Economics, Psychology, and Social Dynamics of Consumer Bidding in Auctions

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Abstract

With increasing numbers of consumers in auction marketplaces, we highlight some recent approaches that bring additional economic, social, and psychological factors to bear on existing economic theory to better understand and explain consumers' behavior in auctions. We also highlight specific research streams that could contribute towards enriching existing economic models of bidding behavior in emerging market mechanisms.

Key words: auctions, bidding, economic psychology, social dynamics, experimental economics

The past decade has seen the advent and growth of online auction marketplaces, with online auction revenues expected to reach $36 billion by the year 2007 (C2C and B2C, Laudon and Traver 2004, p. 784). Study of specific auction formats for the past several decades has produced rich normative economic theories of rational buyers' and sellers' behavior (see Klemperer 1999 for a review). A majority of these theories are developed for rational individuals who bid on behalf of firms for resources such as offshore oil leases, or on behalf of wealthy bidders for expensive pieces of art, in auctions with a specific set of rules.

However, tests of normative theories have found that bidders depart from these predictions (see Chakravarti et al. 2002 for a review), highlighting the necessity of studies analyzing the gaps between the behavioral reality and "the well informed, rational, utility maximizing *homo economicus* of theoretical economics and game theory," (Rothkopf 1991, p. 40), prompting calls for theoretical and empirical research from an economic as well as a behavioral perspective (Rothkopf and Harstad 1994).

In addition, most items now being sold in auctions are mass-produced and/or relatively inexpensive, and participants who bid on these products in auctions may receive utility from factors other than the price. Biases arising in these contexts are liable to be less costly than when bidding on one-of-a-kind, big-ticket items such as oil leases or Impressionist paintings. Thus, few of the assumptions required for the theory to be applicable exist in these auction marketplaces. Consequently, researchers need to focus on consumer characteristics and auction mechanisms that affect behavior in these choice contexts.

We focus on a set of economic, psychological, and social factors that are typically not considered in the context of auction behavior, but that improve our understanding of bidders' behavior. We present ongoing research on these factors, and suggest topics for future research.

1. Auction Marketplaces

Auction marketplaces with a large number of buyers and sellers of substitutable products bring new challenges for both buyers and sellers. Sellers must determine better ways to auction multiple products over time. Buyers must also decide on a good bidding strategy when faced with a large number of nearly identical items (or close substitutes) in auctions that may end simultaneously, sequentially (one ends and the next starts), or *overlap* (some end before others).

For consumers who need one unit of a product, facing multiple auctions raises the issue of a budget constraint that may prevent them from bidding in multiple auctions, and/or the possibility of winning multiple auctions if they do bid in more than one auction simultaneously. Suppliers who bid on contracts in overlapping auctions face a similar problem, being limited by their capacity to fulfill multiple orders if several bids are accepted. Sellers of multiple products face a different problem when selling products with varying levels of substitutability – should they combine these products and auction the bundle, or should they auction them separately?

1.1. Overlapping Auctions

Buyers. In September 2004, eBay listed 10,599 auctions for digital cameras lasting up to 10 days (2,572 ending within 24 hours) - a staggering, albeit typical, number of options. Bidders considering hundreds of overlapping auctions may cope by considering only a subset of the available auctions as well as expected future auctions, and satisfice (Simon 1955). Contextual factors affecting the composition of such a subset are also of theoretical interest.

Zeithammer (2005a) models certain eBay product categories (MP3 players and DVDs) as a set of sequential auctions for identical units (ordered by the ending time), where buyers are informed about *specific* units coming up for sale in the near future and are assumed to have single-unit demand, and independent private values (IPV). He argues that optimal bidding

reduces to solving the tradeoff between winning the auction ending first and the option value of participating in the future auctions, the latter depending on the information about future items. Bidders take detailed information about multiple auctions into account when constructing bids, and bid lower in the current auction when they know about future item availability. Zeithammer (2005b) finds analytically that the sellers are able to regulate buyer bid-shading whenever seller profits are relatively low, and that bid-shading vanishes when the seller profits are near zero.

A related topic of interest is how *affiliated* values affect prices in overlapping or sequential auctions. Prices could drift upwards because price announcements at the end of an auction may increase bidder valuations in subsequent auctions. Prior experiments (Kagel et al. 1987) suggest that revealing the distribution mean (from which affiliated values are drawn) results in higher bids, although the resulting price increase was found to be not significant.

In contrast, Ashenfelter (1989) reports empirical evidence of decreasing prices in sequential auctions for a single seller of art and wine (see Gale and Hausch 1994 for a list of possible reasons). Milgrom and Weber (2000) show analytically that in a sequential auction with IPV bidders, while each auction decreases the pool of bidders (the winner leaves), remaining bidders bid higher in the next auction, thus keeping revenue unchanged.

Zeng, Cox, and Dror (forthcoming) study the coordination of purchasing and bidding activities across online auctions and posted offer sites for products with demand complementarities. Such complementarities create interdependencies among purchasing decisions across distinct markets. Of the theoretical models developed, one set focuses on optimal purchasing decisions across several posted offer sites with flat shipping costs, using discrete location theory to solve for optimal purchasing decisions. Another set of models focuses on optimal coordination and bidding across simultaneous auctions of complementary items.

Suppliers. Pazgal and Iyer (2004) study how capacity constraints affect bids when two projects of different (but known) values ($v_1 > v_2$) are offered in a first-price sealed-bid auction, and each of n suppliers (with IPV) can bid on only one of the two projects. They demonstrate empirically that: a) lower bound of the bids is lower for the higher-valued project (project 1, with value v_1), b) willingness to bid on project 1 increases as the ratio (v_1/v_2) increases, and c) bid amount decreases as n increases, leading to more even probabilities of bidding on each project.

Thus, with a large number of participants, bidders are willing to take "long shots" by submitting low bids on the high value project. This has implications for consumer bidding in online auctions as well: if it is costly for bidders to participate in auctions, they may be less likely to bid and/or bid lower when a large number of bidders are participating in the auction.

These studies emphasize the complexity of the decisions faced by bidders in overlapping auctions for substitutable or complementary products. Sellers of multiple products face another decision: whether to offer the products as a bundle, or separately (and, if so, in what order).

1.2. Product Bundles

Bundling has traditionally been used as a price discrimination device to separate customers with differing reservation prices (Adams and Yellen 1976), allowing high markups to be charged to buyers who may be interested in only one of the two bundled products (Schmalensee 1984). From a buyer's perspective, the auction of a bundle may attract fewer bidders and thus lead to lower prices. From a seller's perspective, an auction of a bundle reduces transaction cost (listing and conducting separate auctions for component products).

However, economic theory predicts that, for more than two bidders, separate auctions of independent component products will yield greater revenue for the seller than an auction of the bundle (Chakraborty 1999, Palfrey 1983). Hence, is it ever optimal for the seller to sell a bundle?

Popkowski Leszczyc, Häubl, and Shen (2004) study empirically different bundling formats in open ascending-bid (English) auctions to determine the role of component product complementarities on seller revenue. They find that with low product complementarities, separate product component auctions raise more revenue than a single auction of the bundle. However, when complementarity is high, a single auction of the bundle leads to substantially *greater* seller revenue than do separate component product auctions.

Bundling also tends to be more profitable with fewer (versus more) bidders. Participants bid lower in component auctions versus the bundle auction, perhaps because the former carry greater exposure risk (i.e., failing to obtain one of the complementary products).

Popkowski Leszczyc, Pracejus, and Shen (2004) study experimentally whether consumers use the assessed value of certain-value items to draw inferences about the value of uncertain-value items in a bundle of items with low complementarities. Results suggest that a bundle of an item of low but certain value together with an item of high and certain value is valued less than the value of the uncertain item alone. However, a bundle of an item of high and certain value with an item of low but uncertain value is valued higher than the sum of the values for the two items. Informing bidders about the uncertain-value item's value attenuates this effect.

This effect of complementarity is also relevant in the context of sequential auctions, where losing the first auction for a product complement may cause the bidder to value the subsequent component less. In contrast, winning the auction may make consumers value the subsequent complement more, and bid higher, in the subsequent auction.

2. Economic Factors

Models of bidding could be further enriched by incorporating economic factors that impact a bidder's behavior in current marketplaces, such as transaction costs and the parsimonious representations of risk preference, that are generally ignored by game theorists.

2.1. Transaction Costs

The time and effort expended by bidders in gathering information, preparing their bids, and in participating in the auction can impose a real and important transaction cost on participation. In general, one may expect transaction costs to lower participation and, hence, seller revenue. However, this is not necessarily true. Lucking-Reiley (1999) found that internet-based Dutch auctions for collectibles produced higher revenue than (strategically equivalent) first-price sealed-bid auctions.

Carare and Rothkopf (2005) attribute these results, in part, to the slow process of online Dutch auctions where bidders incur incremental transaction costs if they delay bidding. The authors develop a game-theoretic model of a slow Dutch auction and derive two symmetric, payoff-equivalent equilibria of the game in the absence of a *cost of return* (for the bidder to wait and/or return to bid at a lower price) and then consider the more general case of costly return.

They find that, within an appropriate range for the cost of return, seller's revenue increases as a function of that cost. Such costs may apply to Filene's Basement (Bell and Starr 1993), which marks down prices by a schedule, and could be considered a slow Dutch auction.

2.2. Risk Preferences

Violations of revenue equivalence in laboratory auctions are often attributed to bidders' risk aversion (see Chakravarti et al. 2002 for a discussion). Friedman and Sunder (2004) question the benefits of using risk-aversion to explain behavior. They note that even complex functions

with many free parameters do a poor job of predicting behavior in out-of-sample data, new tasks, and new contexts. The authors suggest that placing the explanatory burden on potentially observable opportunity sets offers a more robust approach to understanding behavior. Analysis of net payoff opportunities, including embedded options and other interactions with existing obligations, permits analysis of risky choice using expected value, i.e., a linear utility function.

A significant amount of work has focused on the effect of risk preferences on bidding. However, it has been difficult to give bidders a risk "score" on the basis of a priori tests that did not include bidding. Using a linear utility function and risk-neutral bidders may yet require other variables to be introduced in the model to explain observed departures from rationality. Thus, it remains an area of interest for researchers to characterize risk preferences parsimoniously.

3. Social Factors

Consumers' motives to attend auctions and interact with other bidders and sellers vary widely. Studying these motives and the process of interaction increases our understanding of bidder behavior, and may affect optimal auction design. Also, most business-to-business auction bids are handled by groups and not by individuals. It therefore also behooves auction researchers to study how the decision making of these groups differs from individuals' decisions.

3.1. Reasons for Participating in Auctions

While bidders may have several differing motives to attend an auction, little formal attention has been given to categorizing these motives, and to studying their effect on bidding.

For instance, Smith (1993) suggests that buyers may participate in auctions to be a part of the "show," and to communally decide the value of the product. Sellers may use auctions to

arrive at a socially determined "fair" price for a product, even if this price is lower than what they could get by private contract (one-on-one). Herschlag and Zwick (2000) also suggest several motivations for online auction participation, including addiction to excitement, competing against rivals for a good deal, and a need for friendship and community.

Greenleaf (2004a) provides a typology of the different reasons that could motivate a buyer to attend an auction. Some of the "rational" reasons include: getting good bargains and paying prices lower than those at fixed price retailers, paying a "fair" market-determined price, and obtaining information about prices. Sellers, on the other hand, may use auctions to reach new customers, save time as compared to individual negotiations, and to sell excess inventory.

Given the social setting of most auctions, consumers may also participate in or attend auctions to gain prestige, to signal membership in a community of specific collectors, hobbyists, or businesspeople (Smith 1989), to observe people's fall from wealth and signal one's own rise by buying parts of a dispersed estate (Wall 1997), to satisfy their ego by paying a high price for a product, or simply to seek entertainment from watching other people win and lose.

However, not all of these motives will be equally applicable to auction participation online and in the bricks-and-mortar (BM) world. For instance, bidders who participate for social prestige may be more willing to bid high because of social considerations (such as who is bidding, or who is watching) in a BM context. These motives also affect how bidders feel about winning/losing (section 4). In addition, when bids are determined by groups, social dynamics also need to be considered, along with individuals' motives.

3.2. Group Bidding

Groups often decide bids for offshore oil leases, large construction contracts, or expensive collectibles (Smith 1989), as individuals in the group may possess information that

may be important for the overall decision, and/or groups may be less prone to irrational behavior than individual decision-makers. While social psychological research has studied individual and group decisions in non-strategic settings (see Davis 1992 for a review), there is little work on decision-making of small groups as agents in markets and other strategic games.

Cox and Hayne (2004) compare group and individual decision-making in the context of bidding in common value auctions to determine whether groups make better decisions in market environments characterized by risky outcomes and, if they do, whether this reflects an advantage from having more information available. They vary the distinct information possessed by individual group members as an experimental treatment (by manipulating signals received by the bidders), and use a quantitative measure of deviation from minimally-rational decisions.

The results indicate that when groups are characterized as decision-making entities consisting of more than one individual with distinct information, groups with signal sample size of 5 (i.e., each of the 5 group members receives a value signal drawn from a distribution) were less rational than individuals with signal sample size of 1.

On the other hand, giving individuals within the groups the same information changes the results. Groups with signal sample size of 1 (i.e., each group member receives the same signal) bid no differently from individuals with signal sample size of 1. Also, *more* information about the value of the item caused both individuals and groups to deviate *further* from rational bidding and this "curse of information" was worse for groups than for individuals.

Cox and Hayne (2005) explore whether incentive differences for individuals in groups affect performance. They set up "nominal groups" where each member submits an individual bids, and these bids are averaged to arrive at the group bid. The payoff is manipulated such that in one experimental treatment all group members shared the payoff equally (cooperative

incentive) while in the other treatment the payoffs are shared on the basis of individual group members' bids. The latter creates a "free-riding incentive" as group members who bid the lowest earned the most. Groups with a free-riding incentive are more rational, and bid lower, than cooperative groups or "natural groups" with either small or large signal sample sizes.

Thus, social dynamics within groups, and between buyers and sellers, will often affect bidders' entry decisions, bid, and selling prices. In addition to the social components, some of the motives for individual participation (section 3.1) are also emotional or goal-driven, affecting bidder behavior from a psychological perspective. We now illustrate how some of these psychological factors can affect bidding during the auction and emotions after the auction.

4. Psychological Factors

Bidders often do not have a good estimate of an item's value, constructing it when required (Fischhoff 1991). This value is susceptible to information acquired prior to and during the auction (Cheema et al. 2005a, Häubl and Popkowski Leszczyc 2003, Kamins et al. 2004).

4.1. Value Construction and Reference Points

Dholakia and Simonson (2005) study how making certain reference points explicit affects bidding. As comparative loss aversion is more pronounced when comparisons are explicit (suggested by the seller) rather than implicit (i.e., spontaneously used by consumers; Brenner et al. 1999), the former should induce more cautious bidding. Explicit comparisons could also trigger more cautious evaluation of the information and, contingent on the buyers' interpretation of the seller's intention, an error-prevention orientation (Friestad and Wright 1994).

Results from an online auction field experiment supported this claim. Explicit comparisons diminished the influence of adjacent auction listings on the winning bid in the focal auction, and led participants to submit lower and later bids. A choice experiment had similar results: explicit instructions to compare option sets increased choice of the compromise option.

In addition to price information, bidders may be affected by external factors such as other bidders' behavior, copying it, and/or changing their value for the item (e.g., Banerjee 1992, Bikhchandani et al. 1992, Dholakia et al. 2002). Internal factors such as bidder participation motives (section 3.1) will also affect bidding, and bidder emotions, during the auction process.

4.2. Multiple Stages of Decision Making

Bagozzi et al. (1998) suggest that the reasons to enter, bid, or leave auctions emanate from cognitive, emotional, and social processes (see also Ariely and Simonson, 2003). Bagozzi et al. (2003) suggest a decision-making model which could also be applied to an auction setting.

Consider a bidder who enters the auction with a competitive goal of winning the auction. This bidder imagines both goal failure and goal success scenarios, thus experiencing both negative as well as positive anticipated emotions. In the goal failure scenario, commonly anticipated emotions would include disappointment, annoyance, regret, stupidity, guilt, and anger. In contrast, the goal success scenario would entail experiencing relief, satisfaction, happiness, and pride. This bidder would then make a decision about the amount of effort he is willing to expend to pursue his goals contingent on these anticipated emotions.

Bagozzi (1992) argues that desires are necessary to convert reasons for actions into intentions to act. While goal intention refers to a self-commitment to realize a desired end state, an implementation intention refers to a self-commitment to perform a particular action. In the

implementation stage, the bidder activates instrumental behaviors to achieve his goal (bids high). Implementation intentions thus mediate effects of goal intentions on action. In addition, goal outcomes (winning/losing) affect emotions, as discussed in greater detail in section 4.3.

A decision-making model could thus be used to study the effect of goals on bidder intentions, behavior, and emotions in auctions. Some of these factors have been incorporated in auction models. Sinha and Greenleaf (2000) show that *bidding aggressiveness*, i.e., a desire of bidders to win the auction, not just profit from it, can make the seller's reserve price dependent on the number of bidders.

Roth and Ockenfels (2002) demonstrate how bidders' reluctance to bid until the last minute in auctions with timed endings (termed *sniping*) leads to lower auction prices compared to auctions with "soft" endings. Engelbrecht-Wiggans (1989) demonstrates analytically that bidders in sealed-bid auctions will decrease [increase] bids when they anticipate regret from winning and overpaying [losing]. And Greenleaf (2004b) finds empirical support that anticipated regret by sellers of the possibility that the highest bid will exceed the seller's valuation but not the reserve leads them to lower reserves.

4.3. Experienced Regret in Auctions

Cheema et al. (2005b) study empirically how bidders' goals interact with auction characteristics to affect their post-auction regret, contingent on the win/loss outcome. Bidders primed with either a winning focus, or a prudent, value focus participated in either open ascending auctions with irrevocable exit ("Japanese variant" of the English auction) or open descending (Dutch) auctions against simulated bidders (see Cheema et al. 2005a for details).

The deliberative nature of the ascending auction (bidding at each step) led to less regret overall in them than in descending auctions. In ascending auctions, losing bidders reported higher regret than winners, irrespective of the winning/value focus.

In descending auctions, too, among winning focused bidders, losing (versus winning) bidders reported higher regret. However, among value-focused bidders, those who won (being the highest and only bidder) feared that they paid too much. This apprehension was greater among bidders who were relatively less certain of the price of the auctioned product.

Losing bidders' regret increased as a function of the lost potential surplus (value - winning bid), both for ascending and descending auctions. In descending auctions, winning focused bidders who lost were more likely to win a subsequent auction for an unrelated product.

This result has significant implications for sequential auctions for *unrelated* products. However, effects of prior auction outcomes on subsequent auctions of *related* products would be further moderated by product characteristics: winning (versus losing) the first product may make bidders bid higher for subsequent complementary products, but lower for substitutable products.

5. Conclusion: The Relevance of Auctions to Marketing

5.1. Evolving Marketplaces

The participation of the everyday consumer into this environment necessitates enriching existing models from an economic as well as behavioral perspective. Researchers also need to identify bidding and selling strategies for new mechanisms in environments such as eBay and other auction sites.

Differences between various selling mechanisms are becoming increasingly blurred as new hybrids emerge. Most online consumer auction sites now provide a "Buy it Now" price, a fixed-price alternative for buyers. In addition to giving risk-averse bidders an option to purchase the product without risking having to pay more for it in the auction (Budish and Takeyama 2001) and a profitable accommodation for buyers with strong time preferences (Carare and Rothkopf 2005), these prices provide buyers a reference point that affects their value for the item (section 4.1). Other hybrids include similarities between auctions and formal negotiations (Bulow and Klemperer 1996), and elicitation of "best offers" alongside posted prices.

5.2 Methodological Tool

With their fixed structure of interaction, auctions provide a controlled context in which to study decision making under uncertainty (McAfee and McMillan 1996). Researchers can study how consumers process information and change their bidding strategy as the auction progresses and information is revealed (section 4). This market can also be used to study group decision making dynamics and the effect of incentives on decisions under risk (section 3.2). Auctions with proper incentives can elicit consumers' value for new products (Hoffman et al. 1993).

5.3. Conclusion

We highlight research approaches that focus on additional economic, social, and psychological factors affecting consumers' behavior in auctions, and outline areas for further investigation. These factors could enrich existing economic auction models and help us better understand behavior in emerging market mechanisms.

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