessions unless the union provided factual information that would warrant it (Anonymous 1957). Even when an offer was an improvement over agreements which unions negotiated in comparable companies and there was less strife in GE than elsewhere, this strategy is seen as hard, positional and in bad faith. The significance of concession in such situations was experimentally confirmed by Komorita and Brenner (1968) who showed that if one party wishes to reach an agreement at a 'fair' price, then this party cannot make an initial offer at that fair price level and remain firm, instead they have to make the initial offer significantly higher. If the negotiator wants to achieve a good result, she should always start from a high enough level that will allow her to make fairly large concessions (Hinton et al. 1974).

When there are multiple attributes, then the relationship between concessions and agreement is not straightforward. Raiffa (1982), in his seminal work, illustrates the concept of strategic misrepresentation with management-union negotiations. Both sides had the same preferential direction over one attribute (both want the police chief to be fired); however, the union knew the management's preferences, while the management did not know that the union wanted the same. In this situation the union asked the management to make a concession and keep the chief; only after discussions and getting the management to make concessions on other issues (that the union was really interested in) the union made an apparent concession and agreed upon firing the chief. One could say that the union made a "win-win" concession because it resulted in both sides being better off.

¹ In negotiations attributes which are the subject of negotiations are called issues. In decision sciences and economics the term "attributes" is used. In this paper we use attributes to describe characteristics of a good or a service – subject of both... negotiations and auctions.

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