Information Disclosure in Common Value Repeated Auctions

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Abstract

What is the optimal disclosure policy of a seller in a repeated auction? When identical and common value items are auctioned sequentially, information about the outcome of the elapsed auctions, like the winners bid, changes how the bidders value next item and could impact their bidding strategy. We analyse this issue in a twice repeated common value auction, both in theory and in the lab. We show that when the winning bid is disclosed at the end of the first auction, any symmetric equilibrium of the game necessarily involves some bunching at the top: the strategy profiles in the first auction are flat for bidders that receive the highest signals about the value of the object. However, the impact of that information disclosure on the sellers profit cannot be assessed analytically. Therefore, we turn to the lab. We observe that the sellers profit decreases with disclosure of the winning bid compared to the case where no information is disclosed at the end of the first auction. The main reason is that bidders decrease drastically their bids in the first auction when they know that the winning bid will be revealed: an anticipation effect. Moreover and as predicted by theory, bunching occurs for high value signals.

Keywords: First-price auctions, Common value auction, Information disclosure, Experiment.

JEL Classification: C73, C92, D44.

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1 Introduction

Theory: Virág (2007); Cheng and Tan (2010) ; Bergemann and Horner (2010) information disclosure policies in private value repeated auctions. Bergemann and Said (2010) provides a survey. Gershkov (2009)studies public information disclosure by the seller – related to our setting because bidding behavior depends on what is known about other's value.

Goeree and Offerman (2002) experiment mixing common values and private values. One treatment implements disclosure of public (exogenous) information about the common value.

Experimental test of the drainage disclosure model `http://economics.stanford.edu/files/Theses/Theses_2006/Mayefsky.pdf`. More precisely, the experiment test whether a better informed bidder tends to reveal this information – "*If the bidder who is already at an informational advantage acquires even more information, that bidder is best se rved by advertising this occurrence, since the increased gap in information between the bidders serves to intensify the winners curse.*"

"*Milgrom and Weber (1982) prove that, in the Nash equilib rium of the auction model that Wilson introduced, when a better informed player is given additiona l information, revealing that they possess that information is preferable to concealing that informations existence. However, should the less well informed player gain new information, he is best served by keeping it secret, or, if this is not possible, revealing as little as possible about the informations quality.*"

2 The Model

Two bidders compete in auctions for two units of an indivisible object. The value of each unit of the object is the same for both bidders and is equal to $\frac{v_1+v_2}{2}$. There is no endowment effect and this value does not depend on the number of units bought by the bidder. It is common knowledge that each variable v_i is independently and uniformly distributed on $[0, 1]$. Moreover, the realization of v_i is bidder i's private information. Utility is quasi-linear and if bidder i pays p for the object, his utility increases by $\frac{v_1+v_2}{2} - p$.

The game we consider consists in a sequence of two auctions. In each auction, one unit of the object is sold to the two bidders via a sealed-bid first-price auction with a reserve price set at 0.

The two auctions occur sequentially and we are interested in analysing the effect of the disclosure of some strategic information at the interim stage, i.e. at the end of the first auction.

2.1 No information is disclosed

As a benchmark case, let us consider the case in which no information is disclosed. In that case, after the first auction, bidders do not even know who won the first object. The corresponding game is equivalent to an auction in which each bidder submits simultaneously the two bids and its analysis is a straightforward extension of the single-unit first-price auction. In this single-unit auction, bidder i's strategy, $\tilde{b}_i(v_i)$, is a function of his private information v_i. Suppose bidder j plays $\tilde{b}_j(v_j)$, the utility of bidder i is given by:

$$u_i(b_i, v_i) = \int_0^{\tilde{b}_j^{-1}(b_i)} \frac{v_i + u}{2} du - \tilde{b}_j^{-1}(b_i).b_i,$$

The first-order condition for optimality of b_i yields:

$$\frac{\partial(\tilde{b}_j)^{-1}}{\partial b_i}\left(\frac{v_i + \tilde{b}_j^{-1}(b_i)}{2} - b_i\right) = \tilde{b}_j^{-1}(b_i).$$

Then by looking for a symmetric equilibrium in linear strategies, we obtain

$$\tilde{b}_i(v_i) = \frac{1}{2}v_i. \tag{1}$$

The equilibrium bidding strategy trades off three well-known effects. The first one is that a decrease in one's bid decreases the probability of winning. The second one is that it also increases the gains in case of winning because it decreases what the bidder pays. The last effect is the *winner's curse* and comes from the common value nature of the auction: winning is a bad signal on the other bidder's private information and therefore a bad signal on the object value. As a consequence of this trade-off, equilibrium bids are below *ex ante* expected value (which is $\frac{1}{2}v_i + \frac{1}{4}$ for bidder i endowed with the information v_i) When bidders play this equilibrium, the expected payment of a bidder is

$$U_i(v_i) = \int_0^{v_i} \frac{v_i + u}{2} du - \frac{1}{2}v_i^2 = \frac{v_i^2}{4},$$

and the expected profit of the seller is

$$\pi_S = \frac{1}{3}. \tag{2}$$

When the two units of the object are sold and no information is disclosed, the profit of the seller is therefore

$$\Pi_S = \frac{2}{3}. \tag{3}$$

We summarize this analysis in the next Proposition.

Proposition 1 *When no information is disclosed after the first auction, each bidder follows the same equilibrium strategy* $b_i(\cdot)$ *in the two auctions, with* $b_i(v_i) = \frac{v_i}{2}$. *The overall expected profit of the seller is* $\Pi_S = \frac{2}{3}$.

2.2 Disclosure of the winning b_i

Consider now the case in which the seller announces the price at which the first object is sold before running the second auction. This case is of important practical interest. Disclosing strategic information after the first auction may have several significant impacts on the strategies adopted by the bidders throughout the game. The heuristic arguments can be developped as follows.

First, the price in the first auction conveys some information on the bids and therefore on the private information of the bidders. As a consequence, and compared to the case in which no information is disclosed, there is less uncertainty about the true (and common) value of the object in the second auction: the winner's curse is reduced. This suggests that bids should be higher in the second auction when there is disclosure of information: a *reduced winner's curse effect*.

A second effect may be suspected on the bidding strategies in the first auction. When a bidder wins the first auction, much of his information is conveyed to the other bidder when the price is announced. Therefore, his informational rent in the second auction is reduced. The value of making the highest bid in the first auction tends to be reduced. With disclosure of information, bids in the first auction should be reduced: an *anticipation effect*.

Overall, the impact on the seller's revenue is, at least intuitively, ambiguous. Moreover and despite the apparent simplicity of the story, going from these heuristic arguments to the analytical resolution of the model is far from straightforward. Indeed, we prove in this subsection that when the information on the winning bid is disclosed, the first auction does not possess any symmetric equilibrium in pure and strictly increasing strategies. More precisely, we show that there does not exist any symmetric equilibrium in weakly increasing strategies that are strictly increasing and differentiable on an interval $[1-\epsilon, 1]$, i.e. for the highest types. Equilibrium strategies necessarily involve leakage of information in the first auction and exhibit bunching at the top.

This result is problematic for an analytical resolution of the model and will come as a justification for the use of the experimental methodology to further investigate the impact of information disclosure on the bidders' strategies and the seller's revenue.

With information disclosure, the strategies of the bidders are distinct in the two auctions. We extend previous notations and denote $(b_i^k(\cdot))_{k=1,2}$ the strategy followed by bidder i in auction k

Suppose that, in the first auction, a symmetric equilibrium $\{b_i^1(\cdot), b_j^1(\cdot)\}$ exists in weakly increasing strategies that are strictly increasing and differentiable on a given interval $[1-\epsilon, 1]$ for some $\epsilon > 0$. Consider that $v_j \in]1-\epsilon, 1[$ and suppose that bidder j wins the first auction. When the winning b_j is revealed at the end of auction 1, it becomes common knowledge that agent j's information is $(b_j^1)^{-1}(b_j^1) = v_j$. Then the second auction is characterized by the following features. Bidder i perfectly knows the value of the object which is $\frac{v_i+v_j}{2}$. Bidder j does not know the realization of v_i but only that v_i is lower than v_j (because equilibrium strategies are weakly increasing). Therefore, the second auction is a *drainage tract problem* (see Milgrom (2004) for instance) with v_i, the private information of the informed agent, uniformly distributed on $[0, v_j]$. The analysis of such a model is well known. In the second auction, agent i's equilibrium strategy is pure

$$b_i^2(v_i) = \frac{v_i}{4} + \frac{v_j}{2}.$$

Agent j's equilibrium strategy is mixed

$$b_j^2(v_j) \text{ is uniformly distributed on } [\frac{v_j}{2}; \frac{3v_j}{4}].$$

The expected rent of the informed agent is

$$U_i(v_i, v_j) = \frac{v_i}{v_j}(\frac{v_i + v_j}{2}) - \frac{v_i}{v_j}(\frac{v_i}{4} + \frac{v_j}{2}) = \frac{v_i^2}{4v_j}, \tag{4}$$

and the uninformed agent gets no rent in expectation:

$$U_j(v_j) = 0. \tag{5}$$

Suppose now that bidder j with such a signal $v_j \in]1-\epsilon, 1[$ lose the first auction. Then v_i becomes common knowledge for the second auction because the strategy of bidder i is strictly increasing when $b_i^1 \geq b_j^1(v_j)$. The expected profit of bidder j in the second auction is therefore $U_j(v_j, v_i) = \frac{v_j^2}{4v_i}$.

We reason backward and now turn to the equilibrium behavior of the two agents in the first auction. To determine that behavior one must compute the out-of-equilibrium payoffs that bidder j obtains by mimicking the strategy of a $\tilde{v}_j$-agent while being a v_j-agent (we are interested in a local analysis and therefore assume that $\tilde{v}_j \in]1-\epsilon, 1]$).

By doing so and if bidder i wins the first auction, that bidder does not modify his strategy in the second auction, i.e. $b_i^2(v_i)$ is uniformly distributed on $[\frac{v_i}{2}, \frac{3v_i}{4}]$. Bidder j's out-of-equilibrium strategy in the second auction is therefore $b_j^2(v_i, v_j) = \frac{v_i}{2} + \frac{v_j}{4}$ if $v_j < v_i$ and $b_j^2(v_i, v_j) = \frac{3v_i}{4}$ if $v_j \geq v_i$. As a consequence, the out-of-equilibrium profit G of bidder j in the second auction is continuously differentiable and its value is given by

$$\begin{cases} G(v_j, v_i) = \frac{v_j^2}{4v_i} & if \quad v_j < v_i, \\ G(v_j, v_i) = \frac{v_j}{2} - \frac{v_i}{4} & if \quad v_j \geq v_i. \end{cases}$$

Conversely, if he won the object in the first auction, agent j ensures that agent i plays

$$b_i^2(v_i, \tilde{v}_j) = \frac{v_i}{4} + \frac{\tilde{v}_j}{2},$$

in the second auction. Then, agent j's optimal strategy maximizes

$$U_j(v_j, \tilde{v}_j, b_j^2) = \int_0^{(b_i^2)^{-1}(b_j^2)} \frac{u + v_j}{2} du - b_j^2.(b_i^2)^{-1}(b_j^2).$$

By differentiating with respect to b_j^2 we obtain

$$\frac{\partial U_j}{\partial b_j^2} = 2(v_j - \tilde{v}_j),$$

from which we can deduce that

$$\begin{cases} b_j^2 \leq \frac{\tilde{v}_j}{2} & if \quad \tilde{v}_j > v_j, \\ b_j^2 = \frac{\tilde{v}_j}{2} + \frac{1}{4} & if \quad \tilde{v}_j < v_j. \end{cases}$$

Therefore we can compute $H(v_j, \tilde{v}_j)$, the expected payment in the second auction of a v_j-bidder j who won the first auction by mimicking a $\tilde{v}_j$-bidder j.

$$\begin{cases} H(v_j, \tilde{v}_j) = \frac{v_j - \tilde{v}_j}{2} & if \quad \tilde{v}_j < v_j, \\ H(v_j, \tilde{v}_j) = 0 & if \quad \tilde{v}_j \geq v_j. \end{cases}$$

The profit function H exhibits a kink at $\tilde{v}_j = v_j$ and this is incompatible with the first-order condition that must be satisfied by the strategy in the first auction. Indeed, consider a symmetric equilibrium of the first auction in which bidders play the strategies $(\tilde{b}, \tilde{b})$. The expected utility of a v_j-type bidder j who bids b_j^1 in that auction is

$$U_j(v_j, \tilde{b}, b_j^1) = \int_0^{\tilde{b}^{-1}(b_j^1)} (\frac{v_j + u}{2} - b_j)du + \int_{\tilde{b}^{-1}(b_j^1))}^1 G(v_j, u)du + \tilde{b}^{-1}(b_j^1)H(v_j, b^{-1}(b_j^1)). \quad (6)$$

This function U_j can be differentiated with respect to b_j^1 at $b_j^1 = \tilde{b}(v_j)$, on the left and on the right and we have

$$\frac{\partial U_j}{\partial b_j^1} |_{\tilde{b}(v_j)^+} - \frac{\partial U_j}{\partial b_j^1} |_{\tilde{b}(v_j)^-} = (\tilde{b}^{-1})'(b(v_j))\frac{v_j}{2} > 0.$$

And we conclude that it is not possible that $b_j^1 = \tilde{b}(v_j)$ maximizes bidder j's utility. This contradicts the existence of a symmetric equilibrium in strictly increasing strategies on $[1 - \epsilon, 1]$. We summarize our findings in the next Proposition.

Proposition 2 *When the information concerning the winning bid is disclosed at the end of the first auction, any symmetric equilibrium of that auction necessarily involves some bunching at the top, i.e. the strategy profiles are flat for $v_{i,j}$ close enough to* 1.

In light of Proposition 2, the analytical determination of the symmetric equilibrium of the first auction raises complex issues that the state of the art does not allow us to address.

3 The experiment

Each session consists of five practice periods and between 30 and 32 periods that counted toward subjects remuneration. In each period, two subjects compete as bidder i and bidder j in two successive common value auctions: auction 1 and auction 2. A single unit of a fictitious object is awarded to the high bidder at each auction using a first-price sealed-bid procedure . The value of one unit of the item, V, is the same for the two bidders, constant over the two auctions and it is imperfectly known at the time the offers are submitted. At the beginning of each period, before bids are placed, bidder i (j) receives a privation information signal, ( ) randomly drawn from a uniform distribution on the interval . For a period the value of one unit is the simple average of the two signals: . Subjects are randomly re-matched after each period then it could be analysed as a one-shot game. Nevertheless, considering learning and experiment, periods could not be considered as a repetition of independent games.

As we are interested in analysing the effect of information on auction 1 at the interim stage, we use information disclosure as the treatment variable for the design of the experiment. Two treatments are studied: the "no-information" treatment and the "winning bid" treatment. For the "no-information" treatment, bidders do not receive any information about auction 1 before they submit their bids for auction 2. When auction 2 ends, the profits of both auctions are calculated. Bidders are informed about the value of the item for the period, the bids, the selling price, the winner's id and his profit for both auctions, the winner id and winner profit for each auction. The "auction price" treatment differs from the "no-information" treatment regarding information disclosure at the interim stage. After auction 1 and before bid submission for auction 2, bidders are informed about the price of auction 1 and the id of the winner. The disclosure of the winner id was implemented to avoid the ambiguousness related to tie situations. At any point during a session, a past periods history is available for the subjects. For each period, this history includes the value of the item, the bids for both auction and the profits of each bidder. Moreover, each bidder is privately informed about his cumulative profit from the beginning of the session.

Every subject received a participation fee, announced at the beginning of each session, and this money could be used to pay off any losses incurred during the series of auctions. If a subject had overall net losses for the auctions, the amount of the loss would be deducted from the participation fee. Bidders should get negative profit for some periods but theoretically the average anticipated profit is positive for the "no-information" treatment and we expected a significantly lower, but positive, profit for the "auction price" treatment. We overvalued the risk of bankruptcy and then we set the participation fee at 20 for the first session which it was indisputably to high. This participation fee was reduced at 5 for the others sessions. Table 1 shows the details of the experiments.

Five sessions were conducted at GATE Experimental Laboratory using students from engineering school (ECL) and management school (EML). No individual participated in more than one session during the study. The experiment was computerized using the REGATE program (Zeiliger, 2000). There was no communication allowed between subjects during the experiment. Written instructions were distributed to subjects . They were read out, questions were orally and publicly answered. Then a short test is conducted to check the good understanding of the instructions. After the last period, the subjects were invited to participate in a second experiment. The goal of this second experiment is to elicit individual risk preference. We use the individual

Table 1: Design of the experiment

Session	Treatment Treatment	Total periods (trial)	Number of subjects	Average earnings	Show up fee
081106pm	Auction price	35 (5)	14	32,9	20
221106am	No-information	35 (5)	12	19,5	5
221106pm	No-information	36 (5)	16	28	5
231106am	Auction price	37 (5)	16	23,7	5
231106pm	Auction price	35 (5)	16	27	5

in cents of USD in Goeree & Holt (2001), in Yens in Beard et al. (2001) and in Euros in our treatments.

choice procedure proposed by Holt and Laury (2002). Subjects face a menu of ten choices between paired lotteries: option A and option B. The payoffs of option A are less variable than the ones of option B, the risky choice with potentially a high payoff. The probability of the high payoff of option B increases over the ten questions. At the first question, subjects should prefer option A. At the last question, they should prefer option B. When the probability of the high payoff of option is high enough, a subject should change from option A to option B. The question where subjects switch from option A to option B is used as a proxy for the individual risk aversion. Each session lasts two hours.

4 Results

List of topics that shoud be investigated:

Question 1: What is the best information revelation policies for the seller?

According to the answer of question 1 and to understand the final effect on the seller's revenu two effects should be identified.

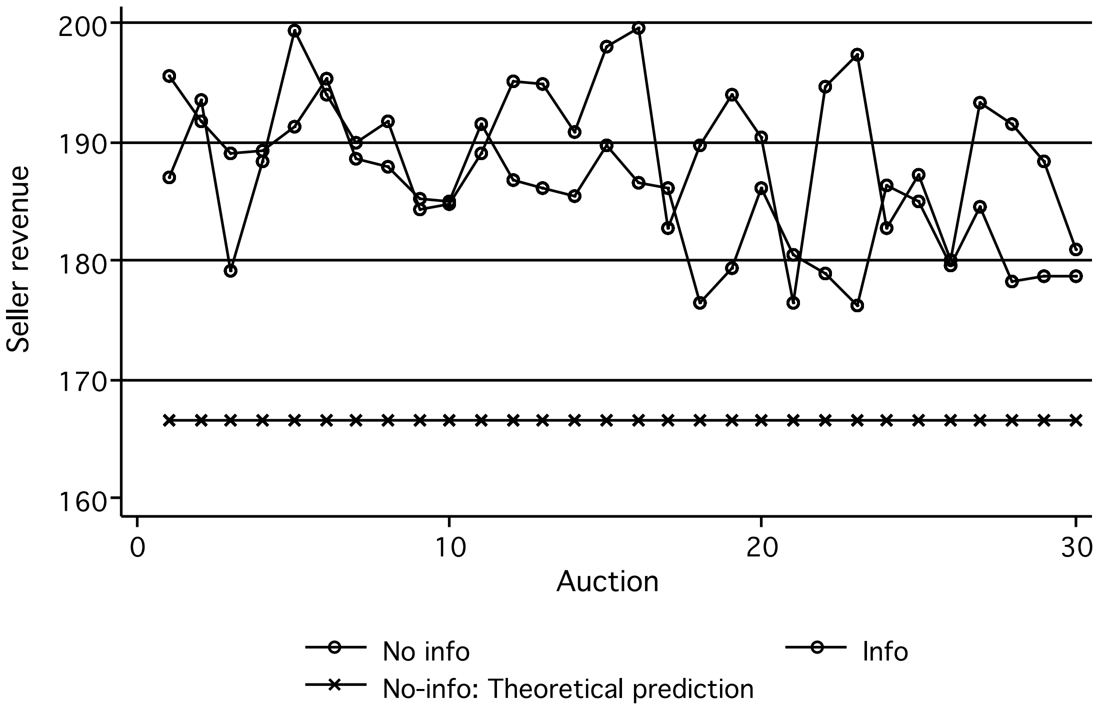
Question 2: Identification of the reduction of the winner's curse effect

Hypothesis 1 Average price bid for the second auction increases as the price of the first auction winning bid is disclosed.

Question 3: Identification of the anticipation effect

Hypothesis 1 Average price bid for the first auction decreases as the price of the first auction winning bid is disclosed.

Figure 1: Average seller's revenue by period and by treatment (from period 1 to period 30)



4.1 Seller's revenue

We first analyse the overall profit of the seller for the two auction of one experimental period. We compare the observed revenue in the experiment for both treatments with the theoretical prediction when no information is disclosed. For the no-information treatment and regarding the parameters used for the experiment, the theoretical prediction for the seller revenue is:

Figure 1 summarize the average seller revenue by period and by treatment from period 1 to period 30.

The seller's revenue for the "no information" treatment is higher than the predicted revenue. Average revenue per period is 189.6 which is 14% higher than the predicted revenue. This increase of the seller's revenue is in accordance with previous experimental results obtained with three or four bidders. It results directly from overbidding observed during common value auction. The winner bid disclosures after the first auction seems to diminish the seller's revenue. For the "winner-bid" treatment, the average revenue per period is 185.5. For both treatments, a t-test under the assumption that each auction is the unit of observation rejects the hypothesis that the average revenue is equal to the predicted revenue with no information disclosed . Likewise, a

Table 2: Estimates of the linear model for seller's revenue (using GLS random effect)

	Coefficient	**Std. Err.**	z	$P > \|z\|$
β_0	119.641482	2.035833	58.77	0.000
β_1	-2.892515	1.310169	-2.21	0.027
β_2	-0.279160	0.036170	-7.72	0.000
β_3	0.727688	0.016164	45.02	0.000

same test rejects the hypothesis that the average revenue is equal between the two treatments . Figure 1 shows that the seller's revenue decreases with period repetition and as bidders become experienced. This result also agree with previous experimental obtained for first price common value auction. Subjects bids less aggressively with experience and the seller's revenue decrease as a direct consequence. For a more thorough analysis, we use the following linear panel data model as the basis for a quantitative support.

Table 2 reports the estimate of the linear model for the seller's revenue. The information disclosure about the winning bid decreases the seller's revenue. This reduction can be estimated at 1.5% of the average revenue. We observe learning dynamic with a significant decrease of the seller's revenue as the periods are repeated. With more experience about the auction, the bidders decrease their offers and, as a consequence, they cut down the revenue of the seller. Finally, as one could expect it, the seller's revenue increases with the value of the item. The communication of the winner bid at the intercourse in repeated auction does not appear as a profitable disposition for the seller. The negative impact of the disclosure of this information is mainly due to an important underbidding during the first auction. Bidding strategy will be analysed in the next part.

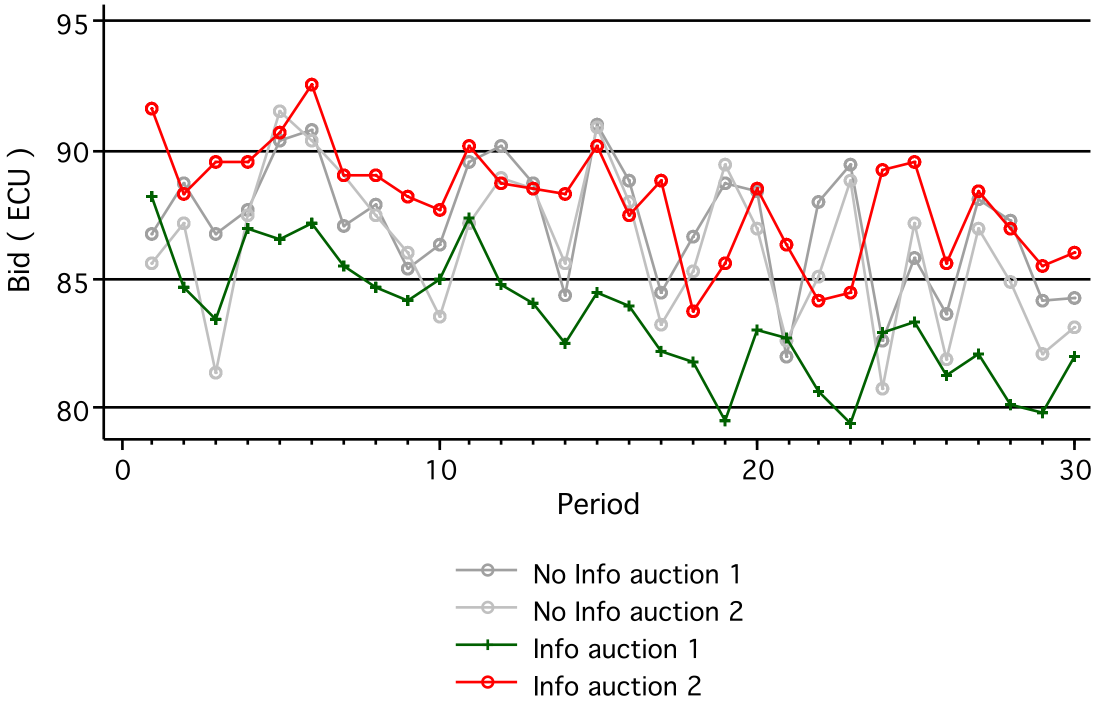
4.2 Bidding behaviour

The average bids for each period, by auction and by treatment are plotted on Figure 2.

As one should expect, we do not notice any significant difference between the bids for the first and the second auction in the "no-information" treatment. Taken as a whole and under this treatment, subjects do not change notably their bids between the two auctions. On the average, we observe a decrease of 0.44% with roughly as much subjects who increase their bids than ones who decide to decrease them.[1] The comparison with observations obtained with the "winner-bid" treatment shows a clear difference. Bidders increase significantly their bids between the two successive auctions under this treatment. A t-test for paired data under the assumption that each

[1]Over 856 observations, we note 368 observations with an increase of the bid between the first and the second auction, 420 observation with a decrease of the bid and 68 periods with constant bid. It seems that subjects tend to increase their bids between the first and the second auction as they receive a higher signal.

Figure 2: Average bids by period, by auction and by treatment (from period 1 to period 30)

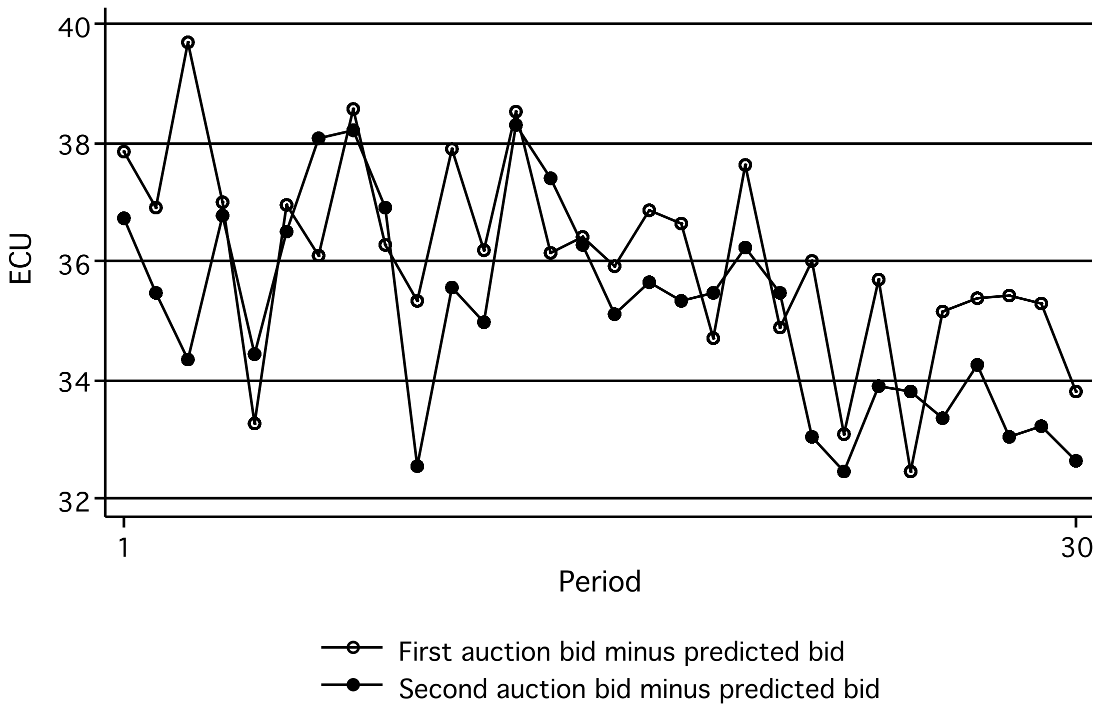


bid is the unit of observation rejects the hypothesis that the bid first auction is equal to the bid for the second auction.[2] For 66.8% of the observations, the bidder increases his bid between the first auction and the second auction with an average relative increase of 4.6%. More precisely, compare to bid strategy under the "no-information" treatment, with information disclosure bidders underbid for the first auction and overbid for the second auction after the winner's bid is revealed. A t-test for paired data under the assumption that each bid is the unit of observation rejects the hypothesis that the bid for the first auction under the "no-information" treatment is higher than the bid for the first auction under the "winning-bid" treatment . Conversely, the same test rejects the hypothesis that the bid for the second auction under the "no-information" treatment is lower than the bid for the second auction under the "winning-bid" treatment . Before to turn towards a more detailed analysis of the bidding behaviour under the "winning-bid" treatment, we compare the bid observed with the "no-information" treatment with the optimal bidding strategy predicted by the theory.

Figure 3 summarize, from period 1 to period 30 and for the first auction and the second auction, the average gap between the observed bid and the predicted bid given the signal actually

[2] n = 1412, t = -12.7293 and p ¡ 0.0001.

Figure 3: Average difference between the observed bid under the "no-information" treatment and the theoretically predicted bid given the actual signal of the bidder



received by the bidder.

Clearly, subjects involved in the experiment overbid compared to the theoretically optimal bid. We notice that the gap between the actual bid and the predicted bid decreases as periods are repeated and subjects become more experienced. Nevertheless, even after 30 periods of repetition, overbidding is still observed. This is a well established experimental result for fist price common value auction [add ref]. In order to identify the factors which favour this overbidding, we use the following linear panel data model.

Table 3 reports the estimate of the linear model for overbidding observed under the "no-information treatment. Surprisingly, the results of the estimation show no impact of risk preferences on overbidding. Overbidding decreases for bidders who receive high signal and when bidders become more experienced. Finally, it seems that bidders overbid slightly less during the second auction compared to the first auction. [More comments + transition]

For the analysis of bidding behaviour under the "winning-bid" treatment, we shall proceed backward. We start with the bidding in the second auction then we shall go back up to the first auction. The information which has the main impact on bidding for the second auction is who the

Table 3: Estimates of the linear model for overbidding under the no-information treatment (using GLS random effects)

Variable	Coefficient	Std. Err.	z	$P > \|z\|$
β_0	47.834003	2.370437	20.18	0.000
β_1	-0.100648	0.006725	-14.97	0.000
β_2	-0.113843	0.021584	-5.27	0.000
β_3	0.038802	0.376952	0.10	0.918
β_4	-0.849882	0.380673	-2.23	0.026

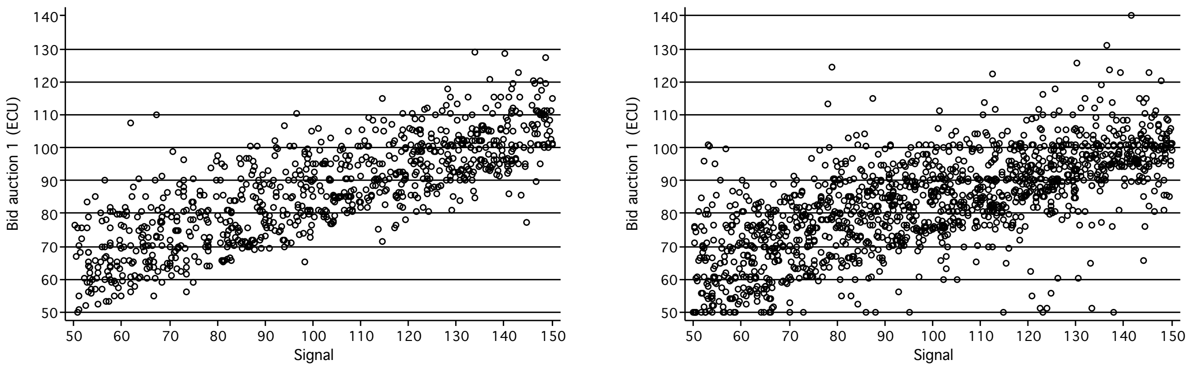
Table 4: Estimates of the bid evolution between the first and the second auction under the winning-bid treatment (using GLS random effects)

	Coefficient	Std. Err.	z	$P > \|z\|$
β_0	6.216574	3.273067	1.90	0.058
β_1	0.002279	0.010941	0.21	0.835
β_2	-0.030197	0.039196	-0.77	0.441
β_3	-0.184598	0.357381	-0.52	0.605
β_4	-20.934632	1.034388	-20.24	0.000
β_5	0.091464	0.026615	3.44	0.001
β_6	0.226181	0.055335	4.09	0.000

winner of the first auction is. On average, 62% of the winners of the first auction decrease their bid when 93% of the losers increase theirs. In order to identify the others factors which influence bid shift during the auction intercourse, we use the following linear panel data model.

The estimate of the linear model for overbidding observed under the "no-information treatment is reported in Table 4. Here again, we do not notice any significant impact of the risk aversion of the subjects on their bidding decision. Likewise, the signal received by the bidder does not have significant influence on the bid shift. In fact, we shall see that the impact of the signal weighs especially bidding during the first auction. The winning bid has a significant and positive impact on the bid shift. A high winner bid for the first auction could be considered as information about a high value for the item and seems to incite bidder to revise their bid upwards. The major factor which explains the bid revision between the two auctions is the information about the winner of the first auction. As noted above, winners of the first auction decrease their bid while loser increase theirs. One could then expect the result we obtain in the model regarding the difference between winners and losers of the first auction on bid revision. From the increase of the losers

Figure 4: Signals and bids under the "no-information" and the "winning-bid" treatments



and the decrease of the winners we find a gap of 22 unit of experimental currency. Moreover, we find that experience the bidder earns after period repetition appears as a significant factor only for the winners of the first auction. We do not find a significant factor for the t variable taking as a whole. But we obtain a significant and positive effect when this variable is combined with the winner dummy variable. It seems that bidders overreact at the beginning of the experiment when they learn they are the winners of the first auction and they decide to cut down their bid for the second auction. Then, when they become more experienced, they still decrease their second bid but for a lower amount.

Regarding bidding behaviour for the first auction, the main factor which influences subjects is the signal they receive before they bid. But the relation between the signal the subject receives and his bid for the first auction is specific to the "winning-bid" treatment. Figure 4 illustrates this specificity. This figure is a scatted plot of signal and bid observed under the "winning-bid" treatment. We add the same figure we made with observation obtained under the "no-information" treatment for comparison.

On one hand, Figure 4 shows that bids seem to increase linearly with signals under the "no-information" treatment. On the other hand, under the "winning-bid" treatment bids seem also to increase linearly with signals until signals reach high value, roughly 100 ECU. For high signals bids seem to be limited by a cap price. This result is particularly interesting as our analytical model predict bunching of the bids for high signal.

For a preliminary descriptive analysis and in order to identify factor which influence bidding behaviour for the first auction under the "winning-bid" treatment, we use the linear panel data model. The results are shown in Table 5.

Table 5: Estimates using GLS random effects

	Coefficient	**Std. Err.**	z	$P > \|z\|$
β_0	47.355280	3.954618	11.97	0.000
β_1	0.361789	0.008292	43.63	0.000
β_2	-0.174035	0.025801	-6.75	0.000
β_3	0.424827	0.612943	0.69	0.488

5 Conclusion

(to be completed)

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