

## Abstract

The main advantage of a procurement combinatorial auction (CA) is that it allows suppliers to express cost synergies through package bids. However, bidders can also strategically take advantage of this flexibility, reducing the performance of the auction. In this paper, we develop a structural estimation approach for large-scale first-price CAs. We use bidding data to estimate the firms' cost structure, and use this information to evaluate the performance of the auction in terms of the cost efficiency of the allocation and payments to the bidders. The large number of bids commonly observed in large-scale CAs makes it difficult to use the structural methods developed in prior work. To overcome these limitations, we propose a simplified model of bidders' behavior where markups of each package bid are chosen based on a reduce set of package characteristics. We apply our method to the Chilean school meals auction, in which the government procures half a billion dollars worth of meal services every year and bidders submit thousands of package bids. Our estimates suggest that bidders' cost synergies are economically significant in this application, and the current CA mechanism achieves high allocative efficiency while keeping reasonably low markups to the bidders. Using our cost estimates, we conduct a counterfactual analysis comparing the performance of the first-price CA with that of a Vickrey-Clarke-Groves (VCG) mechanism. In contrast to recent theoretical work criticizing VCG for leading to high procurement payments, we find that the total VCG payment is reasonable and close to the payment achieved in this first-price CA. The proposed structural estimation framework is quite general and can be applied to other large-scale CAs applications.