REGRET AND INFORMATION AT FIRST PRICE AUCTIONS: A STUDY WITH BRAZILIAN DECISION-MAKERS

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ABSTRACT

Studies point out that the utility of the decision maker in the results depends on the profit. However, acting rationally in an auction environment can be difficult, and the reasons may be due to cognitive aspects such as regret. The "Winner's Regret" bias is characterized by the regret that the winner suffers for bidding too high compared to his opponent. The "Loser's regret" comes from realizing that his very low bid made him lose. Therefore, the objective of this study was to investigate the effect of regret and information on first price auctions in Brazilian individuals and compare with studies conducted abroad, checking if there is a difference in bias amplitude. Initially, a literature review on behavioral operations, auctions and the effect of regret in auctions was performed. Regarding the methodology, the sample applied was non-probabilistic and for convenience. The experiment design had four treatments: Winner's Regret, Loser's Regret, Both and None, manipulated in a 4x1 experiment with college students. Regarding the winner's regret, the results were similar to studies abroad and in the hypothesis of the loser's regret the results were different.

Keywords: Behavior, Regret in auctions, Production.

1. INTRODUCTION

Studies related to the Behavioral Operations area that investigate the subjective aspects that occur in decision making have been developed abroad. These characteristics impact the operational performance of organizations.

Organizations use the purchase function to operationalize their processes. Auctions are one of the ways to obtain raw materials, elements, finished products and services, and through them, a large number of deals are closed by companies.

By combining two characteristics, the auctions are classified as: bid information and the amount to be paid by the winner. The types of auctions found are: open ascending price or English auction; open descending auction or Dutch auction; first price closed auction and second price closed auction.

Although research carried out in an auction environment shows that the utility of the decision maker in the results depends on the profit, acting rationally can be difficult, considering that several factors must be considered, and it is not an easy task to define the ideal bid. Thus, decision makers do not always maximize their results, and the cause of this behavior may be due to cognitive aspects. As an example, when making a decision, a person may regret not having made another; that's when the feeling of regret occurs.

Studies related to behavioral biases present in auctions allowed to identify an individual behavior called "Winner's Regret", which occurs in first price auctions, and is characterized by the regret that the winning bidder suffers from having offered a bid too high in comparison to its opponent. On the other hand, the "Regret of the Loser" was identified, whose regret occurs when he realizes that his very low bid made him lose the opportunity to win (ENGELBRECHT-WIGGANS; KATOK, 2008).

Thus, the objective of this research will be to investigate the regret and information in first price auctions in Brazilian individuals and to compare it with studies carried out abroad, checking if there is a difference in the spectrum of the bias.

Initially, a literature review was made on behavioral operations, an approach to auctions and the effect of regret at auctions.

2. LITERATURE REVIEW

In this section, behavioral operations, auctions and the effect of regret at auctions will be covered.

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2.1.   Behavioral Operations

Behavioral Operations (OC) refers to a sub-area belonging to Production Management, whose research programs are aimed at studying the subjective aspects of the subjects in decision making, and the impact caused on the operational performance of organizations (SILVA, 2015). Although this area of knowledge developing abroad, in Brazil it is still non-existent (DA SILVA, 2015).

As found by the work produced by Bendoly, Donohue and Schultz (2006), the study of OC has a record of articles published since 1985 in renowned journals on this theme.

The authors Lee, Seo and Siemsen (2018) researched articles that carried out experimental studies in the laboratory in the context of behavioral operations in the period comprehended between 2006 to 2016, and found as a result that experiments in the context of more relevant operations in number of average annual citations and total citations were three: the newsvendor model studied by Bolton and Katok (2008), another study on supply chain contracts (LOCH; WU, 2008) and the purchase auction experiment (ENGELBRECHT-WIGGANS; KATOK, 2008). Still according to the authors, the experiment of buying auctions allows the behavioral study of the individual bias when relating to opponents played by the computer.

A study produced nationwide on the newspaper vendor model can be found in Ota and Da Silva (2017), where the work carried out by Bolton and Katok (2008) and Feng, Keller and Zheng (2011) was reproduced, with in order to make a comparison of research conducted abroad with their study. The experiment in supply chain contracts was also carried out nationwide by authors Ota and Da Silva (2019). However, research made from national databases did not present studies related to the theme of the first price auction experiment.

Thus, this study addresses the experiment regret and information in first price auctions.

2.2.   Auctions

In the context of a supply chain, the purchase function is a process in which supplies, materials, finished products, services and goods are obtained by organizations in order to operationalize their processes (CHOPRA; MEINDL, 2011; DA SILVA, 2008), and this activity characterizes an element important in achieving the objectives of a company (CAXITO, 2014). To this end, it must then decide whether to manufacture the product internally or to outsource, in order to increase competitiveness and minimize costs (CAXITO, 2014). One way to obtain these goods is through auctions.

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Companies commonly use this method of buying and selling to purchase supplies, or subcontract services. A large volume of negotiations is held through auctions (KLEMPERER, 1999).

These auctions are classified by combining two characteristics: bid information and the amount to be paid by the winner. In the first category, the auction can be opened, which occurs when everyone has access to the bid amounts, which are communicated by the auctioneer; or closed, where bids are sent to the auctioneer through sealed envelopes. In the second category, although the winner is always the one who launched the best offer, the amount to be paid by the winner can either be the value of the best bid or the second best offer offered, depending on the context in which it occurs.

Auction types in the business-to-business (B2B) context, that is, trade between companies, are a combination of these four mechanisms:

- Open rising price or English auction - starts with a low price and increases successively;

- Open descending auction or Dutch auction - works through values that gradually decrease;

- First price closed auction - bid proposals are sent via a sealed envelope, and the highest value wins and;

- Second price closed auction - in this type of auction, also known as the Vickrey auction, the highest bidder is the winner, but he pays the second highest bid (DALY; NATH, 2005).

A problem that can occur in the auctions of the first sealed price is known as the winner's curse, and this phenomenon does not happen in any open auction, much less in the auction for the second price, and is characterized by the regret bias (CHOPRA; MEINDL, 2011).

2.3.   Effect of Regret at Auctions

The understanding that emotions such as Regret can play a relevant role in situations where decision making occurs under uncertainty has a long history (ENGELBRECHT-WIGGANS; KATOK, 2008).

Therefore, the subjects do not always make their decisions maximizing profits, and the reasons point that the cognitive aspects may be responsible for this behavior (BELL, 1982). In this way, a person, after making a decision and knowing the results, can perceive that another choice could have been more favorable, and left with a feeling of regret or loss (BELL, 1982).

Thus, it can be difficult to act rationally in an auction, whose environment has factors to be considered and deciding the ideal bid is not a simple task (THALER, 1988).

According to Bell (1983), decision-makers, in an environment under uncertainty, are afraid to make a wrong decision, and to avoid the consequences and annoyances that can result from regret for that decision, they may be prone to paying a financial premium. His study also signals the likelihood of aversion to regret being part of risk aversion behavior.

On the other hand, in addition to the risk-aversion behavior observed in the competitors of an auction, in his model, Morgan et al (2003) considered the presence of a grudge, assuming that the bidder, when winning an auction, is not concerned only with his excess, but also, in case of losing, with the excess of its opponents.

Although most auction model studies claim that the bidder's utility in the outcome depends on profit, Engelbrecht-Wiggans (1989) suggests that the various types of regret suffered in this context also affect bidding decisions.

Experiments performed in behavioral operations research made it possible to study and identify an individual bias in closed price acquisition auctions (LEE; SEO; SIEMSEN, 2018). One of the detected behaviors was the "Winner's Regret", which occurs when the successful bidder of a first price auction regrets having placed a bid too high compared to his closest opponent. Another behavior observed was the "regret of the Loser", which occurs when the participant loses the opportunity to win by having made a very low bid (ENGELBRECHT-WIGGANS; KATOK, 2008).

In the Engelbrecht-Wiggans and Katok (2008) experiment, a first price auction environment was simulated, with four treatments, and the participants made bids against two opponents represented by the computer. Computerized participants assigned values from 1 to 100 distributed evenly and according to the Nash equilibrium. Each participant made 20 decisions for each of five resale values (50, 60, 70, 80 and 90), totaling 100 bids. Information was provided separately for treatments. In two of them, the "winning bid" and "profit if winning" were informed; in two other treatments, the "Value more than the second bid" and the "Second highest bid" were announced. In another treatment, no feedback information was communicated.

The model formulated by the authors (ENGELBRECHT-WIGGANS; KATOK, 2008), consists of the Winner's Regret hypothesis and the Loser's Regret hypothesis.

In the first case, the Winner's Regret hypothesis predicts that:

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- Average bids in Treatment Both are lower than in Loser's regret Treatment;

- Average bids on the Winner's Regret Treatment were lower than in the No feedback treatment

  Whereas in the case of the Loser's Regret it is predicted that:

- Average bids on Treatment Both are relatively higher than on Winner's Regret Treatment and;

- The average bids in the Loser Regret Treatment are higher than in the No feedback treatment

3. METHODOLOGY

In order to achieve the objectives proposed in this study, whose variables have already been studied by previous studies, the sample applied was of the non-probabilistic and convenience type.

Experiments similar to those conducted by Engelbrecht-Wiggans and Katok (2008), and Lee, Seo and Siemsen (2018) were carried out, in order to identify a behavioral bias of decision makers in an environment of acquisition by auction of the first sealed bid price, and thus, compare the results collected with those obtained in studies conducted abroad.

The design of the experiment had four treatments: None, Regret of the Winner, Regret of the Loser and Both (that is, Regret of the winner and Regret of the loser), which were manipulated in a 4x1 experiment, with students of higher education. Students from a higher technology course at a public higher education institution in the state of São Paulo participated in the research. In total, 53 students participated in the survey, 52.83% were male, and the average age was 22 years.

In this study on decision making in first price auctions, each participant made bids against two computer simulated opponents, $N = 3$. The computer opponents' bid values were integers evenly distributed from 1 to 100, as well as the values of the students who participated in the event. Resale values were set at 50, 60, 70, 80 and 90. Each session consisted of 1000 auctions in blocks of 10. Students made 100 bid decisions, and each decision was used in 10 consecutive auctions. The resale value was the same for 20 consecutive decisions (200 auctions). The calculation of the profit in the auction was done as follows:

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The resale value of the asset - the bid amount when the auction won	[1]

When the auction did not win, the profit was 0 (zero).

Like the studies conducted by Engelbrecht-Wiggans and Katok (2008), and Lee, Seo and Siemsen (2018), this work verified the effect of providing feedback information to participants regarding winner's and loser's regret. According to previous studies, offering certain information can influence decision making, because for a participant who lost the round, being informed of the winning bid gives him the opportunity to understand which bidding decision would make him win at a favorable price. However, by not being notified of the winning bid, you can underestimate that amount.

In the model, bids in different treatments were compared, where information that can produce the winner's regret and the loser's regret was displayed simultaneously, alternately or not communicated.

The following feedback information was determined:

- In the Loser's Regret treatment, the loser's regret value was calculated and informed to the participant, which was the "Profit if he won" and also the value of the "Winning bid";

- In the Winner's Regret treatment, the winner's Regret value was calculated, which is the "Value over the second bid", that is, the difference between the winning bid amount and the second highest bid of the round, and in addition to the winner's Regret amount, the "second highest bid" was announced;

- In treatment "Both", all the above information was communicated to the participants in this treatment.

This design consists of a replica of the study by Engelbrecht-Wiggans and Katok (2008) and Lee, Seo and Siemsen (2018), in order to verify whether there was a significant difference in the behavior of Brazilian decision-makers.

4. RESULTS ANALYSIS

As in the studies by Engelbrecht-Wiggans and Katok (2008) and Lee, Seo and Siemsen (2018), the impact of the behavioral bias "Winner's Regret" and "Loser's Regret" on the different treatments of this experiment was verified. The values, decisions and evolution during the rounds were also checked.
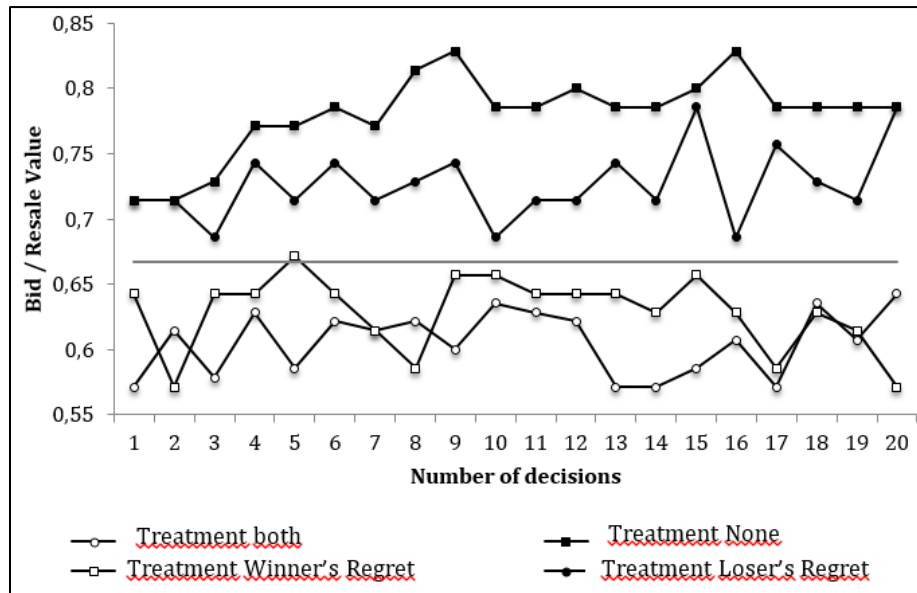
Graph1: Average bid / Average value resale for 20 treatment decisions
Source: Prepared by the study authors

Graph 1 shows the average bid / average resale value on the 20 decisions that participants made with the same resale value. Each point on the graph corresponds to the average bid / average resale value for participants and five values. The graph provides an insight into how bids have evolved over time in response to the information provided.

The average obtained from the average bid / average resale value in each treatment is as follows: Treatment Both: 0.6107, Treatment None: 0.7857, Winner's Regret Treatment: 0.6429 and Loser's Regret Treatment: 0.7143. In the same way as the original study, a regression analysis was performed to verify if there was a decrease in the value of the average bids in the Winner's Regret Treatment, however the results indicated the model's non-significance. The analysis to find support for these results is based on the average bid calculations in the 20 decisions (as shown in Table 1).

Table 1. Summary of theoretical predictions and experimental results.

		Treatment both	Winner's Regret Treatment	Loser's Regret Treatment	Treatment none	
Decisions 1-20 average bid / value (standard deviation)		0,6107 (0,0245)	0,6429 (0,0293)	0,7143 (0,7142)	0,7857 (0,7143)	P Value
Decisions 11-20 average bid / value (standard deviation)		0,6071 (0,0278)	0,6286 (0,027)	0,7214 (0,0331)	0,7857 (0,0139)	Decisions
Hypotheses	Forecast					1-20
1: Winner's Regret	Treatment both < Loser's Regret Treatment	Was lower		Was lower		p<0,01 not rejected
	Winner's					p<0,01

	Regret Treatment< Treatment None		Was lower		Was lower	not rejected
2: Loser's Regret	Treatment both > Winner's Regret Treatment	Was not higher	Was not higher			Rejected
	Loser's Regret Treatment > Treatment None			Was not higher	Was not higher	Rejected

Source: Prepared by the study authors

The average bid / average resale value can be seen in Table 1 as well as the corresponding standard deviation (shown in parentheses and in line 2). The bottom four lines refer to a comparison between the two treatments, as shown in the second column. The p-values presented in the last two columns relate to the result of the t test, which compares the average purchase value / value in the two treatments. The observation unit is the average bid / average resale value for an individual participant in all 20 rounds in column 7.

5. DISCUSSION

Unlike the theory presented and the result obtained in previous studies, the average bid / average resale value was above the neutral Nash balance only in two of the four treatments (Loser Regret Treatment and Treatment None), and the bids remained high even in last half of the decisions.

Table 1 points out that the Winner's Regret hypothesis is supported, which has two predictions. As in the studies by Engelbrecht-Wiggans and Katok (2008) and Lee, Seo and Siemsen (2018), both the prediction that the bids would be lower in Treatment Both than in Treatment Loser's Regret (not rejected with p <0,01), regarding the prediction that the bids would be lower in the Winner's Regret Treatment and in the Treatment None (not rejected with p <0.01), both converged according to forecasts.

In the case of the Loser's Regret hypothesis, which in one prediction would result in higher bids in Treatment Both than in the Winner's Regret Treatment, and in the other, the bids would be higher in the Loser's Regret Treatment than in Treatment None, both hypotheses in this study contradict the predictions of Engelbrecht-Wiggans and Katok (2008).

In addition, another theoretical prediction predicts that the average bids in the Winner's Regret Treatment would result in lower average bids, while in the Loser's Regret Treatment

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the average bids would be higher. In this study, the average bids on the Winner's Regret Treatment were lower compared to the Loser's Regret Treatment, and not on the four treatments, and the average bids on the Loser's Regret Treatment were higher compared to the Winner's Regret Treatment, and not the largest among the four treatments.

6. CONCLUSIONS

Although most studies of auction models state that the bidder's utility in the result depends on profit, there is an understanding that emotions such as the various types of regret suffered in this context also affect bidding decisions (ENGELBRECHT-WIGGANS, 1989). Therefore, the subjects do not always make their decisions maximizing profits (BELL, 1982).

The present study aimed to verify the effect of the behavioral bias known as "Winner's Regret" and "Loser's Regret" in decision making in the context of an auction.

According to the results of the experiment, it was found that the subjects deviate from the amount that maximizes profit due to the effects of this bias.

The biggest differences found contradict the two predictions of the Loser Regret hypothesis:

- a forecast that the average bids for Treatment Both (0.6107) were no higher than for the Winner's Regret Treatment (0.6429) and;

- another forecast in which the average bids in the Loser Regret Treatment (0.7143) were not higher than in the Treatment None (0.7857).

In addition, the average bids on the Winner's Regret Treatment were lower compared to the average bids on the Loser's Regret Treatment, and not compared to the four treatments. The same happened with the average bids of the Loser's Regret Treatment, which were higher only in relation to the Winner's Regret Treatment, and not among the four treatments, as the hypothesis predicts.

Furthermore, the average bids in the Winner's Regret Treatment and Treatment Both are below the neutral Nash equilibrium, diverging from the original study, where all treatments had average bids with values above the neutral Nash equilibrium.

This study can be considered innovative in the national context, due to the fact that it was the first to analyze regret and information in first price auctions and comparing it with other works carried out abroad.

As a limitation to the study, the number of decisions that were made stands out, which may have dispersed the participants' concentration during the experiment, as it is very numerous; another limiting factor was the distribution and number of students recruited in the survey.

Thus, as a suggestion for future research, it is recommended to replicate this study with a larger number of participants.

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