Determinants of the Winning Bid in Oil and Gas Auctions: Analyzing the Brazilian Case

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Finding new oil reserves in the pre-salt layer has brought the interest from many oil companies from all over the world, with the aim of attending the auction to be granted the right to explore such reserves.

In modern economy, auctions have played an important role in allocating rights by the government. Choosing the appropriate type and model of auction is far from being a minor topic, particularly involving petroleum, since different potential models can be adopted. This way, the auction theory help us to identify and analyze which factors are an influence to the bidders' strategy, and it is possible to forecast the result of an auction. Besides, this theory helps to forecast the amount expected from the revenue deriving from the sale of oil blocks and how it can change in light of different governmental interventions.

This study analyzes several determinants that can affect the strategic behavior of players in defining the bids in an auction, and from which it is possible to get several lessons and results both in terms of using information in such games, and in terms of public policy.

Thus, differently than most of auction empirical studies, we consider information asymmetry in order to obtain structural and more precise estimates of the impact from distinct factors in the winning bid in oil blocks in Brazil.

We found out that several variables, such as the block's area and location, number of drilled wells per km² and types of partnerships among companies, affect the winning bid. At last, we found that the problem of "bidder's curse" caused by the presence of informed agents (for example, Petrobrás) eventually makes the winning bid value go up.

Based on the methodology by Rezende [Econometrics of Auctions by Least Squares, Journal of Applied Econometrics (2008), 23:925-948] we were able to correct the bias resulting from simple estimation of the auction's negotiation price against different determinants. In order to that, we included dummy variables for the number of attendants, and they capture all changes occurred between auctions, among them are: changes in auction rules and change in the players' levels of participation.

Regarding the first group of variables, we included dummies for each round that reflect changes in the rules that occur between the rounds, as well as we only include dummies that capture specific changes in some rules, such as changes in terms of local content percentages.

As for the second group, besides dummies for the number of attendants mentioned above, we also included a dummy variable for the presence of informed participant, which is Petrobrás in this case. This is important, since in case of oil auctions in Brazil, there is information asymmetry that produces different block value appreciations among bidders, under the characteristics that can be observed pertaining to the block and bidders (those that do not reflect behavioral asymmetry).
Results

Some of the results of this study show that some characteristics of the block have an important role to establish the value that players apply to the auctioned block. First, it is noticed that the fact that a block's location in the water is highly valued: being in deep waters (shallow) increase the winning bid and, as a consequence, the established value at 1208% (426%) in comparison to on-land blocks. This effect takes place because the blocks situated in waters have a much more significant return potential and involve an extraction technology with higher costs.

Moreover, the number of already drilled wells per km² within the auctioned block have a positive effect in their appraisal – and this can be seen as a type of important information that players take in consideration in the moment of defining an auction bid, being able to reveal some value of the block.

As for the block's size, we observed that elasticity coefficient of the block's area is around 0.391, which means it is inelastic, probably due to the fact that the blocks of higher area are more profitable, but generate more costs – which is a limitation to the attending consortiums.

Another type of important information considered is the number of times that the block is offered. We noticed that the blocks offered twice do not have a different price in comparison to those offered once, while if the block is offered three times or more it is less appreciated than those offered just once or twice. This means that if the block is offered many times it is a sign that it has low potential in terms of exploration/production and profit.

It was also noticed that the changes in score rules put into action from rounds 5 and 7 - on the local content - only caused an impact when the weight of the local content was kept high, making companies to offset the size of signature bonus bids.

A constant fact was that the number attendants continues to represent an increase in bid, as expected, since it represents an increase in terms of competition from the purchase of the block.

An aspect of public policies that was analyzed is related to the fact that ANP started to offer more blocks, however of smaller areas – particularly from the fifth round – and thus we analyzed if this had produced profit (or loss) in collection related to blocks. This effect of “shredding” the offered areas ended up reducing the average collection per sold due block, in part due to the fact that companies subtract the bid by increasing the number of blocks. The best thing to be done in order to extract a higher excess from bidders would be to offer big blocks in a certain basin, because it would make bidders less likely to acquire blocks with split oil reserves, and therefore they would have synergy results.

One relevant matter in auction theory, the existence of an informed attendant, also had an important role in results. It was found that the company considered as a well informed agent, Petrobrás, upon attending the auction influences the winning bids to be 105% higher if compared to a context where the company does not take part. As Petrobrás won most of the blocks when it attended the auction, this positive effect is in great part due to its bigger bids.

Thus, this study showed that information asymmetry, changes in rules and levels of participation between auction must be considered when making a more precise assessment of the impact from different determinants on the winning bid of oil blocks. Following the methodology by Rezende (2008), such an impact on the bid would be the same on the value established by the second highest value of the block, considering that the model adopted in Brazil is the first price auction.