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Cross-bidding in simultaneous online auctions: Antecedents and consequences

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ABSTRACT

Cross-bidding is a new strategy used in online auctions. The bidder simultaneously monitors several identical auctions, taking advantage of their price differential. We examined the determinants and outcomes of cross-bidding behavior and the contingent factors that shape it. Using empirical data, we demonstrated that cross-bidders can realize significant price discounts compared to non-cross-bidders; the number of experienced bidders in an auction market contributes to more cross-bidding; and this effect is positively moderated by market liquidity of the product being auctioned.

1. Introduction

Online auctions have become liquid markets for a wide variety of goods and services. For instance, the most popular online US auction site *eBay* had more than 90.1 million active users during the year 2009, who contributed to a gross merchandise volume of more than $48 billion. Online auctions differ from traditional markets in at least three ways: (1) buyers and sellers are geographically dispersed, (2) prices for goods and services are determined jointly by buyers and sellers based on market supply and demand rather than being fixed by the seller, and (3) all goods and services are eventually sold (market efficiency).

Bidders have been motivated to experiment with different bidding strategies to lower their cost of purchase. One such strategy is "cross-bidding", where a bidder monitors multiple auctions of an identical product, moving back and forth between them, with the goal of winning the one having the lowest possible price [10]. In this strategy, the cross-bidder first identifies a set of simultaneous single-item auctions selling a desired product, then identifies the auction with the lowest standing bid, and finally places a slightly higher bid in this auction. This process is repeated until (1) the bidder wins one of the targeted auctions, (2) the bidder is priced out of the market (i.e., the standing bid exceeds the bidder's maximum), or (3) all simultaneous auctions have expired.

Though prior studies on online auctions have examined bidding strategies in single-item auctions, very little effort has been directed at cross-bidding. Preliminary research has demonstrated that cross-bidding is an emerging strategy that can lower cost of purchase [1]. However, there is little understanding of the causative factors that drive cross-bidding, or the contingent effects that shape this phenomenon. Thus the goal of our study was to address three research questions: (1) what factors influence cross-bidding, (2) what are the outcomes of cross-bidding, and (3) what contingent factors affect cross-bidding?

We formulated a set of hypotheses, and then tested them using live data derived from auctions of Apple iPod music and video players at eBay.

2. Prior research

Research on online auctions started when auction sites such as eBay emerged as a mechanism for trading goods and services over the Internet. While research on offline auctions was predominantly game-theoretic in nature, with Bayesian–Nash equilibrium being the solution space, research on online auctions has tended to be empirical in nature as the game-theoretic assumptions were not adequately generalizable to the Internet [4].

2.1. Sequential online auctions

Much of the initial research focused on *sequential auctions* studying a single auction selling a single item in a market with multiple bidders. These studies centered around three themes: auction design (investigating ways to increase the market efficiency or decreasing the sellers' surplus by setting secret reserve prices, manipulating the optimal bid increment, and

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designing alternative auction formats [13]), price determination (examining potential relationships between auction closing prices and seller, bidder, and/or listing characteristics, such as seller feedback ratings [7], auction design, and informativeness of listings [8]), and bidding strategies (exploring the efficacy of alternative strategies with respect to their timing and frequency).

There are several different bidding strategies. We considered only standard auctions where the latest bid price is known and always rises – they are based on a *private value* concept, where the bidder has decided on an undisclosed, predetermined, maximum price he or she is willing to pay for an item. In a *common value* auction, the bidder continuously updates his or her bid based on cues from other bidders. The other major strategy is to give the maximum bid to a proxy bidder who acts as a surrogate by incrementally increasing the bid up to the maximum whenever the current bid is exceeded by a competitor. Roth and Ockenfels [12] considered a third bidding strategy that they called "sniping", where bidders attempt to win by bidding only during the last few seconds of an online auction which has a stated closing time, thus attempting to avoid a bidding war. Among other studies, Bapna et al. [5] identified five different types of bidders in online Yankee auctions: early evaluators, middle evaluators, opportunists, sip-and-dippers, and participators; and showed that different bidders tend to use different or a combination of bidding strategies.

2.2. Simultaneous online auctions

A later stream examined simultaneous auctions, including multiple-item simultaneous auctions and single-item simultaneous auctions. In multiple-item simultaneous auctions, sellers list multiple units of the same product in a single auction, bidders specify both the price and quantity of items they desire, and winning auctions are determined based on price first, and then on quantity of items bid. This type of auction is popular among corporate sellers interested in liquidating excess inventory. Research on such auctions has compared their efficiency and design criteria with their offline counterparts [3], and examined the design and rules of these auctions. One extension of this type of auction is a combinatorial auction, where items of different types are bundled and auctioned together (e.g., a holiday package consisting of airfare, hotel, and car rental), with the expectation that these items will be worth more as a bundle than if sold separately. Research on such auctions has explored alternative designs that could increase market efficiency and maximize sellers' revenue [11].

A smaller and more recent stream of simultaneous auction research involved single-item simultaneous auctions (referred to as simultaneous auctions), where multiple auctions sell single units of a product at the same time. This is often a consequence of: (1) a large seller base selling identical products of popular products (e.g., iPods) in auctions that are temporally overlapping each other, and (2) software tools that enable bulk listing and simultaneous management of such auctions (e.g., eBay's TurboLister). Research in this area has assumed that some bidders are able to monitor overlapping single-unit auctions and move costlessly between them. Peters and Severinov proposed a design where bidders could move between simultaneous auctions based on the current standing bid in each auction, and concluded that simultaneous auctions increased market efficiency by matching supply with demand and led to a market characterized as a Bayesian equilibrium. They also proposed an optimal bidding strategy and reported that cross-bidding led to a uniform closing price for all simultaneous auctions in the market.

Anwar et al. examined the extent of cross-bidding and its outcomes, focusing specifically on auctions of computer hardware (CPUs). They found that only a small proportion (around 20%) was cross-bidders, and the closing prices for them were, on average, 9% lower than that for non-cross-bidders. This study is indicative of a recent emergence of interest in simultaneous single-item online auctions in general and the cross-bidding strategy in particular. Though this study provides some evidence of the growing prevalence of cross-bidding and its price effects, it does not address other salient issues such as cross-bidding's antecedents and contingent factors that may shape the cross-bidding behavior and its outcomes. In the next section, we attempt to explore these issues by theorizing salient antecedents and consequents of cross-bidding, along with contingent factors related to cross-bidding, for subsequent empirical testing.

3. Theory and hypotheses

3.1. Antecedents of cross-bidding

An essential requirement for cross-bidding is the simultaneous occurrence of multiple auctions of the same product ending at approximately the same time. The extent to which multiple auctions of the same product are simultaneously available is termed here as *market liquidity*. This is a market characteristic that is jointly determined by supply and demand forces in the auction market, rather than by the bidder or seller alone. Simultaneous auctions are a natural consequence of highly liquid markets, characterized by a high demand for the product in question, which motivates a large base of sellers to supply the product to the marketplace. Many of these products tend to be "hot" technology products with limited life spans which, if not liquidated within a short period of time, will be eventually replaced by newer generation products and hence become unsaleable. Examples of such products include central processing units for personal computers and Apple iPod music players, each of which have experienced a substantial amount of cross-bidding on online auction sites such as eBay. Listings of such highly liquid products from multiple sellers often lead to overlapping auctions at any given instant in time. This overlap creates the opportunity for cross-bidders to compare multiple auctions of the same product and move back and forth between these auctions with the goal of minimizing the price paid. This expectation leads to our first hypothesis:

H1. Market liquidity is positively related to greater cross-bidding activity.

Second, for a bidder to cross-bid between competing simultaneous auctions, that bidder must be able to continually monitor these auctions and the standing bids at each auction, and decide on which auction to bid and for what amount. At the same time, she must avoid multiple bids in different auctions at any given point in time, in order to avoid winning multiple items. This process must be managed continually until the end of all auctions. Unlike other popular bidding strategies, cross-bidders cannot place upfront proxy bids (their true private valuation for the desired product), because doing so could result in a higher closing price in one auction and defeat the cross-bidding strategy. Hence, cross-bidding requires substantial information processing capability on the bidder's part, and may not be well-suited for novice bidders. However, experienced bidders, by virtue of their experience with auctions and bidding strategies, are expected to better handle the cognitive overload associated with the cross-bidding strategy, and are more likely to engage in cross-bidding. Therefore, we propose the *number of experienced bidders* in a particular auction as the second determinant of cross-bidding activity, which is expected to have a positive association with cross-bidding. Note that the number of experienced bidders is an auction characteristic, rather