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FEMM Working Paper No. 31, November 2008

F E M M

Faculty of Economics and Management Magdeburg

Working Paper Series

Otto-von-Guericke-University Magdeburg
Faculty of Economics and Management
P.O. Box 4120
39016 Magdeburg, Germany
http://www.ww.uni-magdeburg.de/

An Experimental Analysis of Parallel Multiple Auctions*

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November 27, 2008

Abstract

At online auction platforms we often observed that substitutable goods are auctioned concurrently with auctions ending at the same time. I introduce an experimental setup of three sellers and four buyers in an ascending second price auction environment where every seller runs one auction with a homogeneous good and the buyers are confronted with single unit demand. I find that sellers revenue is significantly lower than theory predicts due to the fact that some auctions did not receive bids whereas other auctions concentrated the bids of all bidders. Moreover, I observe a statistically higher revenue of sellers setting the minimum starting price. Furthermore, my study shows that the buyers submit bids which are significantly lower than the private valuation every buyer receives. Comparing the efficiency of the parallel multiple auction setup to a double auction control experiment, I find a significant lower efficiency in parallel multiple auctions due to the coordination failure of the buyers.

Keywords: simultaneous auctions, internet auctions, market design, electronic business

JEL classification: D44, C92

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*I thank Jacob Goeree and Abdolkarim Sadrieh as well as the audiences in Tucson and Magdeburg for helpful comments.

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1 Introduction

In recent years, particularly in the last decade, we can observe a surge in the number of offered online auctions. The focus of most of the existing literature lies on the standard auction assumption of one seller offering one item to n bidders. However, the largest online auction market eBay includes an increasing number of auctions. Especially, the number of concurrent auctions offering similar or even homogeneous goods is on the rise. There is some theoretical as well as empirical research dealing with parallel multiple auctions. In the theoretical models, the equilibrium outcomes are efficient, whereas the findings of the empirical studies observe efficiency losses.

In this paper I analyze participants' behavior and performance in a parallel multiple auction environment with homogeneous goods. One focus lies in the bidding behavior of potential buyers and the resulting impact on the efficiency of parallel multiple auctions. In addition, this paper studies how sellers can contribute to an efficient outcome. I present an experiment with three sellers each offering one unit of a homogeneous good and four bidders each with an one-unit demand. This market is organized in parallel ascending second price auctions. One research question is whether the four bidders can coordinate between the offered auctions and therefore attain in a efficient outcome.

I find that there exists coordination failure between the potential buyers due to late bidding and bid concentration on single auctions. This leads to a significantly lower efficiency in parallel multiple auctions compared to a double auction control experiment. Both bidders and sellers receive a significantly lower profit than predicted by theory. Despite of the high degree of competition on the side of the sellers in parallel multiple auctions, I did not find pattern that sellers decrease their starting price near their own private valuation. However, I find that the sellers setting the lowest starting price receive significantly higher revenues compared to the rest of the competing sellers.

The reminder of the paper is structured as follows. Section 2 presents the existing related literature for parallel multiple auctions. In section 3, I introduce the experimental design for the parallel multiple auctions setup as well as the double auction market control experiment. The section 4 is divided into three subsections, whereas the subsection 4.1 depicts the result for the seller side. Subsection 4.2 presents the outcomes for the party of the bidders. Finally, subsection 4.3 discusses the efficiency performance both for the parallel multiple auctions experiment and the double auction market experiment, section 5 concludes.

2 Related Literature

Stryszowska (2005) provides a theoretical model with two second price hard close auctions, each auction selling an identical item and three bidders with one-unit demand. She derives a bayesian nash equilibrium where during the bidding stages $t < T$ the bidders sort themselves in the order of their private values. For reaching a efficient outcome there is a minimum of $t =$ *number of sellers* required. Using the coordination mechanism of Stryszowska (2005) the bidders receive information about the ordering of their private valuation. The bidder i with the highest bid during $t < T$ in auction a is called the *current winner*, who will never submit a bid at the opposite auction. The *loosing bidders* will switch to the second auction and start a further sorting. In the last stage T all bidders submit their private value in their participating auction. According to this BNE the two bidders with the highest values receive an item and have to pay a price which is equal to the private value of the third bidder. Thus, there are no efficiency losses. It is important to notice that there must be multiple bidding as well as cross bidding to get into the bayesian nash equilibrium. The theoretical relevance of cross bidding in multiple auctions is also shown by Zheng (2006). I will check for multiple bidding and cross bidding in my experiment, too (see subsection 4.2).

Peters and Severinov (2006) show in their theoretical model that there exists a bayesian nash equilibrium (BNE) in competing parallel multiple auctions. In their going-going-gone auctions every buyer has an one-unit demand whereas every seller offers one identical object. The endogenous pricing mechanism provides a sequential bidding among the potential buyers. After a new current highest bid is submitted, each bidder has the opportunity to submit a higher bid or to pass. The order of bidding in a bidding stage is same as the order of the entry of the bidders. The bidding procedure continues until all bidders pass. As a result of this mechanism Peters and Severinov (2006) find identical prices for all simultaneous auctions. There are two main differences between the two Models of Stryszowska (2005) and Peters and Severinov (2006). The first is the difference between the ending rules of the auction process. The second is that Stryszowska (2005) allows for simultanous bidding, whereas the bidding in the theoretical model of Peters and Severinov (2006) is sequential.

Kranton and Minehart (2001) show in a network motivated study that ascending auctions can result in an efficient outcome. They point out that a buyer and a seller must have a relationship to exchange goods. In their japanese auction, sellers offer identical items in simultanous auctions, where the price is equal across all sellers. As the price increases, every bidder has to decide either to stay in the bidding process or to drop out. The price for all auctions rises until enough bidders have dropped out of the bidding process and the demand is equal to the supply. All bidders who are still active have to pay an equal price. Kranton and Minehart (2001) derive a equilibrium at the point of outcome efficiency, where the bidders with the highest valuations each receive an item.

Bansal and Garg (2005) analyze bidding in ascending parallel multiple auctions with discrete bid increments via a local greedy bidding algorithm (LGB). According to this algorithm bidders should submit their bids on the auction that yields the highest expected profit. In the case of simultaneous auctions this will be an auction with the lowest standing price. Bansal et al. (2005) show that the LGB leads to almost efficiency. Nevertheless, they point out that the local greedy bidding cannot be a dominant strategy for bidders due to the fact that this algorithm increases the prices and thus profits decrease.

In their empirical work Anwar, McMillian and Zheng (2006) collect data for Intel Pentium CPU's on the internet auction site eBay. They divide their data set into three samples, i.e. the daily-, hourly- and the minute wise sample. Particularly the minute wise sample, where the auctions end within one minute, provides empirical evidence for parallel multiple auctions. Anwar et al. (2006) show that 76 percent of the bids were submitted on the auction with the lowest current price. Furthermore, the data suggests that the bidders tend to bid across the parallel auctions. They found that these cross-bidders pay a 9 percent lower price. Both results are statistically significant.

Tung, Gopal and Whinston (2003) examine data for VCR/DVD Player and Mini DV Camcorder from a popular online auction house. In contrast to Anwar et al. (2006) they found that the number of bidders participating in more than one auction is relatively small. Furthermore, no bid submitted by a cross bidder leads to a succeeded auction. The prices observed by Tung et al (2003), exhibit a large dispersion among the auctions. They conclude that poor coordination between the bidders could lead to efficiency losses.

3 Experimental Design

The experiment was conducted in December 2005 at the Magdeburger Experimental Laboratory (MaXLab) at the University of Magdeburg. The programming and implementation was performed with the software z-Tree (Fischbacher 2007). All subjects were undergraduates from the University of Magdeburg, recruited with the online recruitment system Orsee (Greiner (2004)). The subjects were paid according to their performance.

Each subject was paid an average amount of 10 Euro per hour, which is equivalent to the regular hourly wage rate of students. Every experiment session lasted nearly 1.5 hours.

An ascending second price auction format is used, with six bidding stages in each auction. I use a hard close ending rule just as assumed in the theory of Stryszowska (2005). With the six bidding stages, I provide more bidding stages than needed for a coordination to an efficient outcome. Each of the experimental sessions involved fifteen single auction rounds.

On the supply side there are three different seller, each offering one unit of a homogeneous object. Each seller can determine a starting price for his own auction. All three sellers have an endowment of 300 ECU[1]. The private valuation of the sellers for every single auction of each round was independently drawn from an uniform distribution between $[20, 80]$. All sellers were informed that they were confronted with two further sellers and that all three auctions were running in a parallel environment. A screenshot for the decision situation of a single seller is contained in the appendix (see figure 10). On the demand side there are 4 bidders, each with a one unit demand. Every private valuation for the one unit was independently drawn from an uniform distribution with domain $[50, 150]$. Due to the one unit demand of every single bidder the private valuations for items $n > 1$ were equal to zero. Every bidder was provided with an endowment of 300 ECU. A screenshot for the decision-situation of a single bidder is contained in the appendix (see figure 11).

Bidders receive information about their own endowment and their private valuation. Furthermore, bidders have identical information about the three different auctions: the starting price, the current standing price, and the second highest bid history of every bidding stage. Bidders could submit bids in each of the three different auctions at every bidding stage. However, they could also decide not to submit any bid in an auction. Due to the

[1]The exchange rate in this experiment was 1 Euro = 0,017 experimental currency unit (ECU).

fact that sellers offer their items every auction round in a different auction, which follows a random process, the bidder cannot identify the seller‘s identity behind the auctions.

After each auction round the bidders receive information about the starting prices, the final prices, the second highest bid history, and their own submitted bid for every of the three auctions. The sellers also receive information about the starting prices, the final prices and the second highest bid history. Furthermore, all subjects receive individual information about their completed transactions, their profit at this stage, and their current endowment.

The three sellers and the four bidders remain in their roles and their matching for all fifteen auction rounds. I conducted seven sessions with 21 subjects (3 independent groups each) and hence a total of 147 subjects participating in this parallel multiple auction experiment. Altogether there exist 21 independent observations.

To compare the efficiency performance of the parallel multiple auction setup, I run a double auction market experiment in the Magdeburg Experimental Laboratory (MaXLab). The above experiment was also conducted in December 2005. To establish comparability between the two markets, I use an identical setup for the valuations, assigning a private valuation drawn from the uniform distribution between $[20, 80]$ to each seller and a private value drawn from a uniform distribution over the intervall $[50, 150]$ for each buyer. As in the parallel multiple auction experiment I conducted 7 sessions with 21 independent observations.

4 Results

In the following, I analyze the data with respect to the side of the seller, the side of the bidder and the efficiency. Further, in order to account for change of behavior over the time, I group the results of the auctions of each independent auction group into three sections of five auction rounds (1-5, 6-10, 11-15). I run statistical tests for all of these three sections. The results are based on 21 independent observations. The comparisons of the experimental results to the theory are based on the research work of Stryszowska (2005).The first subsection investigates the market side of the sellers, whereas the second subsection examines results for the bidders. In the third subsection, I consider for efficiency aspects compared to the efficiency of a double auction market.

4.1 The Sellers

Due to the fact that the sellers offer a homogeneous good, the only way to differentiate the own product from those of the two other sellers is to choose a different starting price. A priori one might expect the higher degree of competition between the seller in parallel multiple auctions decreases the starting prices. On the other hand Riley and Samuelson (1981) show for one seller that the optimal reservation price lies above the private valuation of the seller. Figure 1 presents the ratio of starting price to private valuation.

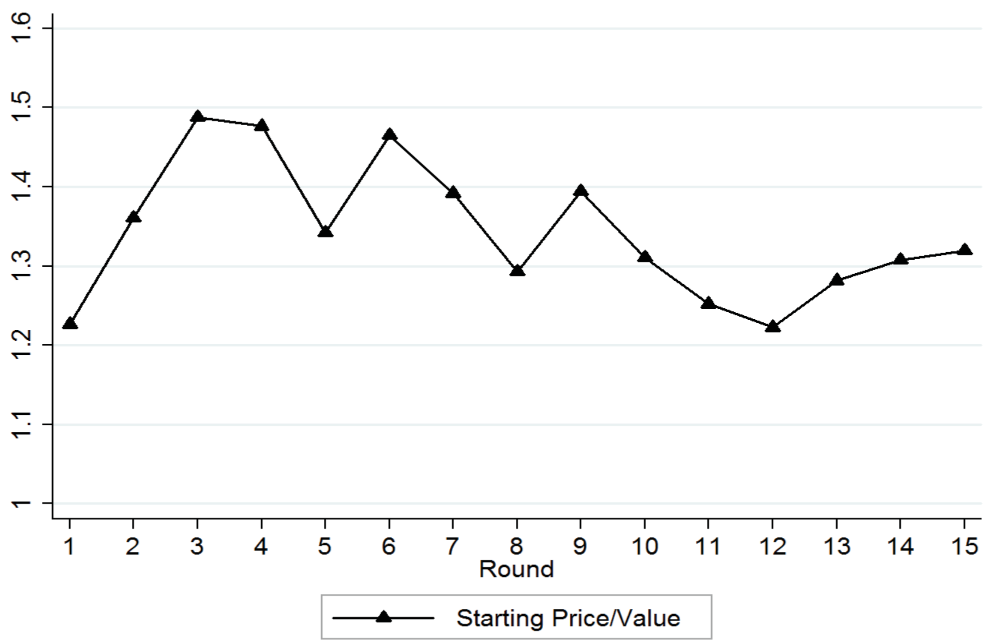

Figure 1: Ratio Starting Price to Private Value

As shown in Figure 1 the starting price to the private valuation ratio lies above the benchmark value of 1.0 for all auction rounds. This means that the starting prices set by the sellers are significantly higher than their private value ($p < 0.01$ according to two-tailed Mann Whitney U Test). Hence, the higher degree of competition in parallel multiple auctions did not result in starting prices being near the private valuation of the sellers. On the contrary, the ratio of the starting price to the optimal reserve price according to Riley and Samuelson (1981) is located below the 1.0 benchmark for all rounds. I found significantly lower starting prices compared to the optimal reservation price on a p-value $p < 0.01$, according to two tailed Mann Whitney U Test.[2]

In the case bidders number exceeds the number of the sellers by one participant, both Peters and Severinov (2006) and Stryszowska (2005) show that the revenue in each auction equals the private valuation of the bidder with the (n-k)'s private valuation. Furthermore, theory predicts that all auctions are transacted successfully. Figure 2 depicts the ratio of the observed revenue to the revenue according to theory. Figure 2 also shows the ratio of the observed to expected revenues by the theory for the seller with the lowest starting price within his group.

Figure 2 indicates that the revenue in the experiment is significantly lower than the theory predicts ($p < 0.01$ according to two tailed Mann Whitney U Test). Figure 2 also shows that sellers setting the lowest starting prices on average earn more than predicted by theory. In fact, applying the two tailed Mann Whitney U Test, I find significantly higher revenue on a significant level of $p < 0.01$.[3] Furthermore, I test the revenue of the seller who sets the lowest starting price against the average revenue of the remaining sellers. The Wilcoxon Sign Rank Test (two tailed, $p < 0.01$) identifies a significant higher rev-

[2] These results also hold in each of the three sections (1-5, 6-10, 11-15).

[3] For the rounds 6-10 and the rounds 11-15 I found significantly higher revenues on a $p < 0.05$, whereas the result for rounds 1-5 is not significant ($p = 0.777$).

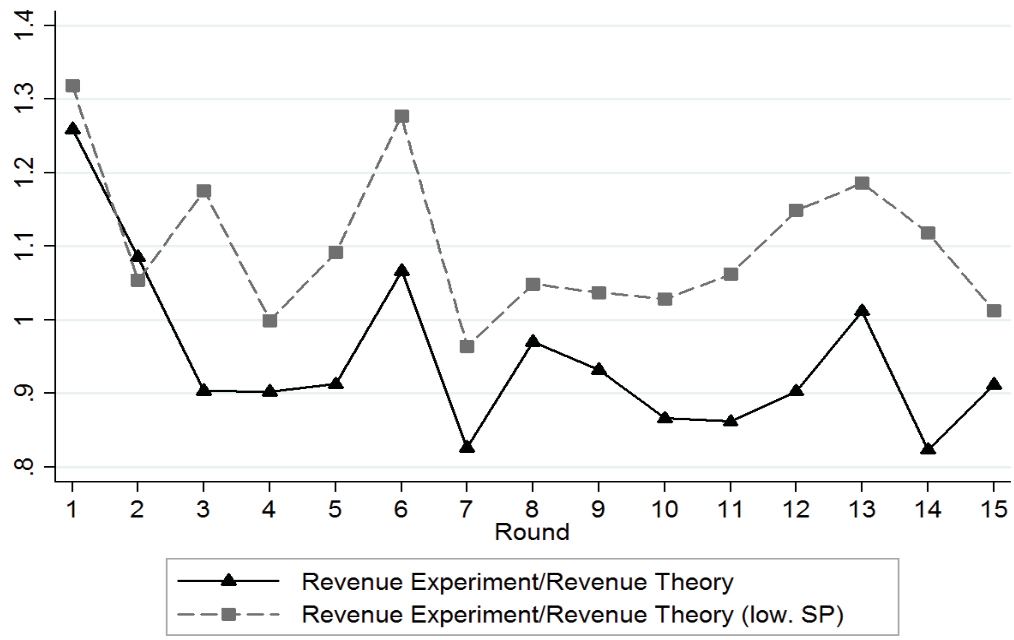

Figure 2: Ratio of observed to theoretically predicted revenues

enue for the sellers setting the lowest starting price.[4]

One reason for the lower revenues could be the existence of auctions that did not succeed successfully. According to the theory all auctions should receive relevant bids from the buyers. It follows that all auctions should end with a transaction. Figure 3 shows the average frequency of unsuccessful auctions both over all sellers and only over the sellers with the lowest starting price.

The bars of the average frequency of unsuccessful auctions over all sellers lies strictly above the zero line for all auction rounds. While this frequency is relatively low for the first two auction rounds, the frequency increases to a level between 0.15-0.25 for the following rounds. The result that the number of unsuccessful auctions is greater than the frequency of unsuccessful auctions of zero predicted by theory is significantly higher

[4] I also find significantly higher revenues for the seller with the lowest starting price in rounds 1-5, 6-10 and 11-15 using Wilcoxon Sign Sank Test (two tailed, $p < 0.01$).

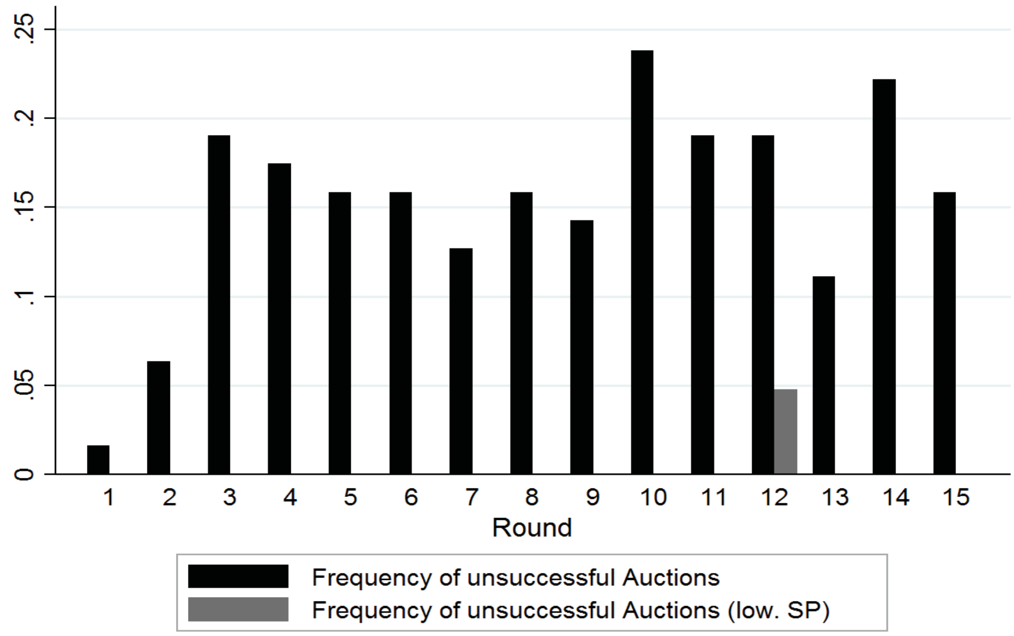

Figure 3: Frequency of unsuccessful auctions

using the one tailed Mann Whitney U Test ($p < 0.01$). In contrast the frequency of unsuccessful auctions for sellers setting the lowest starting price is located nearly at the neutral axis. Merely for the auction round 12, I observe a positive frequency of unsuccessful auctions. Using the one tailed Mann Whitney U Test I did not find significant differences that the mean is different from zero ($p = 0.6346$). I found a significant lower frequency of unsuccessful auctions for sellers setting the lowest starting price compared to the remaining sellers (using two tailed Wilcoxon Sign Rank Test $p < 0.01$).

Summarized due to the results for the frequency of unsuccessful auctions, I can suggest that the sellers setting the lowest starting price seem to be attractive for the potential buyers which is associated with a reasonable size of submitted bids. I observe in the parallel multiple auction experiment that the remaining sellers are confronted with a positive probability, that they did not accomplish a transaction. This could be a sign that there is a coordination failure on the demand side. I will continue the analysis of possible coordination failures in the next subsection.

4.2 The Bidders

Figure 4 shows the ratio of the bidders´ observed to the theoretical profit according to Stryszowska (2005). As Figure 4 depicts, I observe a low ratio for the profit in the experiment to the profit theory predicts in the round 1 and round 2. This ratio increases within the next rounds with its peak in the seventh round where the ratio reaches the highest value of 0.93. Afterwards the curve settles down to a level between 0.6 and 0.75. I find a significant difference in the average profits in the rounds 1-5 as compared to the rounds 6-10 and rounds 11-15 using the Wilcoxon Sign Rank Test (two tailed, $p < 0.05$).[5] Obviously, bidders learn to achieve higher profits towards the end of the experiment. However, on average bidders receive significantly lower profits in all round than predicted by theory (using two tailed Mann Whitney U Test, $p < 0.01$).

There are three possible reasons for observing profits lower than predicted. First, bids may be too high. Second, there may be coordination failures keep high value bidders from buying an item. Third, some bidders face exposure problems, i.e. may buy more than one unit.

4.2.1 Higher Bids

To check the bidding behavior of the buyers, I examine the ratio of the maximum bid to the private valuation of the bidders. Let the maximum bid of a bidder be the highest bid, that bidders submitted on one of the three auctions. Figure 5 shows the average ratio of the observed bids to the private valuation for all six bidding stages. Surprisingly, I find the observed bid to value ratio is significantly lower than 1.0 (using two tailed Mann Whitney

[5] I did not find any significant differences comparing the second section (6-10) with third section (11-15) (Wilcoxon Sign Rank Test two tailed $p = 0.3219$).

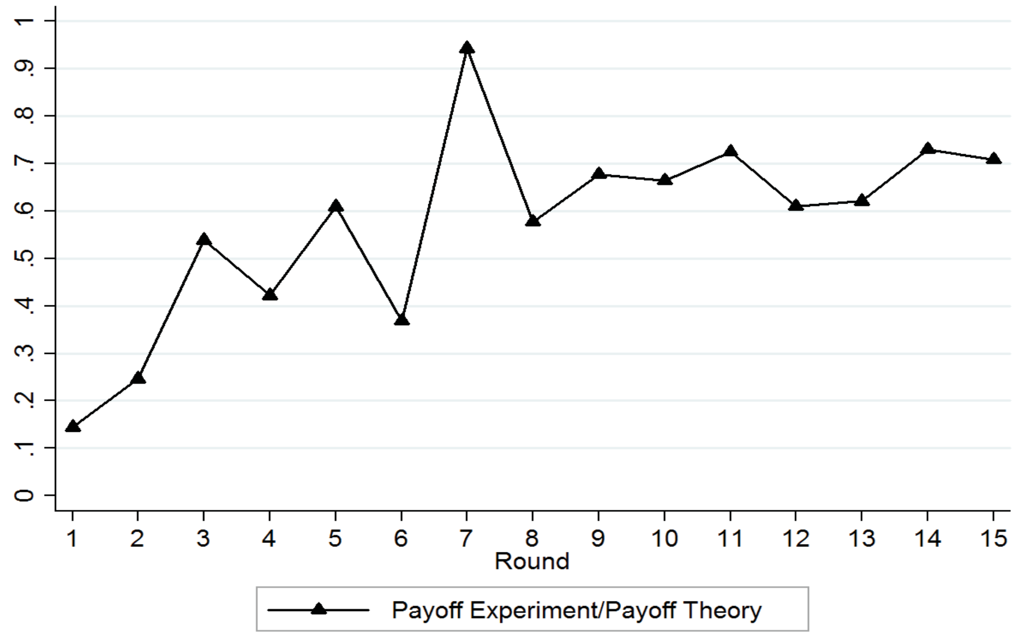

Figure 4: Ratio of observed to theoretically predicted payoff

U Test, $p < 0.01$). In addition, I find that the difference between the bids in the bidding stages 1-5 to the bids in the last bidding stage (stage 6) increases over the auction rounds. Therefor, the buyers submit the main part of their final bid in the last bidding stage, which could be a sign for sniping. Ockenfels et al. (2006) show that bidders submit their bids very late in auctions with a hard close ending rule.

4.2.2 Coordination Failures

The second reason for the lower profit may be the coordination failure between the bidders. Stryszowska (2005) shows that $t = \textit{number of sellers}$ coordination stages are needed before the last stage T for a successful coordination between the bidders among the offered auction. Figure 6 depicts the development of the average entrance stage for bidders sorted by their valuations.[6] According to the theory the four bidders should enter the parallel auctions not later than in the third round. The figure shows that this is the case

[6]The entrance stage of a bidder is the bidding stage in which a bidder submits his first bid on one of the three auctions.

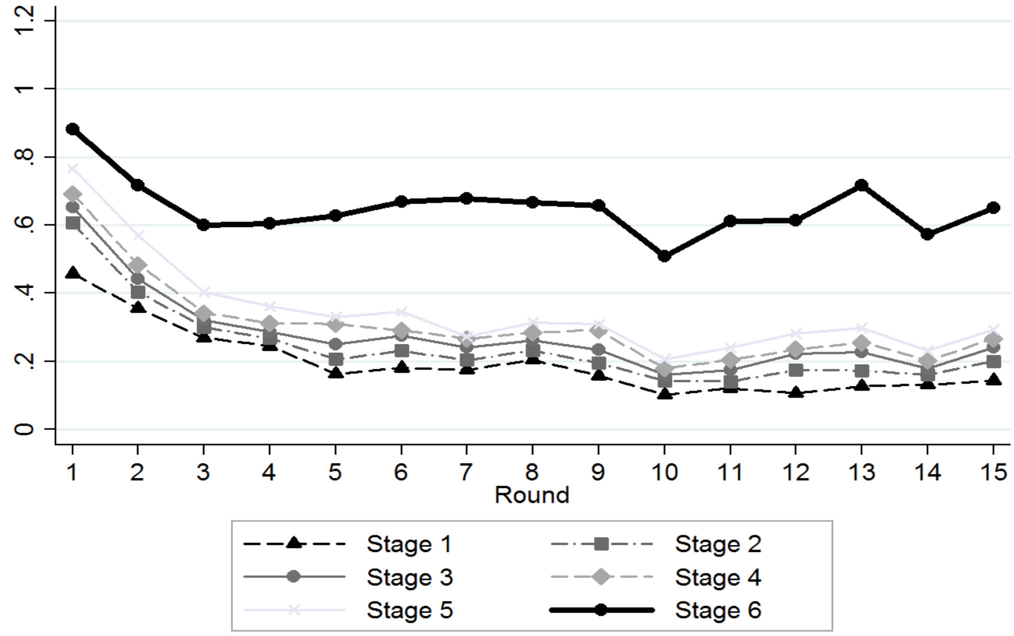

Figure 5: Ratio bid to private valuation

for the first section (1-5). However, with the beginning of the second section (round 6), the average entrance stage lies between the bidding stage 3 and the bidding stage 4. The entrance stage for all bidders for the round 6-15 is significantly higher than the entrance stage for the rounds 1-5 using Wilcoxon Sign Rank Test ($p < 0.01$). I also observe that the bidder with the lowest valuation on average enters the parallel auctions environment earlier than the rest of the bidders. Due to this pattern the bidder with the lowest valuation sometimes wins an auction. This has a negative effect on the efficiency. However, the differences in the entrance stage among the bidders are not statistically significant.[7]

Furthermore, I examine bidder's behavior and categorize it by the willingness to bid at more than one auction in a parallel multiple auction environment. There exist three different bidder types. First, *single object bidders* who submit bids just in one single object. Second, *cross-bidders* who switch between the objects. Third, *multi object bidders* who

[7] I find no significant differences between the entrance bidding stage using a pairwise Wilcoxon Sign Rank Test ($p > 0.05$).

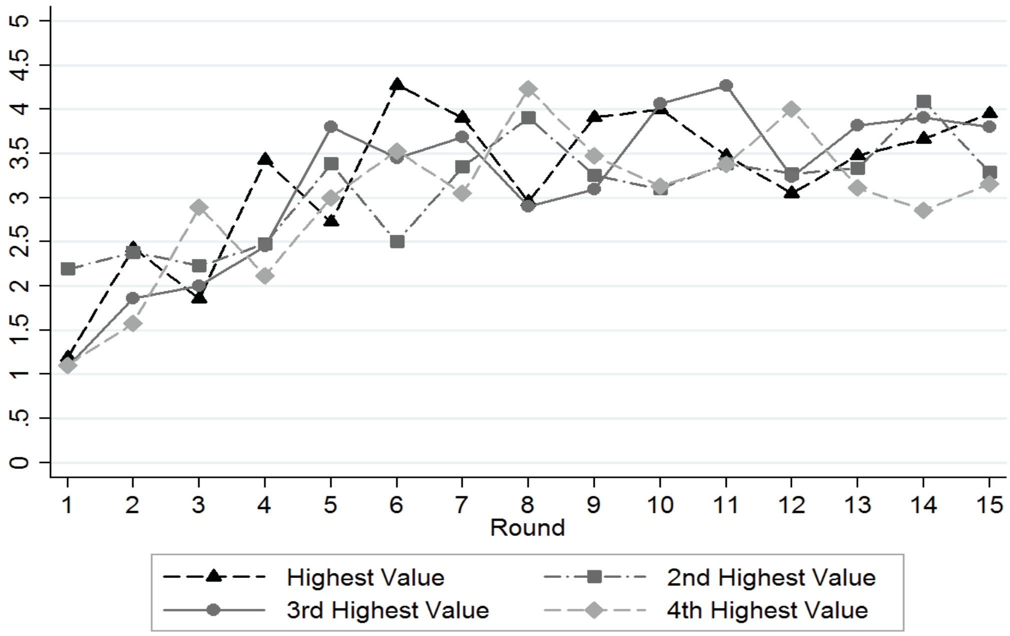

Figure 6: Average entrance stage

submit bids in more than one object. Stryszowska (2005) has shown the relevance of cross-bidders for the efficiency. Figure 7 shows the bidder categorization. For the rounds 1-5 the average proportion for cross-bidders is about 25 percent. The average proportion for the multi object bidders decreases for this section, whereas the average proportion for the single auction bidders increases. However, for the rounds 6-15 the proportion of the single object bidders is the highest with about 60 percent. Both, the proportion for the cross-bidders and the multi object bidders stay on a low level (< 20 percent each). Thus, I can conclude that the bidders only concentrate on one single auction of the three offered auctions, which also is an indication for coordination failures. Both the result for the entrance stage and the result for the bidder type show that the behavior of the buyer complicates the coordination over the three auctions. Furthermore, I find that the profits of bidders who submit bids in one single object are statistically higher compared to the profits of multi object bidders and cross-bidders for the rounds 1-5 (using Wilcoxon Sign Rank Test, $p < 0.01$). For the rounds 6-10 single object bidders earn significant higher payoffs comparing to multi object bidders (using Wilcoxon Sign Rank Test, $p < 0.05$).[8] However, I find that the differences in the profit between the three bidder types are statistically indistinguishable for the rounds 11-15.

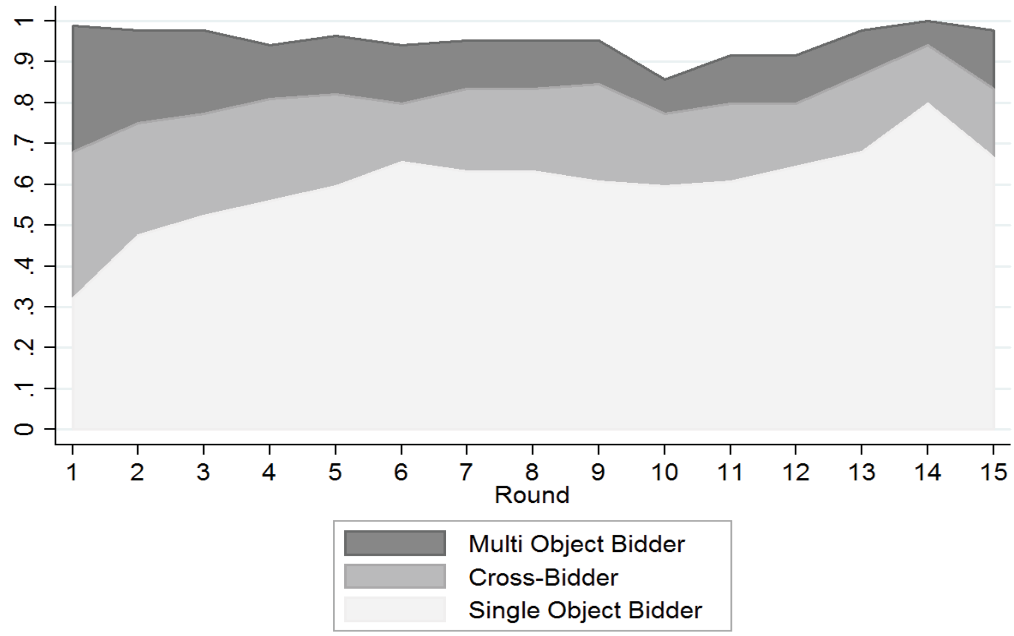

Figure 7: Bidder categorization

4.2.3 Exposure Problems

The third reason for the lower profit in the experiment comparing to the profit in the theory in particular for the first section (round 1-5) results from the frequency of exposure. With exposure I refer to situations in which a bidder wins more than one auction. Due to the one-unit demand constraint this leads to a profit reduction. Figure 8 shows the frequency of exposure for the parallel multiple auction experiment.

Figure 8 indicates the high frequency of exposure for the first rounds, in which nearly 50 percent of the bidders win two ore three units. However, Figure 8 also shows that subjects

[8] I did not find any significant difference in the profit between single object bidders and cross-bidders for the rounds 6-10.

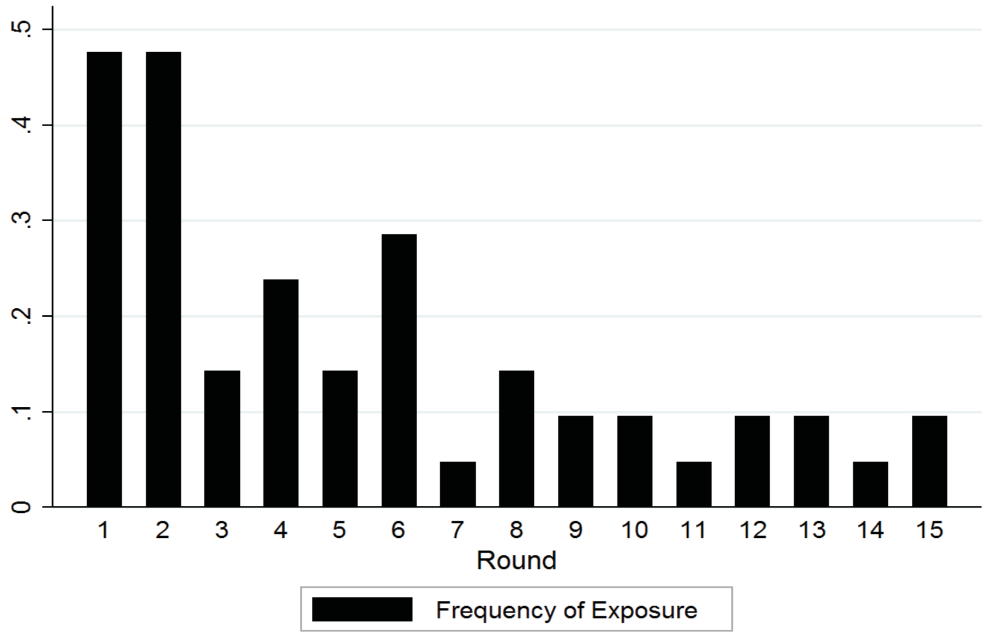

Figure 8: Frequency of exposure

learn to deal with the problem of multiple high bids resulting in a decreasing frequency of exposure. Hence, I find a significantly lower frequency of exposure in the last section (11-15) and the second section (6-10) compared to the first section (1-5) using the Wilcoxon Sign Rank Test (two tailed, $p < 0.01$).[9]

4.3 Efficiency

To analyze possible effects on the efficiency of parallel multiple auctions, I compare the mean observed efficiency in parallel multiple auctions to the mean observed efficiency of a equivalent double auction environment. There exists a large amount of theoretical, empirical and experimental papers dealing with double auction markets including the efficiency thereof. Smith (1981), Krishna and Perry (1998), Plott and Grey (1990) as well as Noussair et al. (1998) have shown that double auction markets provide for high efficiency. Due to this reason, double auction markets seem to be a suitable reference for the

[9] I did not find significant differences in the frequency of exposure between the rounds 6-10 and the rounds 11-15 (Wilcoxon Sign Rank Test two tailed $p = 0.1368$).

efficiency of parallel multiple auctions. Figure 9 shows the mean efficiency for both the parallel multiple auctions and the double auction market.

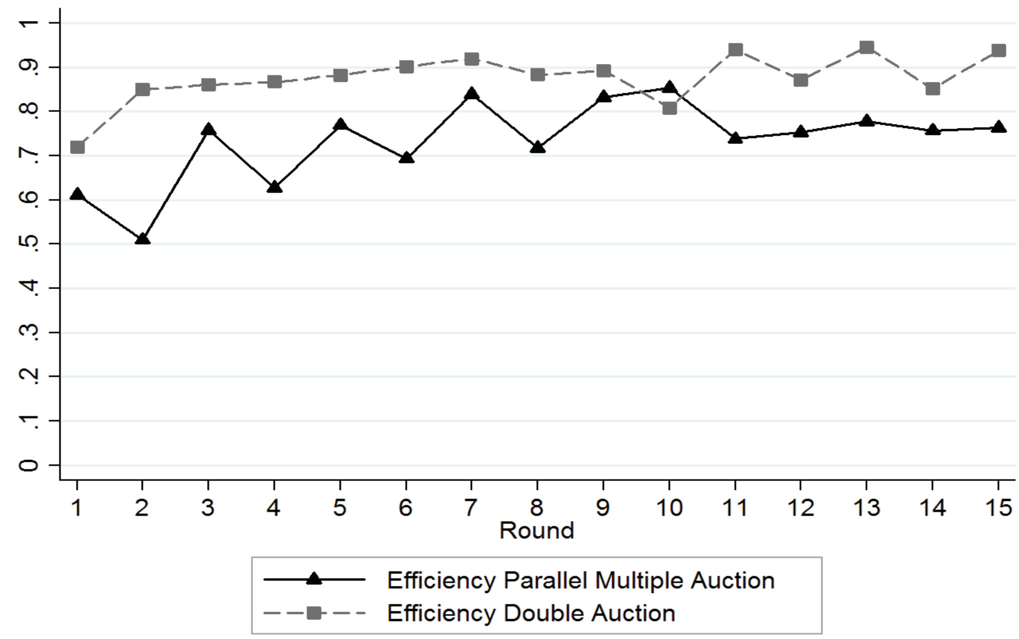

Figure 9: Efficiency

The efficiency of both market types is below 100 percent. However, the mean efficiency for the double markets is higher than the efficiency for the parallel multiple auctions in every round excluding round 10. This result is statistically significant on a $p < 0.05$ using the two tailed Mann Whitney U Test. The development of the mean efficiency for the parallel multiple auctions is remarkable. Whereas the efficiency for the double auction setup is nearly constant at a level of 90 percent, the mean efficiency for the parallel multiple auctions changes over time. I observe for both, the first section and the third section, a lower efficiency comparing this section to the second section.[10] The lower efficiency for the first section (round 1-5) is based on the high frequency of exposures shown in subsection 4.2.3. The efficiency losses for the last section result mainly from the coordination failure between the bidders shown in subsection 4.2.2.

[10]This efficiency differences are evident but unfortunately not significant.

5 Conclusions

In this paper, I investigate the results of a parallel multiple auction experiment to compare them to the theoretical and empirical evidence. Theory predicts that the sellers receive a revenue which is equal to the private valuation of the k^{th}-bidder in a n seller and m bidder case ($k = n - m$) for $n > m$. However, the results of the experiment show that while sellers on average receive significantly lower revenue than predicted by the theory, sellers setting the lowest starting price earn significantly more revenue than predicted. Surprisingly this does not induce sellers to decrease the starting price. Thus, this paper provides evidence that sellers should set low starting prices in parallel multiple auctions

There could be reason to expect that the bidders cannot coordinate in multiple parallel auctions. My analysis provides clear evidence for the presence of coordination failure. Late bidding and bid concentration complicates the achievement of successful transactions. The coordination failure leads to significantly lower profits for the bidders and lower efficiency than predicted by the theory.

These problems may be resolved by an auction design with a different ending rule. Füllbrunn (2006) introduces a candle auction which has a positive termination probability. This design induces bidders to submit serious bids earlier and may diminish coordination failure. In auctions with a soft-close ending rule, the duration of the auctions will only extend when the auctioneer receive a bid in the last bid stage. Auctions with soft-close ending rule cannot be a solution for coordination failures, because I observe that some auctions do not receive a single bid when auctions are run in parallel. A further alternative could be a delay in the ending times of the multiple auctions. Such overlapping multiple auctions allow the bidders to switch from auction to auction and thus improve coordination. A third solution could be that sellers coordinate by choosing points in time to start their auctions. Under these circumstances parallel multiple auctions can avoid. These three alternatives are open for further research.

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A Screenshots Experiment Parallel Multiple Auctions

Figure 10: Seller Decision in the Parallel Multiple Auction Experiment

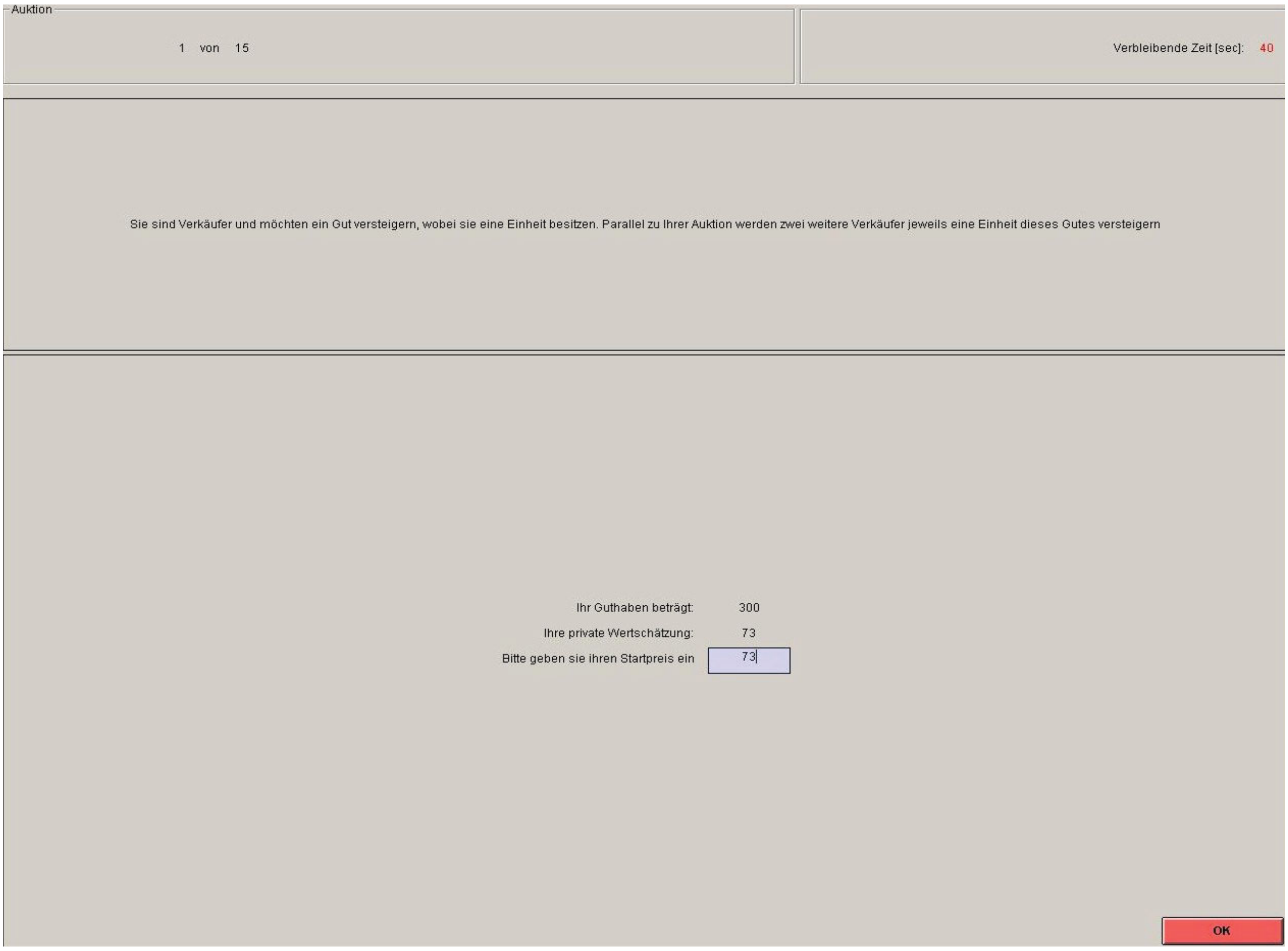
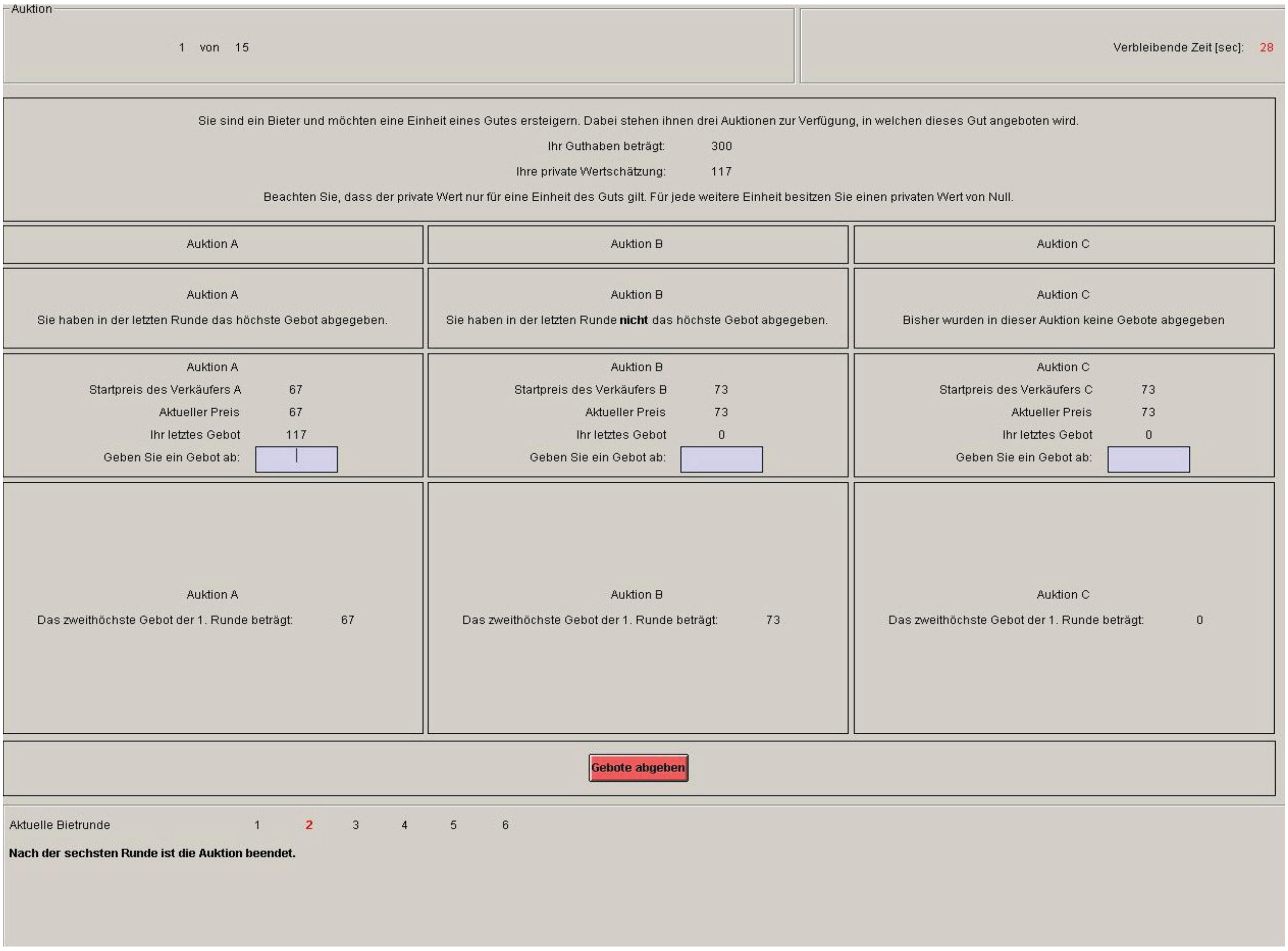


Figure 11: Bidder Decision in the Parallel Multiple Auction Experiment



B Instructions

Welcome to the Magdeburg experimental lab MAXLAB!

You are participating in a study in the context of experimental economic research concerning decision behaviour. During the experiment you will make a sequence of decisions. In doing so you will earn money. How much money it will be, on the one hand depends on your decisions and on the other hand on the decisions of the other players. Your entire profit will be paid to you in cash at the end of the experiment. Your decisions as well as your specific profit will be confidential, i.e. no other player will know about it.

The decision situation:

Your group consists of seven participants. All seven participants will only interact within the group. Just like you, the other six participants are currently located at a computer terminal. All participants have received the same instructions.

The group consists of three sellers and four buyers. After reading the instructions, but before the beginning of the experiment, you will be randomly assigned to a role. During the entire experiment you will be assigned to the same role.

Sellers:

You are in an auction setting. You will receive a credit of 300 ECU. In 15 sequent rounds you will face the following identical decision problem: You own a good, which you want to sell at auction. At the beginning of each round you are randomly assigned to a valuation of the good you want to sell. This valuation results from an uniformly distributed distribution [20,80]. This means that each number between 20 and 80 can be assigned to you with the same probability. In each auction round you have to fix a starting price for the auction. This starting price has to amount to at least 1 ECU. In addition to your auction, each other seller of your group is also selling one unit of the same good at auction.

These two sellers also own a credit of 300 MU and have also been assigned to a valuation from the uniformly distributed distribution [20,80]. During the 15 rounds, each seller will offer his good five times in auction A, five times in auction B and five times in auction C.

The random sequence of these auctions will not be announced. This means that bidders cannot identify which seller is selling his products in which auction. This auction is a second price auction. This means that the highest bidding player wins the bid but only has to pay the amount of the second highest bid.

The profit per round for the seller is:

profit = final price - private valuation

The total profit is the sum of all achieved profits of all performed rounds.

After each round you will receive the following information. All starting prices, final prices and the bidding structure of the second highest bid of all three auctions, will be displayed to all sellers. Furthermore you will receive information at which auction you have sold your good, your private valuation, your profit for the particular round and the total profit. The total profit is the sum of all achieved winnings of all auction rounds.

Buyer:

You are in an auction setting. You receive a credit of 300 ECU. In 15 sequent rounds you will face the following identical decision problem: Each round consists of three independent auctions with six bidding rounds. You have the possibility to buy one unit of a good in each auction. For the first unit you are randomly assigned to a private valuation. This valuation results from the uniformly distributed distribution [50,150]. This means that each number between 50 and 150 can be assigned to you with the same probability. For each further unit you have a private valuation of zero.

In each bidding round you have the possibility to bid in the auctions. In each auction you cab make at most six bids. In which auction and in how many auctions your submit bids is up to you. If your do not want to want to submit a bid leave the box blank.

This auction is a second price auction. This means that the highest bidding player wins the bid but only has to pay the amount of the second highest bid.

Profit for the bidder per round is:

profit = private valuation - sum of all final prices of auctions, in which one won the bid

The total profit is the sum of all achieved profits of all performed rounds.

The other buyers in your group also have also have a credit of 300 ECU and a valuation from the uniformly distributed distribution [50,150].

For each auction you receive information concerning the starting price and the current price of the auction. From the second bidding round on you will be informed whether you are the highest bidder or not, and if there has not been any bidding at all. Furthermore your given the bidding structure of the second highest bid of the previous rounds.

After each round you receive the following information: For each auction each bidder receives the information if he was the highest bidder and if he won the bid. In case two bidders equally hold the highest bid, chance decides who wins the bid. In addition to that each bidder receives information about his private valuation, the starting price and the final price of each auction. Furthermore, you receive information about your profit in the particular round and your total profit. The total profit is the sum of all achieved winnings of all auction rounds.

Pay-Out:
After finishing the 15 rounds your total profit and your starting credit of 300 ECU will be added up (i.e. your credit of the 16th round). The result will be multiplied by 0.017. The resulting amount will be rounded up and paid out to you in cash after completion of the experiment.

Remember: Your decisions are made anonymously from your computer terminal and your payment will be carried out confidentially.

Thank you very much for your participation!