15 COMBINATORIAL AUCTIONS IN PROCUREMENT

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1. Introduction

Everyday, companies struggle with multiple decisions in the fight to increase their profitability. Complex decisions a company must make include, (1) how much should we order from our suppliers and when? (2) how should we organize our supply chain and logistics? (3) how much should we produce? (4) what price should we charge or pay for goods and services?

Making the “right” pricing decision in sales or procurement is a complex task. While the types of pricing policies/methods used in the exchange of goods and services vary greatly, we can divide these mechanisms under two broad categories: posted price mechanisms and price discovery mechanisms. Under a posted price mechanism, a good is sold at a take-it-or-leave-it price determined by the seller. A posted price can be dynamic, that is, the seller may offer different prices to different customers (customized prices) or change prices dynamically over time (intertemporal prices). In a price discovery mechanism, prices are determined via a bidding process.

A commonly used price discovery mechanism that has experienced a tremendous growth in use is an auction. In a forward auction, the seller puts out an item (or a set of items) for sale, and buyers compete in a bidding process. In a reverse (procurement) auction, a buyer puts out a request for quote (RFQ) for a service or a product(s), and prices are determined by a competition among potential sellers. Auctions implemented over the Internet have several benefits compared to traditional auctions, including lower information, transaction, and participation costs; increased convenience; ability for asynchronous bidding; and access to larger markets (Lucking-Reiley 1999). Hence, companies increasingly use Internet auctions to buy and sell excess inventory, first-run goods and commodities, to test prices for new consumer goods, to market one-to-one, and to fine-tune inventory levels.

Most of the B2B auctions involve the exchange of multiple products/goods. Despite this salient characteristic of B2B auctions, the research in auction theory has traditionally focused on single-unit auctions, that is, only a single unit is to be traded via the auction or bidders only wish to acquire a single unit. In addition, while designing, implementing or studying auctions for multiple goods, a strong assumption that has been often made in the literature is that bidders experience no synergies or complementarities in values across multiple units. Two objects are said to be complements, have superadditive values, or exhibit synergies, when their value together is more than the sum of their individual values. For example, in the recent FCC spectrum auctions, bidders, comprised of US telecommunication companies, cellular telephone companies, and cable-television companies, competed to win various spectrum licenses for different geographical areas. The synergies arising from owning licenses in adjoining geographical areas create dependencies in (some) bidders’ valuations for individual licenses. Similarly, in manufacturing there may be synergies, or economies of scale, in producing larger quantities, while in logistics there may be synergies associated with acquiring adjacent lanes or lanes that form a closed loop.

While bidders experience synergies across multiple items in numerous settings, most auctions in use today are simple auctions, that is, each unit (or bundle of units) is auctioned independently of all other units and the lowest bidder wins in each auction. A simple auction is an attractive selection mechanism because it is easy