

Bidding Behavior on Internet Auction: Secondhand versus Newly Manufactured Products

Rong-An Shang

Han-Bo Chang

Department of Business Administration

Soochow University

Taipei, Taiwan

rashang@mail2.scu.edu.tw

benal@ms22.hinet.net

Abstract

Although auctions have been an important model for price discovery on Internet, economics does not have a precise theory of auctions. Auctions raise many problems such as what types of goods will be sold by auction on Internet, and how bidders bid on Internet auction. It is curious why some newly manufactured products that are sold on the posted-price markets are also sold by auction on Internet. This paper presents a field study on Internet to investigate the differences between the bidding behavior for secondhand and newly manufactured goods. Data is collected on an open-book auction site. The results show that there were really some bidders behaved like evaluators and whether a bidder will be an evaluator or a participant is not affected by common referenced external market price. Furthermore, the prices on posted-price market may affect bids on the auction market., averaged normalized mark up of newly manufactured items were significantly larger than that of secondhand items. Implications of the findings are also discussed in this paper.

1. Introduction

The Internet is shaping industries and changing business models. Internet can facilitate transactions between buyer and seller and lower the transaction cost. Some literatures suggested that Internet will cause the disintermediation effects and network services will replace traditional middlemen in the value chain [14] [16]. The issue of disintermediation has raised the debates on whether electronic marketplace can perform the functions of traditional middleman [1].

One major function of intermediaries is to gather, organize, and evaluate information, which is dispersed in society, and to set the price based on this information to clean the market [18] [20]. It is a hard work for the firms to get sufficient information to make the pricing decision. So usually either the quantity of demand is less than the quantity of supply and the product has to be sold at a discount, or the posted price is too low and there will be a rush for the product or the buyers have to pay a premium. Because it is not easy to clean the market on the posted price, traditionally, except for the transactions of some standardized commodities in retail market, most of the final dealing prices are decided by dickering or

bargaining. The price marked in the store or printed in the catalog is just the asking price of the seller. This asking price is usually higher than the price the seller can accept. Sellers and buyers will try to gather information and reveal the other's bottom line during the bargaining process.

For the posted price is usually not efficient enough, it is an interesting problem how the price is decided for products sold on Internet. Lower menu cost is one major benefit of electronic commerce [19]. Modahl [13] has suggested that the dynamic pricing model, which can change the price simultaneously according to current sales, is the most important innovative feature of electronic commerce. On the other hand, some bargaining agents, which is an software agent on the Internet and can take the place of seller or buyer in the bargaining processes, have been proposed [8]. However, although there have been so many solutions for price discovery, auction is still the seldom one which has worked in practice. Electronic auction solve the problem of getting the buyers or sellers to reveal their best price. Companies such as eBay, Ubid, Priceline, and FreeMarkets have invented various auction models in different markets and worked well. For example, eBay, which provides a platform for English auction for individual sellers and buyers, has supposed to be one of the most successful companies on Internet.

Although auctions have been an important model on Internet, economics does not have a precise theory of auctions [4]. Firms face the new type of transaction need to learning how to adopt the new mechanism in the organizations as sellers or buyers [3] [5]. Because Internet provides a different context for auction, bidding behaviors on Internet may be different from other auction markets. Internet auctions raise a variety of interesting questions for economists to investigate such as what types of goods will be sold by auction, and how bidders bid on Internet auction. It is curious why some newly manufactured products that are sold on the posted-price markets are also sold by auction on Internet. This paper will present a field study on Internet that investigated the differences between the bidding behavior for secondhand and newly manufactured goods. Results of this study may help to find out how bidders bid on the Internet and facilitate to explain the utilization of auction on Internet.

2. Auctions on the Internet

Auctions are processes of formalized dickering. There have been many different auction mechanisms like the English ascending-bid auctions, the Dutch descending-bid auctions, the first-price sealed-bid auctions, the Vickrey second-price sealed-bid auctions and double auctions [12]. Auction could be an effective way for price discovery if the number of participants is large enough. However, the cost of gathering enough participants at the same time is high, so in the past, auctions are seldom used in consumer markets except for some expensive collectables.

Electronic auction solve the problem of getting the players at the same time to reveal their best price. Auction evolved in a setting where people could hear and see each other. Traditionally, people participate in an English or Dutch auction have to stay and pay attention to the process during the bidding period. But Internet has provided a different context. The network can get people in different locations participate the auction easily. Besides, in order to get more participants, auctions on the Internet are usually asynchronous that the auction information is exchanged on the network and the bidding period continues for a few days. The basic challenge for Internet auction is that bidders in an auction lasting for several days have to stay on line to raise their bids. Proxy bidding solves this problem by providing a software agent. When current price is below the upper limit price specified by the bidder, the agent will bid automatically on the price mark up by the minimum increment set by the seller [4]. So people don't have to stay on line and can bid on any convenient time during the auction period. Asynchronous auctions have lowered buyers' cost to participate.

Lee [7] analyzes prices in electronic and conventional auction markets for used cars sold from 1986 to 1995. He found that prices in the electronic markets were higher than prices in the conventional markets and that this price difference seems to increase over time. This result has showed that the electronic markets have been more efficient than conventional markets for auctions.

2.1 Types of goods

As Internet technology lowers the cost of running an auction relative to using other pricing mechanisms, it is expected that new types of goods will be auctioned. However, the literature has not yet examined the question of what types of goods sellers would prefer to auction [11]. Wang [21] compares posted-price selling with auctions and finds that without auction costs, auctions are always optimal, and as long as there is a wide dispersion of buyer valuation, auctions will still outperform posted-price selling even if auctions were costly [6]. Similarly, Hall [4] argues auctions are favored when there is a lot of uncertainty about the market value of the objects. The value has to be high enough to make the auction process worthwhile, and the players need to have

enough time to make the auction work.

For Internet technology lowers the costs of running an auction, Lucking-Reiley [11] suggests as the market develops out of its infancy, we might well expect to see more additions to the list of auctioned. On the other hands, Liebowitz [9] emphasizes auctions are a step backward in the evolution of retailing and only make sense for odd lots, surplus, one-of-a-kind items, or items for which the audience likes the thrill of the chase. Meanwhile, Lucking-Reiley [11] suggests that auctions will be used most often for goods in limited supply where the demand is unknown to the seller, because these are the circumstances under which the benefits of a flexible, market-determined price are likely to be greatest. Lucking-Reiley [11] also notices that auctions would seem to provide relatively little social benefit in the case of newly manufactured items, because the supply of such items is not fixed, so the retailer can adjust prices or quantities in response to observed demand. By contrast, used and rare items are in relatively fixed supply, so auctions can be valuable in determining the correct price and allocation in the face of uncertain demand.

However, many auction sites do sell newly manufactured items. Lucking-Reiley [11] notes that there have been two primary business models for Internet auctions: merchant sites and listing-agent sites. A merchant site offers its own merchandise for sale, acting as a retailer who happens to conduct its transactions through auction. A listing site acts as an agent for other sellers, allowing them to register their items and running the auctions on their behalf. Some auction sites combine both types of models. Many Products sold on the merchant sites are newly manufactured ones.

2.2 Bidding behavior

Why these newly manufactured products are sold by auction is an interesting question because these products are sold on posted-price in the past. It seems that the cost to adjust prices or quantities on posted-price markets is higher than the cost of auctions markets on Internet. However, efficiencies of auction markets are affected by numbers and strategies of bidders. Bapna et al. [2] studies bidders' strategies in multi-item online auction and the result of the data mining shows there are three types of bidders: evaluators, participators, and opportunists. Evaluators are those who know clearly their true valuation of the good and submit high bids at the early stages of the auction. Participators are bidders who follow the bidding closely and place ascending bids. Opportunists are driven by thoughts of getting bargains – they usually place the lowest possible bids toward the end of an auction. Because there are list prices for the newly manufactured products, which are also sold on posted-price market, if the posted prices are efficient enough, these prices will be the common value of the products. There will be more bidders who know the market value of the items and may behave like evaluators.

However, Hall [4] has told another story. He argues that auction theory is based on the idea that the players all have cutoff prices in mind before the auction begins. If all bidders are eventually going to enter bids with their true maximums, it just does not matter, whether you bid at the beginning, middle, or end of the auction, or when others bid, has no effect on the outcome. The winner is always the player with the highest cutoff price, and the price is always the runner-up maximum plus the bid increment.

In fact, there is lot evidence that people learn auctions and adjust their ideas about the value of what is for sale. Bidders learn about the value of the goods by seeing the bids of others. They don't know their cutoff values before an auction begin [12]. Rather than having a good idea of the maximum they are willing to pay, they have a general idea that they want an object, and a firm desire not to pay more than it is worth. They would like to gather information from others about an object's value. Hall [4] also suggests experts who know the value of the item will not bid until the end of the auction in order not to reveal the value and raise the price. This strategy is similar to the strategy of opportunists proposed by Bapna et al. [2].

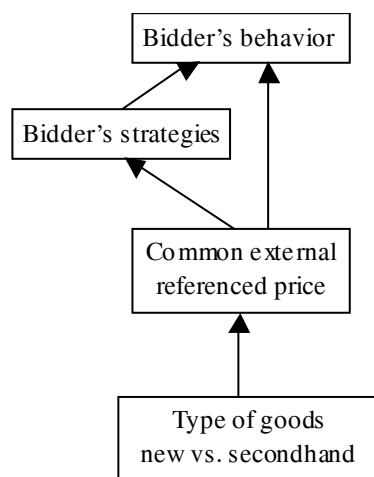


Figure 1. Theoretical model

Figure 1 illustrates the theoretical model of this study. Independent-private-value and asymmetries of information are two important assumptions of many auction theories [12]. For auctions of newly manufactured goods, Common external referenced price on the posted-price market will influence both the strategy and the behavior of bidders. Based on the classification of Bapna et al. [2], we propose that the bidding behaviors for secondhand products will be different with bidding behaviors for newly manufactured ones, and we conducted a field to verify the differences

3. Research Context

We got more than one hundred auction sites using two Chinese search engines. However, as mentioned by Lucking-Reiley [11], most of these auction sites were relatively small. This result reflects the network externality effects of auctions [6]. The site Go2HK (www.go2hk.com) was selected as the sample among the auction sites being searched for several reasons. First, comparing with other auction sites been searched, there were more buyers and products being sold on this site, so auctions on the site would be more likely to be efficient. Second, the site followed the rule of English auction, which is the most popular mechanism on Internet auctions. Third, both secondhand and newly manufactured items were sold on Go2HK, hence this site satisfied the requirements of our study. Fourth, auctions on this site were open-book ones, details of the auctions such as the buyer, price, and time of each bid were provided, and so behaviors of the bidders can be observed.

Lucking-Reiley [11] has surveyed types of items at auction on Internet and finds that the collectibles and the electronics and computers were the two most popular ones. Although collectibles was the largest category, transactions of electronics and computers were selected as the subjects of this study because electronics and computers were more standardized product. For the same reason, the study focused only on transactions of notebook computer and mobile phone.

Go2HK followed the rule of English auction. English ascending-bid auctions are by far the most prevalent on the Internet. On Internet English auction, bidders can search the items they are interested, view the current high bid, and decide whether to raise the bid price. In order to ensure the efficiencies, mark up of the bid must bigger than the minimum acceptable increment set in advance. The process will continue to the end of the bidding period. The last bidder, who will pay the highest price, is going to win the auction. Go2HK also provided the service of proxy bidding. A bidder with a high willingness to pay need not check back at the site repeatedly to keep raising the bid as necessary. Using proxy bidding, it will be no differences when the bidders propose their rules, the bidder with the highest upper limit price will always win the bid, and the price he pay will equal to the price of the next highest upper limit price add on the minimum acceptable increment. From the perspective of auction theory, results of proxy bidding are similar to the sealed-bid, second-price Vickrey auction [10].

Data are collected from the auction site Go2HK. Although there were many items been sold on this auction site, most of them got few responses. Because the interactions among bidders should affects bidding behavior, only the bidding records of the auctions with more than ten bids were collected. 41 auction items that terminate in the data collecting period and satisfied the criteria of bids number and were got. There were totally

1449 bids in the 41 auctions. Table 1 and table 2 show the components of the auction items and bidding records collected in the sample.

Table 1. Auction items in the sample

	Mobile phone	Notebook computer	Total
Newly manufactured items	7	6	13
Secondhand items	12	16	28
Total	19	22	41

Table 2. Bidding records in the sample

	Mobile phone	Notebook computer	Total
Newly manufactured items	223	239	462
Secondhand items	340	647	987
Total	563	886	1449

4. Analysis

Bidding Strategies of evaluators are different with the strategies of participators. Evaluators know clearly their true valuation of the good and submit high bids at the early stages of the auction. On the other hand, Participators are bidders who follow the bidding closely and place ascending bids. So in English auction, participators will bid on the mark up equal to the minimum acceptable increment, and evaluators may bid on the mark up larger than the minimum increment. Comparing with the auctions of secondhand items, because there are the referenced external market prices for the newly manufactured items, bidders can more easily evaluate the true value of the item and are more likely to become evaluators. So there will be more bids which on the mark up larger than the minimum increment for the auctions of newly manufactured items.

Existence of evaluators is discussible. Even if bidders may know the value of the item been auctioned, they will avoid to reveal their valuation and try to get the item on the price as low as possible [4]. Especially by using proxy bidding, bidders can easily bid incrementally and try not to reveal their highest prices. Although there are external market prices of newly manufactured items, bidders will behave like participators and bidding behaviors of newly manufactured items will not be different with that of secondhand ones.

Table 3. Percentage of bids on mark up larger than minimum increment

	Mobile phone	Notebook computer
Newly manufactured items	19.91%	25.75%
Secondhand items	24.09%	17.12%

Table 3 presents the percentage of bids on mark up larger than minimum acceptable increment for each type of items. The table shows that, first, about one fifth to one fourth bidding bided on mark up larger than the minimum acceptable increment, there were really some bidders behaved like evaluators. And second, percentages of bids that on mark up larger than the minimum increment on secondhand items were not different with that on newly manufactured items. The results indicate that there is really someone who will behave like an evaluator on Internet auction, and whether a bidder will be an evaluator or a participator is more likely to be affected by some factors of personal characteristics, but not the factors such as common referenced external market price.

Although the external market price would not affect whether the bidders will be evaluator or participator, it is still interesting whether the external market price could make any impact on bidders' behavior. If there are not any effects at all, the reason could be that the market price is not an efficient one. Except for comparing the percentages of bids of which on the mark up larger than the minimum increment, average mark up are also compared in the study. Because for different items, the price levels were not the same, mark up is normalized by divided by the minimum acceptable increment. Formula of normalizing mark up is as follow:

$$q_i = (P_i - P_{i-1}) / P_{\min}, \quad (1)$$

q_i : normalized mark up for the i bid,

P_{\min} : minimum acceptable increment,

P_i : price for the i bid.

Table 4. Averaged normalized mark up for mobile phone

	New mobile phone	Secondhand mobile phone
Average	25.072	2.264
Variance	15219.156	14.969
N	223	340
t statistics	3.4081	
p (two tails)	0.0007 < $\alpha = 0.1$	

Table 5. Averaged normalized mark up for notebook computer

	New notebook computer	Secondhand notebook computer
Average	50.992	2.588
Variance	53796.41	935.655
N	239	647
t statistics	5.1923	
p (two tails)	2.5786E-07 < $\alpha = 0.1$	

Averaged normalized mark up prices for new manufactured and secondhand items is compared by t test separately for mobile phone and notebook computer on table 4 and table 5. The results indicate averaged normalized mark up of newly manufactured items were significantly larger than that of secondhand items, both for mobile phone and for notebook computer. Although external referenced price may not affect whether a bidder will be an evaluator or a participator, affected by the prices on posted-price markets as common referenced value, evaluators for the newly manufactured items will bid on a higher mark up than evaluators for the secondhand items.

5. Conclusion

We conducted a field study on Internet to investigate the differences between the bidding behavior for secondhand and newly manufactured goods. Data is collected on an open-book auction site that lists all the bidding history on web. Results of the analyses show that, first, there were really some bidders behaved like evaluators. Second, percentages of bids that on mark up larger than the minimum increment on secondhand items were not different with that on newly manufactured items. Whether a bidder will be an evaluator or a participator is more likely to be affected by some factors of personal characteristics, but not the factors such as common referenced external market price. Third, averaged normalized mark up of newly manufactured items were significantly larger than that of secondhand items, common external referenced price may affect bidders' behaviors.

This study try to investigate what types of goods will be auctioned on the Internet by comparing bidding behaviors of newly manufactured goods and that of secondhand ones. Results of the study suggest the prices on posted-price market will not affect bidder's strategy but could still affect bids on the auction market. Because bidders do refer to the posted-price, the problem why newly manufactured products are sold by auctions remains to be further investigated. Winner's curse of the auctions may be one of the reasons [15]. Except for the bidding price, bidding time is also an important decision

variable in auctions. Experts and opportunists will not bid until the last minute of the bidding [2] [4]. The last minute effect has been well-known phenomenon on Internet auctions [17]. Bidding time should be further combined with bidding price to model and compare the bidding behaviors of various types of goods.

This study verified bidders' strategies as evaluators and participators. However, it is still curious why bidders will be an evaluator that raise the prices substantially and reveal their valuations of the items, and why bidders as a participator will bid in the early stage of the bidding. Many works needed to be done in the future.

Reference

- [1] Bakos, Y., "The Emerging Role of Electronic Marketplaces on the Internet," *Communications of the ACM*, Vol. 41, No. 8, August 1998, PP. 35-42.
- [2] Bapna, R., Goes, P. & Gupta, A., "A Theoretical and Empirical Investigation of Multi-item On-line Auction," *Information Technology and Management*, Vol. 1, No. 1-2, 2000, pp. 1-23.
- [3] Ertogral, K. & Wu, S. D., "Auction-theoretic Coordination of Production Planning in the Supply Chain," *IIE Transactions*, Vol. 32, 2000, pp. 931-940.
- [4] Hall, R. E., *Digital Dealing: How e-Markets are Transforming the Economy*, New York, NY: W. W. Norton & Company, 2001.
- [5] Jin, M. & Wu, S. D., "Supply Chain Coordination in Electronic Markets: Auction and Contracting Mechanisms," *ISE Technical Report 00T-071, Lehigh University*, November 2001.
- [6] Kauffman, R. J. & Wang, B., "New Buyers' Arrival Under Dynamic Pricing Market Microstructure: The Case of Group-Buying Discounts on the Internet," *Journal of Management Information Systems*, Vol. 18, No. 2, Fall 2001, pp. 157-188.
- [7] Lee, H. G., 1997. "Do Electronic Marketplaces Lower the Price of Goods," *Communications of the ACM*. Vol. 41, No. 12, January 1997.
- [8] Liang, T. P. & Doong, H. S., "Effect of Bargaining in Electronic Commerce," *International Journal of Electronic Commerce*, Vol. 4, No. 3, Spring 2000, pp. 23-43.
- [9] Liebowitz, S., *Re-thinking the Network Economy: The True Forces that Drive the Digital Marketplace*, AMACOM, 2002.
- [10] Lucking-Reiley, D., "Vickrey Auctions in Practice: From Nineteenth Century Philately to Twenty-first Century E-commerce," *Journal of Economic Perspectives*, Summer 2000, vol. 14, no. 3, pp. 183-192.
- [11] Lucking-Reiley, D., "Auctions on the Internet: What's Being Auctioned, and How?" *Journal of Industrial Economics*, Vol. 48, No. 3, September 2000, pp. 227-252.
- [12] McAfee, R. P., "Auctions and Bidding," *Journal of Economic Literature*, Vol. 25, June 1987, pp. 699-738.
- [13] Modahl, M., *Now or Never*, Forrester Research, 2000.
- [14] Malone, T. W.; Yates, J.; and Benjamin, R. I. *Electronic*

Markets and Electronic Hierarchies," *Communications of the ACM*, Vol. 30, No. 6, June 1987, pp. 484-497.

[15] Mehta, K. & Lee, B., "An Empirical Evidence of Winner's Curse in Electronic Auctions," *Proceedings of the Twentieth International Conference on Information Systems*, 1999, pp. 465-471.

[16] Rayport, J. F. & Sviokla, J. J., "Exploiting the Virtual Value Chain, *Harvard Business Review*, November-December 1995: 75-85.

[17] Roth, A. E. & Ockenfels, A., "Last Minute and the Rules for Ending Second-Price Auctions: Theory and Evidence from a Natural Experiment on the Internet," *Working paper #7729, National Bureau Of Economic Research*, May 2000.

[18] Schmitz, S. W., "The Effects of Electronic Commerce on the Structure of Intermediation," *Journal of Computer Mediated Communication*, Vol. 5, 2000, (<http://ecommerce.mit.edu/papers/ERF/ERF114.pdf>)

[19] Smith, M. D., Bailey, J. & Brynjolfsson, E., "Understanding Digital Markets: Review and Assessment," in E. Brynjolfsson & B. Kahin eds., *Understanding the Digital Economy*, MIT Press, 1999.

[20] Spulber, D. F., *Market Microstructure – Intermediaries and the Theory of the Firm*, Cambridge University Press, 1999.

[21] Wang, R., "Auctions versus Posted-Price Selling," *American Economic Review*, Vol. 83, No. 4, September 1993, pp. 838-851.