Measuring the Performance of Large-Scale Combinatorial Auctions: A Structural Estimation Approach

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Abstract

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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, by discounting package bids and “inflating” bid prices for single items, even in the absence of cost synergies; the latter behavior can hurt the performance of the auction. It is an empirical question whether allowing package bids and running a CA improves performance in a given setting. In this paper, we develop a structural estimation approach that estimates the firms’ cost structure using bidding data and use these estimates to evaluate the performance of the auction. To overcome the computational difficulties arising from the large number of bids observed in large-scale CAs, we propose a novel simplified model of bidders’ behavior based on pricing 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 (~5%), and the current CA mechanism achieves high allocative efficiency (~98%) and reasonable margins for the bidders (~5%). Overall, this work develops the first practical tool to evaluate the performance of large-scale first-price CAs commonly used in procurement settings. (This is a joint work with Gabriel Weintraub and Marcelo Oliveares both at Columbia Business School.)