DEPARTMENT OF ECONOMICS AND FINANCE

SCHOOL OF BUSINESS AND ECONOMICS

UNIVERSITY OF CANTERBURY

CHRISTCHURCH, NEW ZEALAND

# It Ain't Over Until It's Over: English Auctions with Subsequent Negotiations

Onur A. Koska
Frank Stähler

*WORKING PAPER*

No. 4/2020

Department of Economics and Finance
School of Business
University of Canterbury
Private Bag 4800, Christchurch
New Zealand

# WORKING PAPER No. 4/2020

## It Ain't Over Until It's Over: English Auctions with Subsequent Negotiations

**Onur A. Koska**[1†]
**Frank Stähler**[2]

March 2020

**Abstract:** We consider a standard private value ascending-bid auction and show that subsequent negotiations make a seller worse off. The reason is that the seller's optimal strategy does not change if she can make a take-it-or-leave-it offer to the highest bidder after the auction. Consequently, her expected revenues do not increase with subsequent negotiations, but decrease if the highest bidder has some bargaining power.

**Keywords:** English auction; negotiations; reserve prices.

**JEL Classifications:** D44.

[1] Department of Economics and Finance, University of Canterbury, NEW ZEALAND
[2] School of Business and Economics, University of Tübingen, GERMANY

†Corresponding author: Onur Koska, email: onur.koska@canterbury.ac.nz

# 1 Introduction

There is a lot of evidence that auctions do not end if the reserve price is not met, but that the auctioneer invites the seller and the highest bidder to negotiate privately. This seems to be an easy way out of a situation in which the highest bid has not met the reserve price, so potentially mutually beneficial trade will not take place unless both parties negotiate. However, both parties will anticipate the possibility of negotiations, and our interest in this paper is in the effects of negotiations on the seller's expected revenues.

We will show that negotiations will make the seller worse off as the seller does not benefit from negotiations even if she has all the bargaining power. The reason is that the optimal reserve price is time-consistent: a seller who can make a take-it-or-leave-it offer to the highest bidder once this bidder is identified will set an *ex post* reserve price that is equal to the optimal *ex ante* reserve price if the second-highest bid is not larger. This is in line with the well-known finding that the optimal reserve price does not depend on the number of bidders in a standard private value auction because the reserve price is effective only if the highest valuation is larger and the second-highest valuation is smaller than the reserve price (see, for example, Krishna, 2002, Chapter 2.5).[1] In our setup it has the implication that the expected seller revenues do not change with negotiations in which the seller can make a take-it-or-leave-it offer. However, if the highest bidder has some bargaining power, expected revenues will be smaller.

The statistical evidence that supports our main finding (and thus the empirical motivation of the paper) comes from the housing auctions, especially in Australia and New Zealand (where houses may "pass in" either on genuine bids or on vendor bids). According to the Real Estate Institute, in major housing markets in Australia (e.g., Brisbane, Melbourne, and Sydney), the market share is ranging between 20-50%. New Zealand has a smaller market and thus somewhat smaller shares. Both markets, however, feature high "pass-in" rates and low clearance rates. As Eves (2006) presents, for example, in the second half of 2005, there were 9116 residential houses on offer in Sydney. 1393 were sold on "private treaty sales" terms and conditions prior to the auction day; 2468 were passed in on a genuine bid, whereas 958 were passed in on a vendor bid. While 969 were withdrawn, only 4721 of 9116 residential houses were sold eventually. This indicates a significantly high total pass-in rate, roughly about 44 % (which would be also a clear indicator for the rate of potential post-auction negotiations), and a

[1] The results are also consistent with Myerson (1981) and Samuelson and Riley (1981).

significantly low clearance rate (excluding prior private sales), roughly about 43 %.

In particular, in housing auctions in Australia and New Zealand, when the highest bid falls short of the reserve price and there is no vendor bid, the highest bidder gets the sole right to negotiate a "post-auction" selling price. That said, when the highest bid falls short of the reserve price, before the auction ends, the auctioneer may place a "final" vendor bid (and reveals to all the bidders that the bid is submitted by the seller). In such a case, either the highest bidder outbids that figure so as to get a chance to negotiate a "post-auction" selling price, or the property is "passed in on a vendor bid" and the house remains unsold.[2] Given significantly high pass-in rates and low clearance rates, it is of particular interest to delineate the implications of subsequent negotiations when the reserve price is not met in auctions.

In this short paper, we take such post-auction negotiations as a fact of life, but do not suggest or discuss any alternatives or optimal mechanisms. It is well known that a lack of commitment to allocation rules will make a seller worse off (see, for example, McAdams and Schwarz, 2007a, 2007b, Skreta, 2015, and Vartiainen, 2013). Our study shows that the seller cannot improve even if she has all the bargaining power in the negotiations. Interestingly, Vartiainen (2013) finds that the ascending-bid auction is also chosen as an optimal mechanism if the seller cannot commit not to use any other mechanism after the auction. The reason is that the ascending-bid auction reveals as little information about the bidders' valuations as possible, and this effect makes up for the commitment problem not to use this information after the auction. This is also true in our setup, but we will show that the lack of commitment not to enter into subsequent negotiations will make the seller worse off also in this environment.

# 2 A model of an ascending-bid auction with subsequent negotiations

We consider an ascending-bid auction with private values: the utility of a risk-neutral bidder $i$ (when bidder $i$ owns the object) depends on his private signal $s_i$ and is given by $U_i = s_i$. Private signals are drawn independently from the cdf $F(s)$ with bounds $\underline{s}$ and $\overline{s}, 0 \leq \underline{s} < \overline{s}$ such that $F(\underline{s}) = 0$ and $F(\overline{s}) = 1$, and $F(s)$ is differentiable such that

[2]Given "The Fair Trading Act of New Zealand" does not allow any advertising or reference to a "higher" vendor bid as the amount for which the property had been passed in so as to control misleading and unfair re-marketing strategies, such vendor bids cannot be used solely to improve post-auction market prices. See Koska et al. (2017) for an analysis of the strategic use of vendor bids in housing auctions.

the pdf $f(s) = F'(s)$ exists. Furthermore, we assume that $F(s)$ is log-concave implying that the inverse hazard rate $h(s) = [1 - F(s)]/f(s)$ is monotonically decreasing. The utility of the seller (had the object been left unsold) is given by $V = v$ where $v$ is drawn independently from the cdf $G(v)$ with bounds $\underline{v}$ and $\overline{v}$, $0 \leq \underline{v} \leq \overline{v} \leq \underline{s}$ so trade is always socially desirable. We do not make any assumption on $G(v)$, and we also allow $\underline{v} = \overline{v}$.

Assume that the seller does not (yet) set a reserve price and runs an ascending-bid auction with one addition: once the second-highest bidder has dropped out of the auction at bidding price $s_2$, the seller and the highest bidder start negotiations. In line with empirical evidence, we assume that $s_2$ is a binding lower bound of the sales price such that the highest bidder is bound to accept $s_2$ if this is suggested to him during the negotiations, and he cannot make an offer that is strictly below $s_2$. In order to determine the outcome of these negotiations, we follow the notion of the neutral bargaining solution that is a generalization of the Nash bargaining solution for two-person bargaining problems with incomplete information (see Myerson, 1984). We are not interested in any efficiency properties,[3] but use the setup of a random dictatorship: with probability $q$, the seller will make a take-it-or-leave-it offer to the highest bidder, and with probability $(1 - q)$, the highest bidder will make a take-it-or-leave-it offer to the seller, where $0 \leq q \leq 1$.

To begin with, assume that $q = 1$: the seller has all the bargaining power. She either accepts the bid $s_2$ or makes a take-it-or-leave-it offer $x$ to the highest bidder. In this sense, this offer is an *ex post* optimal reserve price. Once the highest bidder is identified, Bayesian updating implies that the valuation of this bidder is distributed according to

$$F_1(x, s_2) = \frac{F(x) - F(s_2)}{1 - F(s_2)}, f_1(x, s_2) = \frac{f(x)}{1 - F(s_2)}, \tag{1}$$

where $F_1(x, s_2)$ and $f_1(x, s_2)$ denote the cdf and pdf of the valuations of the highest bidder. Using eq.(1) and the inverse hazard rate expression, we find that

$$h(x, s_2) = \frac{1 - F_1(x, s_2)}{f_1(x, s_2)} = \frac{1 - F(x)}{f(x)} \equiv h(x) \tag{2}$$

such that the inverse hazard rate does not change with the Bayesian update. The seller maximizes $(1 - F_1(x, s_2))\,(x - v)$ w.r.t. $x$. Using eq.(1) and eq.(2), and following

[3]Our auction setup is not efficient as the valuations of the seller and the buyers do not overlap, but it may happen that no trade will take place. Due to no overlap, the Myerson-Satterthwaite Theorem (Myerson and Satterthwaite, 1983) does not apply, so we cannot rule out that an efficient mechanism outperforming the ascending-bid auction will exist.

Kuhn-Tucker conditions, we can write

$$h(x^*) - (x^* - v) \leq 0, x^* \geq s_2, (h(x^*) - (x^* - v))\,(x^* - s_2) = 0, \tag{3}$$

where the last expression follows from the complementary slackness condition. In case of an interior solution, $h(x^*) - (x^* - v) = 0$ is equivalent to the optimal *ex ante* reserve price. The reason is that the Bayesian update increases both the probability of accepting $x$, measured by $[1-F(x)]/[1-F_1(x, s_2)]$, and the marginal loss if $x$ is rejected, measured by $f(x)x/[1 - F_1(x, s_2)]$, *proportionately* by the factor $1/[1 - F_1(x, s_2)]$, and thus the Bayesian update is irrelevant for the optimal policy. Since *ex ante* and *ex post* reserve prices coincide, the subsequent negotiation is meaningless for the seller: she accepts $x^* = s_2$ if $h(s_2) - (s_2 - v) \leq 0$, and this would also have happened if she had set an *ex ante* reserve price according to $h(x^*) - (x^* - v) = 0$. If $h(s_2) - (s_2 - v) > 0$, the highest bidder would bid up to his valuation and either reach $x^*$ or not, and this is equivalent to setting a reserve price optimally *ex post*. Since $h(x^*) - (x^* - v) = 0$ does not depend on any Bayesian update, the highest bidder is indifferent between entering negotiations with the seller or bidding up to his valuation.

Consequently, under the assumption that the seller has all the bargaining power, the expected revenue of the seller does neither depend on the reserve price regime nor on subsequent negotiations, and we consequently find:

**Lemma 1** *If $q = 1$, subsequent negotiations in a private value ascending-bid auction do not change the expected revenues of the seller.*

Lemma 1 holds only if all the bargaining power rests with the seller. What are the implications if this is not the case and the highest bidder has some bargaining power in subsequent negotiations and were in a position to make a take-it-or-leave-it offer $y$ to the seller with some positive probability? If the reserve price has been met, the highest bidder wins the auction without any subsequent negotiations with bid $s_2$. If the reserve price has not been met, it is now a dominated strategy to increase the bid beyond $s_2$ as the highest bidder would only worsen its bargaining position in any subsequent negotiations. Thus, the highest bidder will prompt negotiations immediately when the second-highest bidder has dropped out. If he makes the offer and since $s_2 > \overline{v}$, $y^* = s_2$ as the bidder knows that the seller's valuation is lower.[4] If $q = 0$, that is, the highest bidder

[4] If the second-highest bidder could undercut $s_2$, $y^* \leq \overline{v}$, but our results would not change.

has all the bargaining power, the auction is strategically equivalent to a second-price auction without reserve price with a lower expected seller revenue. We thus conclude:

**Proposition 1** *Subsequent negotiations in a private value ascending-bid auction make the seller worse off if* $q < 1$.

Hence, running an auction without negotiation option is a weakly dominant strategy of any seller in a standard private value ascending-bid auction.

# 3 Concluding remarks

This paper shows that subsequent negotiations make a seller worse off in a standard private value ascending-bid auction. The seller would be better off if she or her auctioneer could commit not to enter negotiations once the auction is over without sale. This result raises the question why subsequent negotiations are observed so frequently. First, there may be no way to design English auctions such that negotiations can be avoided once the seller has identified the highest bidder and vice versa. Contractual freedom thus may make any announcement not to negotiate incredible. However, this leaves us with the question why the seller does not run a second-price sealed bid auction instead in which bidders will bid their valuations. The reason could be that bidders do not trust the auction format that they will have to pay the second-highest bid only, as they have to rely on the trustworthiness of the seller and the auctioneer not to inflate the second-highest bid, and if they do, they prefer an oral auction. Furthermore, a first-price auction with subsequent negotiations will not lead to separating equilibria as bidders will improve their bargaining position if they do not reveal their type through their bid.

Second, we have assumed a private value auction. If valuations are interdependent and affiliated, it is well known that the *ex ante* reservation price decreases with the number of bidders and approaches the seller's utility (see for example Levin and Smith, 1996). One reason is that the difference between the second-highest and the highest valuation grows small such that the gain from using a reserve price becomes smaller. Furthermore, the probability that the reserve price is binding becomes smaller in a private value auctions with the number of bidders, but does not necessarily do so in an auction with interdependent and affiliated values. However, if the reserve price is already low to begin with, subsequent negotiations should not be observed very often.

Finally, subsequent negotiations increase the sales probability. It is in the interest of the auctioneer to allow for subsequent negotiations, in particular, if the auctioneer's commission is a percentage rate of the sales price. Thus, it seems that subsequent negotiations occur because they can hardly be avoided if the auction has failed to sell, and they are in the interest of the auctioneer. In fact, anecdotal evidence suggests that auctioneers in property markets sell the idea of running an action also as a device to identify the most interested buyer.

# References


[1] Eves, C. 2006. Residential sales by auction: A property type or geographic consideration. Conference paper: 13th European Real Estate Society Conference, June 7-10, 2006 Weimar, Germany.

[2] Koska, O.A., Onur, I., Stähler, F. (2017) The economics of vendor bids, ERC Working Papers 1711, ERC - Economic Research Center, Middle East Technical University.

[3] Krishna, V. (2002), *Auction theory*, Academic Press, San Diego.

[4] Levin D. and J.L. Smith (1996), Optimal Reservation Prices in Auctions, *Economic Journal*, 106: 1271-1283.

[5] McAdams, D.and M. Schwarz (2007a), Credible Sales Mechanisms and Intermediaries, *American Economic Review*, 97: 260-276.

[6] McAdams, D.and M. Schwarz (2007b), Who Pays When Auction Rules are Bent?, *International Journal of Industrial Organization*, 25: 1144-1157.

[7] Myerson, R.B. (1981), Optimal auction design, *Mathematics of Operations Research*, 6(1), 58-73.

[8] Myerson, R.B. (1984), Two-Person Bargaining Problems with Incomplete Information, *Econometrica*, 52: 461-488.

[9] Myerson, R.B. and M.A. Satterthwaite (1983), Efficient Mechanisms for Bilateral Trading, *Journal of Economic Theory*, 29: 265-281.

[10] Riley, J.G., Samuelson, W.F. (1981), Optimal Auctions, *American Economic Review*, 71(3), 381-392.

[11] Skreta, V. (2015), Optimal auction design under non-commitment. *Journal of Economic Theory*, 159(2), 854-890.

[12] Vartiainen, H. (2013), Auction Design without Commitment, *Journal of the European Economic Association*, 11: 316-342.