ACADEMICIA: An International Multidisciplinary Research Journal
ISSN: 2249-7137 Vol. 11, Issue 12, December 2021 SJIF 2021 = 7.492
A peer reviewed journal

THE EFFECT OF PUBLIC KNOWLEDGE ON HIGHWAY PROCUREMENT AUCTION BIDDING

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DOI: 10.5958/2249-7137.2021.02676.8

ABSTRACT

The revelation of information about the seller's value of an item may lead buyers to bid more aggressively, according to a number of studies in the theoretical auction literature. In the empirical literature, this widely recognized conclusion in auction theory is largely unproven. This impact may also be more apparent in auctions with more common cost uncertainty, according to recent theoretical work. The effect of an Oklahoma Department of Transportation policy change that resulted in the publication of the state's internal estimate of the costs to finish highway building projects is examined. We conduct a differences-in-differences analysis comparing bidding in Texas to bidding in Oklahoma, a state that had a consistent policy of disclosing the same information throughout the study period. Our findings indicate that following the change in engineers' cost estimate (ECE) regulation, the average bid in Oklahoma decreased in comparison to Texas auctions. This drop in bids was much more pronounced for projects with a higher level of cost uncertainty. Furthermore, following the change in ECE policy, the within-auction standard deviation of bids decreased, with the greatest decrease seen in projects with higher common cost uncertainty.

KEYWORDS: *Auction Bidding, Equilibrium Bidding, Economic Policy, Highways Procurement, Transportation.*

1. INTRODUCTION

The public publication of information about an object's value may lead to more aggressive bidding behavior, according to auction. The availability of information may increase competition among bidders in a competitive setting by making values more predictable. In auctions of items having a shared value uncertainty, this impact is particularly apparent[1]. The relative worth of a bidder's own private knowledge may likewise be reduced by public information, lowering his rentals. Although these forecasts are generally accepted, they have yet to be validated using field auction data. The empirical data on the effect of public knowledge distribution is mostly limited to laboratory studies. Using data from highway construction procurement auctions, this research investigates the impact of information release on bidding behavior[2]. Every state in the United States has transportation procurement auctions, with billions of dollars in building projects granted each year. The auctions are first-price sealed bid auctions conducted at regular intervals

throughout the year in each state. While most states use a similar auction structure, one element that differs is the information given to bidders about the state's internal estimate of a project's cost. Some states make this information public before bidding, whereas others don't.

Oklahoma's stance on this has recently altered. Prior to the policy change, state officials were prohibited from disclosing the state's cost estimate before bids were solicited[3]. The Oklahoma Legislature instituted a series of amendments to state legislation that reversed this policy over a six-month period starting at the end of 1999. Prior to submitting a proposal, bidders now have access to the state's cost estimate. This information policy change in Oklahoma is comparable in spirit to the information release described, and it is this information policy change that we use to test the hypothesis. As previously stated, the data on the impact of public information disclosure in auctions is sparse and mainly based on trials[4]. Simulations of a public information disclosure are the closest evidence in the empirical literature. To estimate the distribution of private values when the reserve prices are hidden in an open auction of flats in Sweden. They next model the impact of switching to an open reserve price method and find that if the reserve price was disclosed, the seller's income would increase by approximately 10%. The empirical studies of drainage auctions look at how bidders' bidding behavior is affected by inequalities in the accuracy of their knowledge. In asymmetric settings where one bidder may obtain better knowledge than others, the emphasis is usually on analyzing the size of information rents[5]. There is some evidence that royalty systems that offer revenue assurance boost bids in wildcat auctions when information is reasonably symmetric. Greater market volatility may lead to decreased demand, lower prices, and increased bid dispersion in Treasury bill auctions. Risk aversion has a role in this behavior. The impact of value dispersion and seller reputation on pricing in computer auctions on Ebay. She discovers that the seller's reputation adds credence to the information given by the auction site. However, none of these empirical studies directly tests concludes that providing public knowledge about an item's value influences bidding behavior[6]. The predictions of this theory have yet to be put to the test using a natural experiment and data from field auctions. To this aim, we use a differences-in-differences method to empirically evaluate the effect of public information release in Oklahoma auctions and compare changes in bidding behavior in Oklahoma and Texas auctions. Throughout the time, Texas had a consistent information release policy, and we used the Texas auctions as a control group.

Over 13,000 proposals were filed by construction companies in Oklahoma and Texas between 1998 and 2003, according to the statistics. Our empirical research backs up the hypothesis by showing that when more information is released, the average amount of bids drops. The lower average offers do not result in statistically significant lower winning bids, despite the competitive pressure generated by the information release[7]. According to the hypothesis, the impacts of information release should be more noticeable in auctions with more frequent cost uncertainty. We identify two kinds of projects from the collection of auctions utilized in this study that seem to vary substantially in the degree of common cost uncertainty associated with the particular construction jobs[8]. Asphalt paving projects and bridge construction/repair activities are the two project categories. We contend that in order to estimate the cost of asphalt projects, one must depend more on the particular firm's condition of equipment and internal efficiency, while in bridge construction projects, there is more uncertainty that is shared by all bidders. In line with the hypothesis, we discover that the impact of information release is greater for bridge construction projects. This is the first study that we are aware of that examines and analyzes the

effect of a public information release in auctions with varying degrees of common cost uncertainty[9].

The rest of the paper is laid out as that releasing public information causes more competitive bidding and may result in greater revenues in first-price sealed bid auctions with linked values. ‘‘In a first-price auction, a policy of publicly disclosing the seller's knowledge cannot reduce and may increase the anticipated price. In such a situation, the auction winner is the one who has the most optimistic estimate in comparison to his rivals. The winner's curse is caused by a failure to anticipate this reality and account for it while developing bidding tactics. The publication of information in a competitive setting may have two impacts on bidding behavior. For starters, it may make values more predictable, reducing the winner's curse and promoting fiercer competition among all bidders. Second, it may minimize the effect of the bidder's own private knowledge on his valuation estimate, lowering his information rents. We propose a basic model of competitive bidding with additive and separable common and private cost components to formalize the importance of public knowledge in auctions[10].

2. DISCUSSION

This model, which offers helpful guidance for the empirical research that follows. When the amount of the common cost component compared to the private cost component varies, the framework provides a simple bidding function with the additional benefit of allowing us to evaluate the relative scale of the effect of an information release. We can also explain the observed difference in the effect of information disclosure on projects with mostly private expenses (such as asphalt) vs those with primarily common costs such as bridge repair. Finally, the approach can anticipate impacts on bid variance owing to its simplicity. In addition, the vendor may get an estimate of the average cost V. If he chooses to get that estimate and disclose it to the bidders, the value of n rises by one, and the weight given to any privately detected signal falls. As a consequence, private information rents are decreased, and bidders are more aggressive in their bidding. After the information is published, the greater the relative magnitude of the common cost component, the more aggressive bidding behavior is anticipated. If the seller's estimate was given greater weight than the other estimates, his choice to purchase and disclose it to bidders would further decrease the private information rents, resulting in lower average offers.

All bidders will discover the state's estimated value of the common cost as a result of the publication of that information. At every level of bid, the information rents are decreased, causing bids to grow increasingly concentrated. The analysis above assumes that the total number of bids is known. The qualitative impact of the policy change on the equilibrium bidding strategy will be the same in the model with an unknown number of bidders as in the model with a known number of bidders. On average, the revelation of information will lead to more aggressive bidding behavior. Overall, the theory predicts that the disclosure of knowledge will lead to competitive bidding. The lower the offers and the smaller the variation of bids once the information is disclosed, the greater the common value component of the cost. In a competitive setting, however, if the costs were entirely private, the revelation of information would have no impact on the offers. Our empirical investigation will put this hypothesis to three major tests. First, we'll calculate the total impact of the ECE policy change on bids and winning bids. Second, we'll calculate the impact of the ECE policy change on projects with varying amounts of common and private cost components.

This research uses data from the Oklahoma Department of Transportation (ODOT) and the Texas Department of Transportation (TXDOT) on construction project auctions held between January 1998 and August 2003. 10 Auctions from throughout Oklahoma, as well as the North Texas and Panhandle construction districts in Texas, are included in the statistics. These Texas regions border Oklahoma, have comparable terrain and soil conditions, and utilize similar building materials as Oklahoma. We know the contractors that bought blueprints (plan holders), the bids made by each contractor if they bid, the winning bidder, and the winning bid for each project auctioned off. Any contractor interested in bidding on a project must first buy a plan from the state, and the list of plan holders outlines the possible competitors in an auction. Prior to the auction letting, all bidders have access to the plan holder list, which is public information. Furthermore, both states offer information on each project. The information includes the project's location, a comprehensive description of the duties, an anticipated completion time, and, most crucially, the ECE. We create a panel data set with this information, where each observation represents a plan stored and potentially a bid made by a company for a certain project. Bidders may make several individual bids in a month or choose not to bid at all in certain months, resulting in an imbalanced panel structure.

Two panels summarize the auction statistics for Texas and Oklahoma by the ECE policy information periods mentioned above January 1998 October 1999, November 1999 March 2000, and April 2000 August 2003. Statistics on the number of auctions, bidders, and bid prices are included in the table. Bid information is provided as a relative offer, which is calculated by dividing the bid by the engineering cost estimate. This enables direct comparison of bids for projects of various sizes. There are three things worth mentioning. First, the sample is fairly evenly split between Oklahoma and Texas, with somewhat fewer auctions in Texas in each of the three periods than in Oklahoma. Second, participation rates in Texas are typically greater than in Oklahoma, both in terms of plan holders and bids. The number of bids in Texas outnumbers those in Oklahoma by.5–1.0 bidders each auction on average. Third, it seems that bids and relative winning bids have decreased over time in both Oklahoma and Texas, with the drop being more pronounced in Oklahoma. There was no change in policy in Texas, with the ECE being accessible to bidders prior to the whole sample being bid on. As previously stated, there was a significant shift in policy in Oklahoma.

We'll use our auctions to represent this shift in knowledge by categorizing them into three time periods: pre-November 1999, November 1999–March 2000, and post-March 2000. Prior to the bid letting, the ECE for Oklahoma projects is unknown in the first phase. The second time interval is a transitional phase that includes the two legislative changes that happened in November 1999 and March 2000. The ECE is accessible to bidders in the final time period, and both legislative modifications have been implemented. In addition to firm-fixed effects, we incorporate two bidder characteristic variables that quantify bidder cost heterogeneity: the bidder's capacity utilization rate and the bidder's distance from a project. We anticipate bidders to submit higher bids when their capacity utilization grows or their distance from a project increases. Three variables are also created to assess competitor qualities. To begin, we use historical data on competitor plan holders' bidding performance to calculate the average winning percentage of all rival plan holders in an auction. This is a metric for how difficult a competitor is. We anticipate businesses to bid more aggressively when they confront a slew of strong

competitors. Second, we take into account the competitors' minimal distance from the project and their minimum backlog.

The ECE information effect should be more apparent in auctions when the cost is unknown, according to the theoretical literature on auctions. We investigate at two particular project types, asphalt and bridge construction, where we believe the relative significance of the common value components differs and where we have a large number of projects, to evaluate the possible variations in the impact of ECE policy across projects. Based on talks with state highway and civil engineers, we think the independent private value framework best describes asphalt projects. Variances in submitted bids are mainly attributable to differences in private expenses, and the costs involved are less unclear. This is due to the fact that asphalt projects are usually simple, requiring a contractor to put down a particular thickness and kind of asphalt over a specific road surface. The quantity and kinds of material mentioned in the work items for these projects are typically carefully specified. Bridge building and maintenance expenses, on the other hand, are often more unpredictable. Each bridge is unique, therefore the intricacy of bridge building projects will vary.

Furthermore, bridge work may need demolition and excavation in order to properly comprehend the job's expenses. Some costs connected with bridge work, such as demolition and pier building, were more unpredictable than the cost components usually seen in asphalt projects, according to the state construction engineers and civil engineers we talked with. The uncertainty may stem from problems evaluating soil conditions or determining the precise repairs that need to be made to an old bridge. They discover that bridge projects include both common and private cost components, while road-paving contracts have mostly private costs, using a model of associated values. We think that in this context, a cross-project comparison provides a more rigorous application of the differences-indifferences method. Policy assessment based on differences-in-differences implies that all other variables affecting bidding in Texas and Oklahoma in the pre- and post-ECE policy eras have been accounted for. It's conceivable that we haven't accounted for an omitted variable influencing bidding in Oklahoma or Texas, which may skew our findings. This option should be illuminated by the bridge–asphalt contrast. If our ECE policy variable is just picking up the impact of an omitted variable that resulted in somewhat more aggressive bidding in Oklahoma, it should not influence particular project types within states differently. The bridge–asphalt comparison effectively enables us to improve our test by using within-state variance in the data among project types.

3. CONCLUSION

The impact of information release on bidding behavior in procurement auctions is examined in this paper, which adds to the empirical literature on auctions. Using a natural experiment and field auction data, we offer the first empirical test of the hypothesis. Three major empirical results emerged from our examination of the bidding data. First, in contrast to Texas auctions, the average bid in Oklahoma has dropped after the ECE policy was changed. Second, bids for bridge work fall dramatically, but not for asphalt projects. Third, after the change in ECE policy, bid variation decreases, and the magnitude of this decline is greater for bridge projects than for asphalt projects. These three findings are consistent with the theory's expectations. When a seller's information is made public, it usually results in lower offers. These lower average bids in Oklahoma do not result in lower winning bids across all projects, and therefore do not result in

reduced overall procurement costs. This increases the possibility that the information release is just impacting the top tier of bid distribution. The quantile regression findings, as well as the fundamental patterns observed, indicate that the impact of the ECE policy variable is rather consistent across quantiles.

Furthermore, we find a reduction in winning bids that is comparable in size to the fall in the average offer in bridge projects, where we anticipated to see a greater effect. The impact of the ECE policy change on relative bids remains substantial and statistically significant even when we account for implicit factors such as a possible change in the number of bidders submitting bids. Furthermore, in the two and a half years since the policy change, we have found no evidence that the change in information policy resulted in an increase in relative bids. This is a critical result to rule out since federal and state transportation authorities have expressed worries that publishing the ECE estimate before the bid letting process would reduce competitiveness. In terms of the state's ECE, the guidelines recommend that states do not make the information public until after the contract has been awarded. The reasoning behind this suggestion is that releasing the ECE may promote and enable bid manipulation. If an open information policy encouraged collusive conduct, the consequences described above would be mitigated. Alternatively, if the availability of information decreased the advantages of existing cartels exchanging information, the open information policy may lower the probability of cartelization and enhanced competition.

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