
19 Online and name-your-own-price auctions: a literature review

*Young-Hoon Park and Xin Wang**

Abstract

With the explosive growth of activity in online auctions, considerable recent research studies this market mechanism. We survey recent theoretical, empirical and experimental research on the effects of auction design parameters (including minimum price, buy price and duration) and bidding strategies (including reference price, auction fever and dynamic bidding behavior) in online auctions, as well as literature dealing with competition in online auctions. We also discuss the name-your-own-price mechanism, in which the buyer determines the price, which the seller can either accept or reject. The review concludes with a proposed agenda for future research.

1. Introduction

The growth of the Internet has transformed markets for antiques, collectibles, consumer electronics and jewelry, to name just a few. In particular, online auctions have become popular and important venues for conducting business transactions. eBay Inc., the most widely recognized and largest online auction venue, has witnessed tremendous growth during the past decade, as shown in Figure 19.1.¹ From its humble origins as a trading post for Beanie Babies' collectors, eBay achieved 222 million confirmed registered users in the fourth quarter of 2006, representing a growth rate of 23 percent. These users generated a total of 610 million listings, and the listings helped drive eBay gross merchandise volume, or the total value of all successfully closed items on its trading platforms, to \$14.4 billion, for a growth rate of 20 percent.²

In addition, the emergence of the Internet and its extensive electronic commerce provides companies with the opportunity to experiment with various innovative pricing models. A well-known example is the name-your-own-price (NYOP) model and, more generally, the concept of online haggling. In an NYOP setting, instead of posting a price, the seller waits for an offer by a potential buyer that he or she can then accept or reject. The relative ease of transacting in electronic markets makes this pricing mechanism viable, especially in the emergence of several new price intermediaries, such as Priceline.com, which implemented an NYOP model for selling airline tickets, rental cars and vacation packages.

Concurrent with this explosive growth of activity in online and NYOP auctions comes considerable research in recent years to study these market mechanisms. The enormous

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¹ eBay Inc. financial releases from second quarter 1998 to first quarter 2007 are available at <http://investor.ebay.com/results.cfm>.

² eBay Inc. financial releases from fourth quarter 2006 are available at <http://investor.ebay.com/results.cfm>.

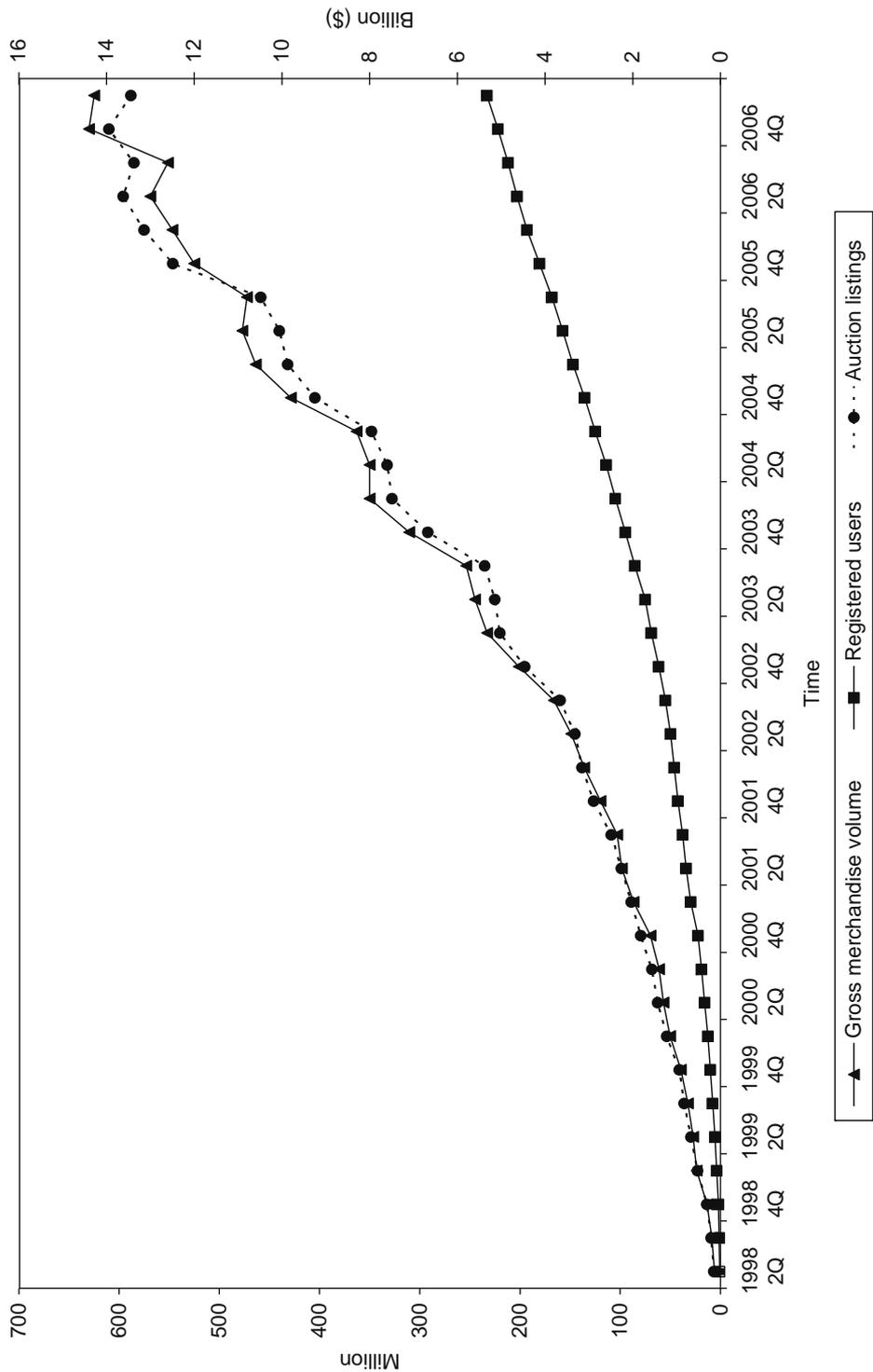


Figure 19.1 Registered users, auction listings and gross merchandise volume on eBay

amount of readily available field data, emergence of innovative auction design features, and precise and simple rules for bidders and sellers on auction platforms such as eBay have created excellent research opportunities. This chapter reviews that recent research on online and NYOP auctions and thus provides an overview of theoretical, empirical and experimental research. We limit the scope of this chapter to recent research in the marketing field. In particular, we organize this review according to two major areas: online auctions (including auction designs, bidder behavior and competition) and NYOP auctions. Although we attempt to cover all major aspects of research in the field, we exclude the reputation construct, because most research into the relationship between feedback ratings and auction outcomes is conducted by economists and is well documented in economics literature (e.g. Bajari and Hortaçsu, 2004). We refer interested readers to Bajari and Hortaçsu (2004) for a review of Internet auctions in economics literature.³ Interested readers also may choose to peruse a few recent review articles (e.g. Ockenfels et al., 2006; Pinker et al., 2003) and discussion papers (e.g. Chakravarti et al., 2002; Cheema et al., 2005) pertaining to online auctions.

The rest of this chapter is organized as follows. In Section 2, we discuss research findings pertaining to the effects of auction design parameters (e.g. minimum bid, buy price, duration) on auction outcomes. Then, in Section 3, we detail research findings that show that bidders are susceptible to both static and dynamic context effects and allow situational factors or irrelevant cues to influence their decisions. This section includes insights from recent research regarding the influence of reference prices, auction fever and bidding dynamics on bidding outcomes. In Section 4, we discuss the impact of competition on bidding behavior in online auctions. In addition, we present research findings on the NYOP auction mechanism in Section 5. We conclude with directions for future research in Section 6.

2. Auction design in online auctions

Online auctions have precise and simple rules, which greatly facilitates theoretical analyses because it limits the complexity of strategic decisions by market participants. The huge amount of data readily available in electronic form further facilitates empirical studies. As a result, literature on online auctions has quickly produced insights into the effects of online auction design parameters on a variety of auction outcomes. In this section, we discuss research findings regarding the effects of the seller's design parameters (e.g. minimum price, buy price, duration) on auction outcomes on the basis of a mixture of empirical, experimental and theoretical research in online auctions.

Minimum price

Minimum price (or starting or minimum bid) represents a form of reserve price, usually publicly observable and contractual. When a seller sets the minimum bid below her valuation, she often combines this strategy with either a secret reserve price or shill bidding.

³ We also exclude research on traditional auctions. Several important articles in economics discuss auction theory in general (e.g. Milgrom, 1989; Milgrom and Weber, 1982; Riley and Samuelson, 1981; Vickrey, 1963). Although these articles are crucial for understanding auction theory as it relates to online auctions, they are not specifically concerned with online auctions *per se* and thus are not included in this research.

The latter two are not made public; shill bidding is a type of fraud. However, both have similar effects on the minimum price: a trade occurs only if the final highest bid is above the secret reserve price or the shill bid. Although the details may differ, theoretical models share a few predictions that represent some of the earliest ideas studied in the field. The first basic hypothesis states that reserve prices (whether public or secret) should reduce the number of bids and bidders in an auction. The second hypothesis posits that the number of auctions that end without a trade should increase with the use of reserve prices.

Reiley (2006) tests hypotheses regarding reserve prices in first-price, sealed-bid auctions on Internet newsgroups, using field experiments of collectible trading cards from the game 'Magic: The Gathering'. By systematically varying the reserve-price levels as a fraction of each card's book value while keeping everything else constant, he finds that imposing a public reserve price can reduce the number of bidders and increase the chance of goods being unsold. However, conditional on a transaction taking place, having a reserve price increases the revenues received on the goods. Moreover, bidders clearly exhibit strategic behavior in their reactions to public reserve prices. High-value bidders, for example, raise their bids above the reserve in anticipation that rival bidders will do the same. The increased reserve-price level also seems to reduce the number of bidders and the probability of sale, although auctions with a reserve price tend to receive higher revenue than those without, conditional on sale.

Similarly, through field experiments, Ariely and Simonson (2003) document a positive correlation between the minimum price and the auction price. In particular, their experiment suggests that a high minimum price generates a higher auction price when bidders cannot compare the prices of two items. Furthermore, although low minimum prices tend to draw more bidders, the bids generally are low and insufficient to create a price war. Therefore low minimum prices often lead to lower auction prices.

Another role of minimum price is signaling. On eBay, as on most online auction sites, bidders know that an auction has a secret reserve and whether that reserve has been met. In an interesting contrast, traditional, live auction houses such as Christie's and Sotheby's do not inform bidders whether any secret reserve price has been exceeded. Bajari and Hortaçsu (2003) examine the effects of minimum prices and secret reserve prices using field data associated with collectible coin auctions and find that a secret reserve deters entry less than does a public reserve and has a positive effect on revenue. Therefore these authors suggest that a combination of a low minimum bid and a secret reserve probably represents the optimal configuration from a seller's point of view, especially in auctions of high-value items.

In the comprehensive descriptive model proposed by Park and Bradlow (2005), which models several key components of the bidding process (e.g. whether an auction prompts any bids; if so, who bids, when they bid, and how much they bid), the authors find a minimum price in general relates positively to bidder valuations in the context of a first-price ascending notebook auction. Using the same data set, Bradlow and Park (2007) find that the minimum price relates negatively to bid time increments. That is, a lower minimum price leads to the faster arrival, and thus greater concentration, of bids.

Behaviorally, Greenleaf (2004) identifies two emotional effects (anticipated regret and rejoicing) that a seller might experience while setting a reserve at auctions. Regret occurs when the highest bid exceeds the seller's value for the product but remains below the reserve, whereas rejoicing occurs when the reserve forces the winning bidder to pay a

higher price. When asked to make reserve price decisions repeatedly over a series of open English auctions, sellers deliberate over their reserve decisions and adjust them considerably. This finding suggests that seller learning takes place. The result also indicates that sellers use a frequency heuristic, and both anticipated regret and rejoicing are significant for the seller's learning process.

Suter and Hardesty (2005) also investigate the relationship between price fairness perceptions and minimum prices. A high minimum price has a positive impact on the fairness perceptions of winning bidders but an adverse effect on losing bidders. This finding implies that sellers receive greater earnings, as well as no adverse price fairness perceptions from winning bidders, when they set minimum prices higher.

In most online auctions, the seller can make strategic choices not only about the amount of the reserve price but also whether to make it secret or public, and, if public, at what point in the auction it should be revealed. Although this scenario violates the formal rules of the auction game on eBay and most other online auction sites, the seller also may effectively camouflage and dynamically adjust the reserve price during the auction by using shill bids, or bids covertly placed by the seller or the seller's confederates to inflate the final sale price artificially. The seller could use any of these strategic options (or combinations thereof) to increase expected revenues from the auction. For example, Sinha and Greenleaf (2000) examine sellers' optimal reserve and shilling, as well as the effect of bidder's aggressiveness on these strategies, in the specific contexts of discrete bidding in private value English auctions, in which the bidders can bid only in increments rather than continuously. These auctions thus closely resemble online auctions. When they assess the utility implications of shilling for both sellers and bidders and compare them with those of using a reserve, they find that the optimal reserve strategy is affected by the relative bidding aggressiveness of the highest-valuation bidder compared with the remaining bidders, as well as the number of bidders.

Buy price

An interesting auction feature, unique to online auctions, involves the seller's ability to post a buy price at the auction, at which the product may be sold without bidding. Buy price auctions are ubiquitous in online auction markets. Starting with Yahoo!Auctions' Buy-Now in 1999, all major auction sites currently have similar features (e.g. 'Buy-It-Now' on eBay, 'Take-It-Price' on Amazon), though variations in buy-now auction formats appear in the online auction market. For example, on Yahoo and Amazon, the buy price stays throughout the auction, as long as the buy-now option is not exercised; in eBay's buy-now auction, in contrast, the buy price disappears after the first qualifying bid (i.e. higher than the reserve price).

The growing importance of selling auction items through the buy-now feature has attracted the attention of academic researchers and motivated studies on rationales for its existence. Various theories attempt to explain this seemingly irrational phenomenon, which explicitly limits the final price by imposing a fixed price at auction. One argument involves risk aversion, in that bidders might be risk averse to losing an item for various reasons, such as if the item is rare or they have lost items in the past and therefore are wary about losing a desired auction item again. In this case, a seller can exploit and appeal the bidder's risk aversion by offering the buy-now option so that the bidder can circumvent bidding (e.g. Budish and Takayama, 2001). Therefore, the higher the risk aversion among

bidders, the higher the buy price a seller can demand for an item, which implies that risk-averse bidders are not better off in buy-now auctions (e.g. Hidvégi et al., 2006). Reynolds and Wooders (2009) study buy prices in both eBay and Yahoo auctions and find that introducing a buy price generally increases the seller's revenue when she faces risk-averse bidders. Moreover, Yahoo's buy-now auction can generate more revenue than eBay's with the same reserve and buy prices.

Other explanations regarding why sellers use a buy price in online auctions include waiting costs and the impatience of bidders. Wang et al. (2008) use a game-theoretical model to study the effect of endogenous participation on a seller's use of buy-now prices and argue that potential bidders endogenously make auction participation decisions. Because bidding entails costs (e.g. waiting, monitoring, cognitive efforts) and valuations vary across bidders, not everyone can afford or should participate in the auction. Instead, the decision should reflect a utility-maximizing outcome determined from a comparison of the utility of bidding versus not bidding. Similarly, when a price is posted at the auction, bidders base their choice on the expected utilities of bidding and exercising the buy option. In analyzing eBay's buy-now auctions, these authors find that because of endogenous participation, the seller can extract more surplus from the bidders, which would be lost in a pure auction. However, because of the dynamic nature of the buy-now feature, the seller should take extra care in setting the price level; when the costs of bidding are high, the seller should adjust the buy-now price downward to avoid the situation in which the buy-now auction reverts to a pure auction.

Sellers also might prefer to set low buy prices for their own reasons. Parallel to bidder risk aversion, sellers might be risk averse, such as if they are inexperienced, their items have unobservable quality, or they do not want to spoil their reputation as a reliable seller. Similarly, sellers might suffer high waiting costs. A similar argument indicates that sellers' impatience can motivate the use of a buy price. However, in all these cases, sellers might set the buy prices too low, which leads to the exercise of the buy-now option and lower revenues. In addition, Qiu et al. (2005) empirically analyze the use of buy prices by both sellers and bidders on the basis of eBay and experimental data. Their study shows that when bidders experience uncertainty about the value of the product, the buy price serves as an external reference price. Therefore the seller can use the buy price to signal the quality of the product and improve the auction outcome. Sellers with good reputations might be able to implement this method better than those without credibility. In addition, the signaling effect diminishes as the buy price increases and loses its own credibility.

Using notebook PC data in first-price ascending auctions, Chan et al. (2006) propose an integrated framework that examines sellers' decisions about whether and where to set buy prices, which are displayed throughout the auction. Bidders' regular bidding and buy-now decisions get modeled jointly, and the model contains several other distinctive features. First, bidders' willingness to pay is a function of their demographics and experience. Second, the effect of buy price (relative to expected price) on willingness to pay is modeled explicitly. This impact also has been explored in behavioral literature pertaining to how price may have an anchoring effect on willingness to pay, as well as in economic literature regarding how price can provide a signal if bidders are uncertain about quality. Third, the model does not assume that all sellers already optimize their buy-now decisions. Instead, the authors compute the optimal prices on the basis of estimation results and compare them with the data. If the sellers are risk averse, the observed buy price should

be lower than the optimal level, but if bidders are willing to pay more for the buy-now option, the observed buy prices should be higher than the optimal level estimated by the model. Similar to Qiu et al. (2005), this research finds that a buy price higher than the 'expected price' increases bidders' willingness to pay. Furthermore, a large proportion of notebook PC sellers (62 percent) set their buy prices suboptimally from a revenue maximization perspective: approximately 15 percent of sellers set their buy prices too high, more than half (about 54 percent) set their buy prices too low, perhaps as a result of misestimations of competition across auctions. In addition, the authors show how sellers can use the model to set optimal buy prices.

On eBay, identical goods often sell simultaneously by two different mechanisms, that is, auctions and posted prices. Zeithammer and Liu (2006) propose and empirically test four possible reasons why sellers choose auctions versus posted prices, including sellers' indifference to selling mechanisms, price discrimination, an exogenous partitioning of the eBay market into posted price and auction markets, and sellers' heterogeneity. Using a data set that captures individual seller behavior across categories and allowing for various sources of seller heterogeneity, these authors find no empirical support for the first three hypotheses. In contrast, they indicate that both observed and unobserved seller heterogeneity represent important correlates of mechanism choice. Thus the coexistence of pure auctions and posted price selling is largely due to sellers' heterogeneity in, for example, their inventories.

Duration

Different rules mark auction ending times on various online auction sites. For example, the duration of an Amazon auction is automatically extended if bidding remains active; that is, if a new bid occurs within ten minutes of the previous bid. Hence the auction does not have a hard ending time. In contrast, eBay adopts a hard ending time and accepts no bids after the closing time specified by the seller. Roth and Ockenfels (2002) compare last-minute bidding behavior in eBay and Amazon auctions and find that late bidding occurs more frequently in the presence of hard-ending rules such as on eBay, in categories that require more expertise, and from more experienced bidders. Ockenfels and Roth (2006) also examine bidding strategies under the hard-ending rule in second-price online auctions and find that snipe bidding (i.e. bidding during the last ten minutes of an auction) arises as both equilibrium and an off-equilibrium outcome. Using data from completed auctions, they conclude that the extent of sniping is much more pronounced on eBay than Amazon, and that it largely occurs as a best response to incremental bidding.

Research findings regarding the impact of duration on auction outcomes are mixed. Ariely and Simonson (2003) argue that even though shorter durations may attract fewer bidders, they also can lead to increased competition. They document in a field experiment that auction duration relates negatively to auction price. By viewing bids as a sequence of record-breaking observations, Bradlow and Park (2007) empirically study auction duration as one of three key design variables, along with image placement and minimum price. Their results indicate that auction duration negatively affects the number of latent bidders; furthermore, auctions of shorter duration tend to have larger bid increments and marginally larger bid variations.

Borle et al. (2006) analyze the degree of multiple bidding and late bidding in online auctions using more than 10 000 eBay auctions across 15 different consumer product

categories. Large variation occurs in late bidding and multiple bids across product categories, and in general, experienced bidders refrain from submitting multiple bids. In contrast to findings in existing literature on late bidding, the authors report that experienced bidders tend to bid either at the beginning or near the end of the auction.

In addition to these research findings regarding auction design parameters under the seller's control, a few researchers study the role of the seller in shaping demand for auctions. In particular, Yao and Mela (2008) estimate a structural model of buyer and seller behavior that incorporates heterogeneities in both bidder and seller costs. Thus they infer how changes in the listing behavior of the seller affect each bidder's likelihood of bidding in any given auction. Using data on Celtic coins, they find that buyer valuations are influenced by item, seller and auction characteristics; buyer costs are affected by bidding behavior and seller costs are influenced by item characteristics and the number of listings. On the basis of their model estimates, the authors assess the effects of an auction house's pricing strategy on the market equilibrium number of listings, bids and closing prices in the product category studied. This investigation is particularly useful because it provides explicit guidance to auction houses regarding their fees. Specifically, they find commission elasticities are higher than per-item fee elasticities because they target high-value sellers and enhance the likelihood that they will list.

3. Bidder behavior in online auctions

While an auction is in progress, participants are influenced by various types of value signals, which in turn can affect their decision dynamics for the auction item. In addition, economic, social and psychological factors might alter bidding behavior (e.g. Cheema et al., 2005). In this section, we discuss research findings that reveal that consumers violate principles of value maximization and consistency and are susceptible to both static and dynamic context effects, in that they allow situational factors and irrelevant cues to influence their decisions.

Reference price

Various price cues may systematically affect bidding behavior in an auction marketplace. Some researchers consider price cues within the focal product category, whereas others address them across product categories. Kamins et al. (2004) investigate the impact of two external reference points (reserve price and minimum price) under the seller's control on the final price of an auction and the number of bidders. In a field experiment, they find that when a seller specifies a high external reference price (reserve price), the final bid is higher than when it specifies a low external reference price (minimum price). When the seller provides both high and low reference prices, the former influences the final bid more, although a low reference price leads to a lower outcome than when the seller does not communicate any reference price. In addition, the number of bidders influences outcomes in the absence of seller-supplied reference prices. Finally, auctions with only reserve prices specified tend to attract more bidders than those with both reserve and minimum prices, which illustrates further the asymmetric role of the two reference prices.

In addition to reserve prices, other price cues can influence a consumer's willingness to pay. For example, Nunes and Boatwright (2004) examine how the prices of products that buyers unintentionally encounter can serve as anchors that affect their willingness to pay for the product they intend to buy. According to real-world auction data, the price

tag on a relatively expensive car alters bidders' willingness to pay for a lower-priced car that subsequently appears on the auction block. This effect increases as the price of the anchor increases.

Building on the notion that loss aversion is more pronounced for explicit compared with implicit comparisons, Dholakia and Simonson (2005) propose that the existence of explicit instructions to make particular comparisons induces more risk-averse and cautious choice and bidding behavior among consumers. Their field experiment involves real online auctions, in which buyers either viewed comparisons among listings provided spontaneously by bidders or were encouraged by an explicit instruction to compare the focal auction with an adjacent listing. They find that an explicit reference point reduces the influence of adjacent auctions' minimum prices on the focal auction's price; induces bidders to submit fewer, lower and later bids; increases the tendency for sniping and bidding on multiple items at the same time; and reduces bidding frenzies.

Chan et al. (2007) also incorporate closed auction prices in their willingness-to-pay model. They find that the impact of a previous closing price on willingness to pay is negative, possibly because the bidder with the highest willingness to pay has been eliminated after purchasing the product, which means willingness to pay decreases among the pool of remaining bidders.

Auction fever

Auction fever refers to an excited and competitive state of mind in which the thrill of competing against other bidders increases a bidder's willingness to pay, beyond what the bidder would pay in a posted-price setting. Because auction fever depends on the thrill of competition, the effect should increase with the number of active bidders. This theory also may explain why some sellers prefer low minimum prices; a lower opening bid may attract more competitive bidders who are looking for a bargain, even though it increases the risk of underselling.

Ku et al. (2005) explore field and survey data of live and online auctions to find evidence of competitive arousal, such as rivalry, time pressure, social facilitation and first-mover advantages. They find considerable support for competitive arousal and escalation models but no support for rational choice predictions. In addition to evidence of auction fever, the authors find overbidding due to an attachment effect, such that long bidding durations and other sunk costs intensify the desire to win the auction and thus increase revenues for the seller. Both effects also emerge in a controlled laboratory experiment that varies the sunk cost parameter and the number of bidding rivals.

Heyman et al. (2004) also examine these two phenomena of competition and attachment, using the opponent effect to describe the arousal prompted by competing with others and quasi-endowment to represent the increased valuation due to having been attached to the item as the high bidder. In two experiments, one involving hypothetical bids and the other real-money bids, they vary the number of rival bids and duration of the quasi-endowment (i.e. time spent as the high bidder). Increases in both the number of rival bids and the duration of the quasi-endowment have positive effects on the final price; therefore the authors conclude that sellers may be able to increase their revenues by increasing the total auction duration and lowering the minimum price to induce more feverish bidding.

The evidence to date thus suggests that auction fever is a real phenomenon, which

implies that sellers might increase revenues by setting a very low minimum price that increases the number of active bidders. Although this specific prediction has not been tested directly, several researchers report that lower minimum bids increase the number of latent bidders for auction items, which in turn increases the final auction price (e.g. Bradlow and Park, 2007).

Dynamic bidding

Although bidding behavior is inherently dynamic during an auction, research commonly assumes bidder rationality, such that bidders do not change their valuations while an auction is in progress. Most researchers focus on summary outcomes (e.g. final auction price) in an auction (e.g. Ariely and Simonson, 2003; Chakravarti et al., 2002) rather than explaining bidding behavior across the duration of the auction.

Park and Bradlow (2005) study bidding behavior over the entire sequence of bids by building a latent, time-varying construct of consumer willingness to bid, in which bidders may update a particular auction item over the course of the auction. They therefore incorporate and model simultaneously four key components of the bidding process within an integrated framework: whether an auction receives a bid at all; if so, who bids, when they bid, and how much they bid over the entire sequence of bids in an auction. The authors impose no structural assumption on bidder rationality or equilibrium behavior; instead, they derive the model using a probabilistic modeling paradigm. With a database of notebook PC auctions, they demonstrate that this general (yet parsimonious) model captures the key behavioral patterns of bidding behavior established in existing literature. Furthermore, they provide a tool for auction site managers to conduct customer relationship management efforts, which requires an evaluation of the goodness of the listed auction items (whether bids occur), as well as the potential bidders in their online auctions (who, when, and how much to bid).

A recent modeling advance in the field of dynamic bidding comes from Bradlow and Park (2007), who consider a sequence of bids in online auctions with an analogy of record-breaking events, in which only data points that break an existing record come into play. They investigate stochastic versions of the classical record-breaking problem, for which they apply Bayesian estimation to predict observed bids and bid times in online auctions. They address these data through data augmentation, with the assumption that participants (bidders) have dynamically changing valuations for the auctioned item but that the latent number of bidders competing in the events is unknown. Significant variations are identified in the number of latent bidders across auctions. In addition, the analysis indicates that there are many latent bidders relative to observed bidders. Given a previous bid, the number of remaining latent bidders is much smaller compared to that of new entrants. Moreover, both larger bid and time increments significantly influence the bidding participation behavior.

4. Competition in online auctions

In online auctions, both buyers and sellers have more opportunity to obtain the best value in the marketplace, compared with traditional auctions. Sellers have access to a much larger pool of potential bidders, unconstrained by information access or time restrictions. Similarly, buyers can consider more auction items in a given product category, which enables them to find the object of their search. The level of competition among auction

items and bidders probably matters in terms of consumers' willingness to pay, which in turn affects the final auction price. Therefore we discuss the impact of competition on bidding behavior next.

Dholakia and Soltysinski (2001) provide evidence of herd behavior bias – the tendency to gravitate toward and bid for auction listings with one or more existing bids while ignoring comparable or even more attractive unbid auction listings within the same product category and available at the same time. To elaborate on this bias, they posit two distinct psychological mechanisms – the use of others' bidding behaviors as cues for pre-screening and the escalation of commitment after the first bid – as responsible for herd behavior. On the basis of auction listings in four product categories (portable CD players, Italian silk ties, Mexican pottery and Playstation consoles), they report that herd behavior bias gets attenuated by increasing bid prices but increases with the difficulty of evaluating quality. Dholakia et al. (2002) further investigate two specific types of herding bias moderators: auction attributes (volume of listing activity and posting of reservation prices) and agent characteristics (seller and bidder experience). They find that greater experience mitigates bias susceptibility among both sellers and bidders. As in traditional exchange arenas, for which behavioral decision research shows consumers are influenced by contextual informational cues when they make choices, consumers still violate the principles of value maximization and consistency and make suboptimal bidding decisions in online auction marketplaces.

In studying the extent to which people search for prices and the influence of the minimum price on the magnitude of bids, Ariely and Simonson (2003) find that higher minimum prices cause participants to bid more for the goods, but only when there are no immediate comparisons. Thus the measure of the amount of supply offered by other sellers interacts with the effect of the minimum price on auction prices. When many sellers offer identical or similar items at the same time, auctions with both high and low minimum prices end at roughly the same price. That is, a high degree of supply reduces the effect of the public reserve price; however, when few other sellers offer the same item, a high minimum price yields empirically higher auction prices.

To model a bidder's willingness to pay in ascending first-price auctions, Chan et al. (2007) consider two-dimensional market competition. These authors use breadth and depth measures to characterize marketing competition in online auctions; they define the former as the number of items with product attributes (except for brand name) similar to the focal item and the latter as the number of items with the same brand as the focal item that come from the pool of auction items with similar product attributes. The elasticities for breadth and depth are informative. An increase in breadth reduces willingness to pay about four times as much as an increase in depth, even after they control for brand effects (and other brand interaction effects) in the willingness-to-pay estimates. Therefore consumers appear to value breadth, because it helps them determine their willingness to pay by reducing their search and comparison shopping costs (especially if the same seller provides multiple listings of the same brand). This explanation is consistent with literature in psychology and marketing regarding consumer consideration and choice set formation and decision-making.

In online auctions, nearly identical goods often sell in a sequence of auctions, which allows bidders to focus on the auction that will end first while accounting for the presence of subsequent auctions. Zeithammer (2006) analytically and empirically studies this

forward-looking behavior in online auctions with a model that extends existing literature on sequential auctions by allowing consumers to take into account the exact product information for future auctions. He assumes that bidders know not only the type of the current product on which they bid but also the type that will be sold next and when. The expected future surplus, and hence the opportunity cost of winning now, is a function of the available information about what will be sold at what point in the future. Actual data from eBay's MP3 and DVD categories test the theoretical model, and the empirical results suggest that bidders pay close attention to future products and auction timing, and adjust their bidding strategies accordingly.

5. NYOP auctions

'Name your own price' refers to a pricing mechanism in which the buyer, instead of the seller, determines the price. The buyer makes a bid, and the seller decides to accept or reject it. In an NYOP auction, any consumer who bids above a seller's unrevealed threshold price receives the product at the price of his or her bid. In the case of limited availability, consumers who are the first to bid above the threshold are served first. In contrast, a standard auction determines the winning bidder as the one who places the highest bid (if bidding to buy) or the lowest (if bidding to sell) among rival bids.

Chernev (2003) examines consumers' willingness to pay in an online environment by comparing two price elicitation strategies: price generation (i.e. 'name your price') and price selection (i.e. 'select your price'). The former approach, advanced by Priceline.com for example, asks consumers to state their willingness to pay for the product under consideration. In the latter approach, consumers consider a set of possible prices and select the price they find most acceptable. Contrary to popular belief that more choice is better, this research demonstrates that consumers often prefer a price elicitation task that offers less flexibility and is more restrictive in allowing consumers to express their willingness to pay. Moreover, Chernev shows that the presence of a readily available reference price moderates consumer price generation processes. This reference price, either externally or internally generated, can strengthen consumer preferences for the price generation process by mitigating the negative affect associated with it such as due to complexity of the task.

In an NYOP channel, no consensus exists about how to structure the market interactions optimally. For example, Priceline and eBay Travel allow consumers to place only a single bid for a given item, whereas sites such as All Cruise Auction openly allow consumers to continue bidding if their previous offer was rejected. To understand the effects of restrictions on the possible number of bids consumers can submit on an NYOP, Fay (2004) develops an analytical model and compares the single-bid model with one in which experienced consumers can submit multiple bids at Priceline. The analysis indicates that both market structures yield the same expected profit if all consumers have the same bidding options (single bid versus multiple bids). However, some consumers may know how to circumvent the single-bid rule and submit multiple bids (sophisticated bidders). The author argues that if it is impossible to completely prevent consumers from 'surreptitious rebidding', then the NYOP firm may be better off by encouraging rebidding. The benefit is determined by the proportion of the sophisticated bidders.

From the consumer point of view, repeatedly revising bids is not costless. Hann and Terwiesch (2003) study this cost, which they call frictional costs in NYOP, defined as the

disutility that the consumer experiences when conducting an online transaction, such as submitting an offer. Thus consumers trade off direct financial value for frictional costs. The authors show that frictional costs in electronic markets are substantial, with mean (median) values ranging from EUR 4.84 (3.54) for a portable digital music player to EUR 7.95 (6.08) for a personal digital assistant. They also report that socio-demographic variables do not explain variations in frictional costs. Spann et al. (2004) develop and empirically test a model that simultaneously estimates individual willingness to pay and frictional costs on the basis of consumers' bidding behavior at an NYOP seller. Their results show significant consumer heterogeneity that enables sellers to segment the market and indicates an opportunity for sellers to increase profits further through price discrimination. Moreover, they find that restricting consumers to a single bid may reduce the seller's revenue. Thus providers of NYOP mechanisms should be very concerned about the particular design of this mechanism.

Terwiesch et al. (2005) present a model of consumer haggling between an NYOP retailer and a set of individual buyers. In an NYOP setting, instead of posting a price, the retailer waits for potential buyers to submit offers and then chooses to accept or reject them. Consumers whose offers have been rejected can invest in additional haggling effort and incrementally increase their next offers. Using transaction data from an NYOP retailer, these authors show that the retailer must choose a threshold price above which all offers will be accepted. If consumers are very heterogeneous with respect to their valuations and haggling abilities, haggling can lead to higher profits than posted prices.

According to the notion that real-life bidders do not behave as game theory prescribes they should, Ding et al. (2005) formally incorporate the emotions evoked by an auction process similar to Priceline's, including the excitement of winning if a bid is accepted and the frustration of losing if it is not. They identify the important role that emotions play in bids revisions, which has been ignored by classic economic models. It is found that emotions dynamically influence the direction of such revisions, particularly according to the bidding outcome of the previous round. In addition, the authors characterize the optimal bidding strategies depending on the bidder's propensity to bid.

The behavior of consumers in NYOP auctions has also been empirically investigated and compared with the predictions of economic theories. Spann and Tellis (2006) find that a majority of bidding sequences are inconsistent with the theoretical prediction in that the bids in a sequence do not increase monotonically at a decreasing rate. Empirical evidence is found of overbidding, which suggests that consumers are paying a higher than efficient price. Interestingly, the authors find that bidders' experience (measured by the number of products bid on) does not increase the chance of rational bidding. A large number of bids and long inter-bid times increase the chance of irrational bidding.

The literature on NYOP auctions remains quite sparse. Some studies focus on the specific design of an NYOP channel but do not provide empirical data (Chernev, 2003; Ding et al., 2005; Fay, 2004). Other studies analyze consumer characteristics on the basis of data from such auctions but do not examine whether consumer behavior is rational (Hann and Terwiesch, 2003; Spann et al., 2004). Spann and Tellis (2006) analyze the empirical behavior of consumers and assess the extent of irrationality reflected in the bids submitted. Although NYOP channels have rapidly become a familiar business model in the e-commerce landscape, uncertainty about the survival of these new electronic markets

on the Internet remains. Thus it is critical to study how best to structure this sales mechanism and design user interface. To this end, behavioral aspects should be considered in additional research of NYOP mechanisms.

6. Conclusions and future research

In this chapter, we focus on effects of auction design parameters on auction outcomes, irrational bidder behavior, and competition among online auctions, as well as research findings pertaining to NYOP auctions. Although we acknowledge that a more complete literature review is possible, this chapter captures the key results from existing literature about online and NYOP auctions and thus provides a strong overview.

Extant literature covers much ground and attempts to answer various questions. After assessing that literature, we note several avenues for the further exploration of online auctions. First, current empirical research mainly focuses on understanding the effects of various auction design parameters. Most research examines design variables in lieu of competition, whether from other auctions or from alternative options such as the retail channel. Incorporating these aspects would not only clarify the actual decision-making process of bidders more accurately but also provide more relevant insights for managers as they develop pricing strategies, in terms of both price format and price levels.

Second, a new theme has been formed in online auction research, namely, the behavior of bidders, especially how bidders form their willingness to pay. Economic models typically assume that in private value auctions, bidders *a priori* possess a valuation (signal) that remains invariant to other signals. Increasingly, however, researchers identify various influences on this valuation and the process by which it forms. Continued research into how consumers form their willingness to pay in online auctions has great value for business managers, because it can help them identify potential buyers and increase the efficiency of their business operations. This topic might be explored in more detail through controlled lab or field experiments.

Third, bidder learning represents yet another promising research area. Prior research examines sellers' feedback ratings and links them to auction outcomes; more recent work also considers bidders' experience, also measured through feedback ratings, as a means to explain bidding behavior and the formation of willingness to pay. Additional research is needed in this area, because understanding how bidding strategies within a product category, as well as across product categories, evolve as a result of experience will be crucial for online auctions to evaluate the lifetime value of bidders (both winners and losers). Because buyers and sellers interact in an auction marketplace, further research should develop integrated frameworks to study both buyer and seller behavior, instead of presuming that seller behavior is exogenous (e.g. Yao and Mela, 2008).

The Internet provides a fertile ground for studying consumer behavior, particularly in the cases of online and NYOP auctions. Not only do these new trading platforms make the market more efficient, but they also provide generous amounts of data and information that can inform our understanding of human behavior, especially with regard to decision-making processes associated with transactions. Research developments pertaining to online and NYOP auctions have been fruitful; we hope this review further accelerates the development of theoretical, empirical and experimental research on online and NYOP auctions.

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