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TOWARD UNDERSTANDING SELLERS' CHOICE
OF STARTING PRICE STRATEGIES:
AN EXPERIMENTAL APPROACH

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ABSTRACT

This paper seeks to explain the eBay-Yahoo! Auction phenomenon: while eBay charged sellers a listing fee and a percentage commission and Yahoo! Auction charged no fees at all, Yahoo! Auction, however, had a significantly lower sold-out rate than eBay, and eBay continued to dominate the C2C auction category. We combine three theoretical perspectives - the economic, the psychological and the marketing perspectives to develop our research framework and hypothesis for a fuller understanding of such a puzzle, and try to bridge the great gap between the real world and the theoretical world. A controlled experiment that took into account interactive effects of chances, payoffs, and costs was used to check subjects' choice of the starting-price strategy in the simulated online auction market environment. We have three major findings. First, subjects generally gave more weight on transaction chance than listing fee and payoff. Second, at the website with high cost incurred, subjects could choose a median starting-price strategy, seeking a higher payoff. Third, subjects did not show strong preference to choose a high starting-price strategy at the website with no cost incurred.

1.   INTRODUCTION

Consider the following scenario:

Imagine that you are planning to dispose of a camera. Auction on the Internet springs to your mind. You have narrowed down your decision to two options, eBay and Yahoo! Auction. At eBay, you know that it would incur a listing fee whether the camera will be sold or not. Although Yahoo! Auction has a much lower successful transaction rate than eBay, it charges no fees at all[1]. Assuming that you choose eBay this time, would you set a reasonably low starting price to increase the probability of an actual transaction such that you would not lose the nonrefundable listing fees? At Yahoo! Auction, since you have no chance to lose your money, would you set a very high starting price or reserve price, hoping that someone would come along and pay your asking price?

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[1] When we began this research, Yahoo! Auction charged nothing from sellers

As at summer 2001, eBay and Yahoo! Auction were the two largest online consumer-to-consumer auction websites in the world according to Nielsen NetRatings and Harris Interacitve[2]. Yahoo! Auction has a lot of similarities to eBay: similar categories of goods, similar English auction bidding rules, and similar auction-listing procedures. Both sites offer proxy bidding, but they differ in fee structure and transaction chance. The fees charged by eBay and Yahoo! Auction are provided in the following table[3].

Site	Listing fees[4]	Final Value Fees
eBay	$0.25 - $2.00	5% of first $25 2.5% of $25-$1000 1.25% of > $1000
Yahoo! Auction	Free	Free

Table1: *Expenses for Auction on eBay, and Yahoo! (December, 2000)*

To examine the most important example of competition between two largest C2C auction sites, we sampled thousands of auction listings at each site during December 2000. Table2 shows the estimated sold-out rates of both sites from two product categories in this survey.

Site	Sold-out Rate in 35cm Camera Category	Sold-out Rate in DVD Category
eBay	61.8%	45.2%
Yahoo! Auction	16.7%	5.9%

Table2: *Sold-out rate estimation for eBay, and Yahoo! (December, 2000)*

eBay charged sellers a listing fee and a percentage commission, while Yahoo! Auction charged no fees at all. However, Yahoo had a significantly lower auction transaction rate than eBay. In a seminal paper, "Auctions on the Internet: What's Being Auctioned, and How?", Lucking-Reiley (2000) explained this phenomenon as follows: "indeed, a quick check revealed that most Yahoo! auctions had very high minimum bids or reserve prices, with the sellers apparently hoping for someone to come along and be willing to pay their high price. By contrast, at eBay and Amazon, sellers knew that they would incur a listing fee whether the item sold or not, so they had an incentive to set reasonably low reserve prices to increase the probability of an actual transaction."

Although Lucking-Reiley's work offered many insights, it could not explain certain phenomena on online auctions. For example, while Yahoo Japan (a joint venture between Yahoo! and SoftBank) did not charge fees for each auction, it had a rather high successful transaction rate[5]. However, eBay Japan which charged a listing fee and percentage commission could not dominate online-auction market in Japan. How can we use Lucking-Reiley's theory to explain such a contradiction: Yahoo Japan had a free auction portal against which eBay's fee-based model could not compete?

As an economist, Lucking-Reiley was more willing to regard sellers in online auction world as a rational agent. He might be accustomed to construct a normative model to explain the phenomenon in the natural market. How do individuals make decisions under risk and uncertainty in natural markets?

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[2] Source: Nielsen//NetRatings & Harris Interactive eCommercePulse, May 2001

[3] From January 10, 2001, Yahoo! charges sellers a listing fee, but no percentage commission. Yahoo! Auction's transaction fees are still lower than other Internet auction sites.

[4] Listing fee depends on the size of the starting price or reserve price.

[5] Business Week, "How Yahoo! Japan Beat eBay at Its Own Game," June 4, 2001

Over the past thirty years, a rather large body of literature in a variety of disciplines, such as psychology, marketing, and economics, has developed fruitful theories, which would seem to have a close bearing on this question. There is growing evidence that probability weighting may be an important factor in explaining a variety of field data pertaining to gambling and consumer choice behavior (Camerer, 2000). The validity of Lucking-Reiley's statement could be challenged with an alternative hypothesis: That sellers tend to give more weight to the probabilities of successful transaction chances than payoffs and costs. Notwithstanding the absence of fees at Yahoo! Auction, most sellers would still set reasonable rather than high starting price[6] in order to get a higher probability of resulting in a transaction. Despite incurring transaction cost on eBay, some sellers would choose a higher rather than a low starting-price strategy in the hope of seeking a higher payoff. Compared with eBay, Yahoo! Auction did have a much lower transaction rate. We argue however that the reason might not be related to whether the listing fee is charged or not.

2. RESEARCH FRAMEWORK AND HYPOTHESES

Why does the consumer-to-consumer auction process work so well? The answers are rather predictable. Now anyone who can access the Internet may participate in the fun of buying and selling by auction. This opening up to a greater, more fluid market has brought an unprecedented variety of goods to the virtual Internet world. Participants get excited during the bidding process, develop a sense of urgency as auctions close, and always love a potential bargain.

2.1. Experiential-Directed Sellers in Online Auction Market

Hoffman and Novak (1996) observed that consumers engaged in two general categories of behavior in computer-mediated environments like the Web: goal-directed and experiential-directed. Consumer choice in goal-directed behavior is based on a clearly definable goal hierarchy, and movement through this goal hierarchy involves choices among products and services, information sources, and navigational alternatives. On the other hand, consumer choice in experiential behavior is dominated by choices among navigational alternatives and corresponds to a relatively unstructured and continually changing goal hierarchy. In experiential behavior, choice is "intuitive and spontaneous" and does not involve conscious, deliberate decisions (Deci and Ryan, 1985). Hoffman and Novak (1996) also hypothesized that for some, if not most consumers, experiential behavior dominated a consumer's early flow experiences on the web.

Online auctions attract both goal-directed sellers (disposing of a specific product such as a PC, or seeking for high payoffs) and experiential-directed sellers (looking for entertainment and community). The bidding experience addresses people's need for entertainment, excitement, competition, and winning. There is also a rather addictive quality to the auction proceedings, similar to gambling. We believe, to most new sellers on the online auction market, the exploratory and fun experience is one way sellers begin to learn auction on the Internet. It is thus rational for them to regard the choice of auction website and the setup of the price strategy as a lottery.

Do most sellers really learn how to auction on the Internet, as Lucking-Reiley argued that the listing fee might elicit some sellers to setup the reasonable starting price? Economists argue that, despite cognitive limitations, economic agents arrive at optimal choice rules by learning. The assumption is that consumers, for example, are adaptively rational. However, adaptive rationality raises a host of issues. Market researchers have done a large number of relevant experiments (Jaideep and Tellis, 2000). They reveal the following three conclusions. First, multiple segments of consumers exist on the basis of learning. Second, the largest segment consists of consumers who do not learn despite timely feedback and motivation. Third, although some consumers do learn to make optimal choices, the

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[6] In this paper, we refer to a high starting-price strategy as the setup of a high minimum bid or a low minimum bid with a high secret reserve price. We refer to a low starting-price strategy as the setup of a low minimum bid without a secret reserve price.

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effect of this segment on market efficiency is cancelled by an equal number of consumers who 'learn' false relations. In general, we argue that when most sellers choose auction website or setup starting-price strategy for their products, they take into consideration more of perceptual and emotional effects than cognitive effects. Overall, the decision-making process of an online seller is a complex process, involving a whole range of feelings rather than rational thinking as most economists would argue.

2.2.   Choice of Starting-Price Strategies

Sellers' starting-price strategy has been a hot topic for many economists and market researchers. The most common argument in favor of a low starting price appears to be that a high starting price tends to scare away potential bidders, which may result in the good not being sold at all (Kaiser and Kaiser, 2000). By contrast, a low starting price can attract more bidders to participate in the auction. In general, if you set a low starting price for your product, you have a high successful transaction chance. Choosing a high starting price, however, you have a low probability to sell your product.

There is an explicit divergence of views on the relationship between the starting price and the last payoff. Some researchers suggested that the starting price (minimum initial bid) was the key: too high and few people logged on; too low and the final price would be low (Vakrat and Seidmann, 2000). Others argued that "a low starting price (with a high secret reserve price) could grease the wheels of bidding, building up bidding momentum that could propel the price higher" (Rama and Lucking-Reiley, 2000). Consumer-to-consumer auction sites, such as eBay and Yahoo! Auction, are less systemic and consistent in terms of the consumer goods that are offered. For instance, many sellers auction their second-hand electronics and books, or their unique memories and antiques on the Internet. It is difficult to obtain the accurate estimation of products' book value and sellers' last payoff. Conducting several empirical analyses of data, we cannot find the clear and definite evidence supporting the hypothesis that a positive coefficient of correlation exists between low starting price and high last transaction price (results available on request).

As proposed before, the choices made by experiential-directed sellers are "intuitive and spontaneous" and does not involve conscious, deliberate decisions. They might have such an intuition: if they set a low starting price, their product has a high chance to be sold out, but they earn less; if they set a high starting price, they can gain a high payoff with a low chance. The reason in psychology is that high positive or negative payoffs are typically associated with very low probabilities, while mediocre or zero payoffs are typically associated with high probabilities (Edwards, 1954).

In this paper we refer to sellers' subjective transaction chances as the combination of all attributes other than transaction cost and payoff that make an auction website desirable (e.g., traffic, the number of items being sold on the site, the number of buyers participating in an auction, reliability, brand reputation). In other words, we relate the transaction chance to a main standard measuring the service quality which an auction website provides. It is neither the case that the risk is random in online auction market nor that the relevant transaction chances could be estimated from available statistics. However, we can still use real numerical form to analyze seller's choice preference. The reason is that in most situations of uncertainty, sellers do eventually make choices, and although they may not acknowledge that they have assigned numerical probabilities to transaction results, it is often possible, given certain assumptions about the decision-making process, to infer from their choices what those probabilities must have been (Lopes, 1983). Marketing researchers often apply such a methodology in the study of consumer choice, because there are a wide range of goods and services whose utility on any occasion cannot be anticipated with certainty, and the choices are made by comparing the attractiveness of the odds of quality offered by differing options such as the timeliness of an airline or the service at a restaurant (Meyer and Shi, 1995).

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2.3. Tradeoff among Payoff, Transaction Chance and Cost

When sellers choose a starting-price strategy for their product, they may make a tradeoff among three attributes: payoff, transaction chance and cost. In other words, sellers have to deal with uncertainty and with the possibility of loss.

Such a risk decision-making may be understood well by a mixed choice problem described by Shafir, Osherson and Smith's advantage model (1993)[7]. A "mixed" lottery means a less-than-certain chance p to win a specified sum of money d coupled with a chance $1-p$ to lose a specified sum of money e (where exactly one of these two outcomes must occur). In our research of sellers' strategy choice, we simply regard listing fee as transaction cost, without considering the percentage commission. Thus, we can refer a "mixed" lottery to a sellers' choice of starting-price strategy by that the seller has the transaction chance p to sell out her product and gain the payoff d (listing fee e has been deducted), coupled with a chance $1-p$ to lose the nonrefundable listing fee e.

Shafir et. al argued that a probability advantage was qualitatively different than a payoff advantage or a loss advantage. They introduced two parameters k_G and k_L representing the relative weight of payoffs and probabilities, in the case of gains and in the case of losses respectively, as a means of comparing these qualitatively different advantages. After a large amount of experiments, the parameters k_G and k_L are verified to be less than unity for most people, which means people generally give more weight to probabilities than payoffs in gain framing lotteries, and to probabilities than losses in the loss framing lotteries.

In their classic paper, Slovic and Lichtenstein (1968) noticed that the prices subjects gave for bets were highly correlated with bet payoffs, but the choices were more highly correlated with probabilities. They concluded that if subjects were offered two bets, one with a high probability and low payoff (a "P-bet") and another with a low probability and high payoff (a "$-bet"), they might choose the high-probability P-bet but price the high-payoff $-bet higher. Given this finding, we have the following two hypotheses:

Hypothesis 1: Sellers globally choose auction website with high transaction chance despite high cost incurred.

Hypothesis 2: Sellers globally choose low-starting price strategy with high transaction chance, showing risk aversion to possible failure and loss incurred.

3. EXPERIMENT DESIGN

We constructed a simulated online-auction marketing structure in our experimental environment. There were two auction websites in this structure in which we manipulated the figures of transaction chance and listing fee that were consistent with the characteristics of eBay, and Yahoo! Auction. In each website, there were two product categories which also had different transaction chances. For each product category, we provided three starting-price strategies for choices: low starting-price strategy with high chance and low payoff, median starting-price strategy with median chance and median payoff, high starting-price strategy with low chance and high payoff.

Thus, we could examine how subjects' intuitive solutions to the auction-website-choice game varied as a function of three task parameters: transaction chance (p), listing fees (l), and payoff (p). We deliberately manipulated three parameters for converting all expectative monetary values of corresponding strategies in one product category into an approaching value 0.3, the other one into an approaching value 0.1. The expected monetary value is computed as:

$$EMV = (e - l) \times p - l \times (1-p)$$

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[7] The advantage model – combining absolute and comparative considerations – stipulates a relative weighting of payoff, loss and probability advantages, which is assumed to vary in a systematic fashion with the decision-maker's focus of attention.

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Where EMV denotes expected monetary value; e, p denote earnings and auctioned-off probability for each strategy respectively; l is the listing fees. For example, if you choose an auction website with high transaction cost 0.5\$, and a low starting-price strategy with a high probability 80% to gain 1\$, the expected monetary value of such a choice is computed as:

$$EMV = (1 - 0.5) \times 0.8 - 0.5 \times (1 - 0.8) = 0.3$$

The detailed numbers manipulated in the experiment are structured in the following table.

	Website with High Transaction Chance and High Cost (eBay)			Website with Low Transaction Chance and No Cost (Yahoo!)		
Cost (l)	0.5\$			Free		
Starting-Price Strategy	High	Median	Low	High	Median	Low
Payoff (e)	2.5\$	1.5\$	1\$	2.5\$	1.5\$	1\$
Chance (p) in Product Category 1 (EMV 0.3)	32%	53%	80%	12%	20%	30%
Chance (p) in Product Category 2 (EMV 0.1)	24%	40%	60%	4%	7%	10%

Table3: *Manipulation of Listing Fees, Payoffs and Chances in the Experiment.*

The purpose of manipulating the same EMV in one product category of both auction websites was to guarantee the validation of experiment. If subjects were given different EMV, they could then tend to choose the strategy with the highest EMV. In a repeated experiment, if subjects chose the strategies randomly, the result would be the same. Hence the experimental result could be compared with a random choice model in which all strategies were chosen equally in each period.

There were two reasons why we chose EMV 0.3 and EMV 0.1. First, the listing fee and transaction chance were chosen to reflect actual listing fee and transaction chance in real market. To auction a product with a starting price or secret reserve price below 25\$, listing fees charged in eBay was 0.5\$. According to our sample data, the transaction chance in the category of 35 Camera at eBay was 60%, Yahoo! Auction's was 16%; the transaction chance in the category of DVD at eBay was 45%, Yahoo! Auction's was 4%. The average transaction chances applied in our two product categories were manipulated for approaching these numbers. Second, we must consider the experiment budgets. In our 20-round repeated experiment, we gave subjects an initial capital and real money incentives. Hence we had to keep the expected monetary value in each round at a relatively low level.

We developed a computer-based market game to provide a static context in which subjects could make choices over time. The system used in the experiment was written in the Java language (java applets) and can be easily accessed through the Web (See figure 1). The system provided choice information to subjects on a computer screen in a matrix form, with the piece of information on transaction chance and payoff associated with each cell hidden behind an opaque box. Subjects undertook decision processing by using a mouse-controlled cursor to open the box. The system recorded the subjects' choices and the associated results including success or failure, earnings or losses in each round, and cumulative payoffs.
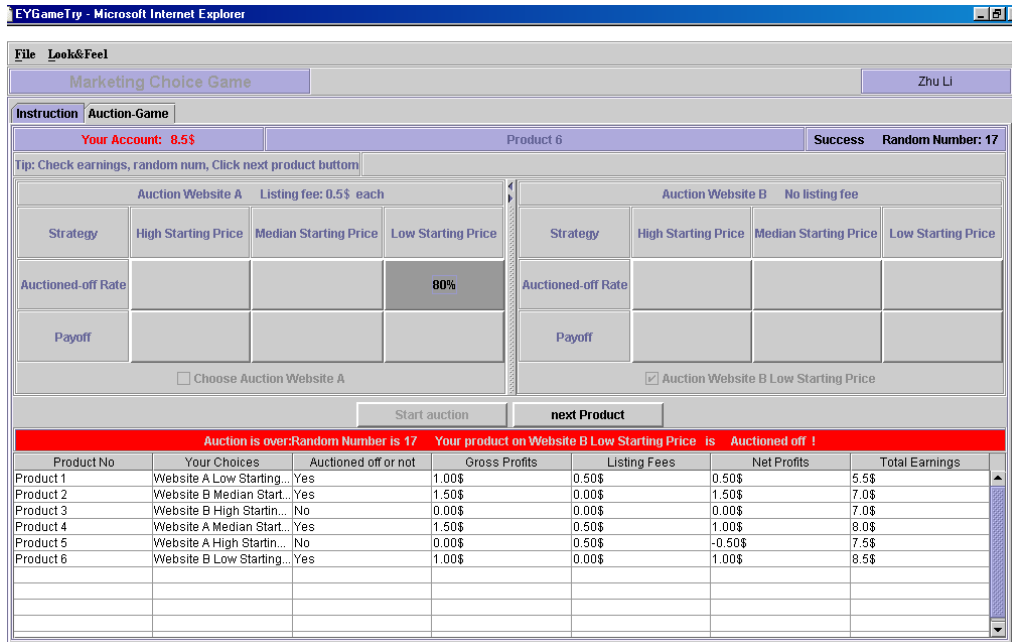
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Figure1: *Computer Interface Used in the Experiment (Snapshot).*

Thirty subjects, enrolled at the School of Computing in an East Asian university participated in this repeated-play version of the auction-website-choice game, motivated by a cash incentive. At first subjects made 20 choices from one section of game with the 0.3 EMV; then subjects made another 20 choices from the section of game with the 0.1 EMV. Before each section, subjects would receive an initial capital of five dollars, as their participation fees for this experiment. Subjects were told that they would play the role of an auction seller choosing between a pair of websites and their associated starting-price strategies. After subjects entered their choice for each auction, computer system would create a random positive integer from 1 to 100. If the random number was smaller than the value of transaction chance, the product would be sold and vice versa. Based on payoffs and costs, the computer calculated the total rewards or losses depending on their conditions and displayed this information as feedback for the period. Their objective in game was to choose one auction website and the respective strategy to maximize the number of successful sales of products over a fixed decision horizon. Total realized payments that subjects received varied between $12.00 and $24.00 ($18 in average).

4. DATA ANALYSIS

Choice Percentage of Starting-Price Strategy	Website with High Transaction Chance and High Cost (eBay)			Website with Low Transaction Chance and No Cost (Yahoo!)		
Starting-Price Strategy	High	Median	Low	High	Median	Low
EMV 0.3(600)	18.8% (113)	36.3% (218)	21.5% (129)	7.8% (47)	4.8% (29)	10.7% (64)
EMV 0.1(600)	18.3% (110)	20.5% (123)	45.1% (271)	2.3% (14)	2.1% (12)	11.7% (70)

Table4: *Choice Percentages (Number of Choices) in the Experiment*

4.1 Choice of Auction Websites

Table 4 summaries the subjects' choices of auction websites and starting-price (SP) strategies. As we expected (Hypothesis 1), subjects tended to choose the auction website with high transaction chance despite a high transaction cost incurred. Only 140 of 600 choices (23%) were given to the auction website with low transaction chance in the product category with 0.3 EMV. In the other product category with 0.1 EMV, the choices were even less (16%). Subjects showed a strong aversion to the website with extremely low transaction chance (transaction chances 4%, 7% and 10% respectively), which means the condition of no cost in charge at this website was unappealing to most subjects. In general, subjects generally gave more weight to the transaction chance, not to the cost in this experiment.

4.2 Choice of Starting Price (SP) Strategy

Given that a subject would maximize their payoffs, the result of randomly choosing any SP was same during 20 periods. The expected monetary values of six SPs in one session were equal to 0.3. In the other session, the expected monetary values of six SPs were equal to 0.1. We compared subjects' choices of SP with a random choice model in which all strategies were chosen equally often in each period. The result showed that subjects had strong individual preference to each strategy. ($X^2 = 40.03$, p < 0.001 in session of EMV 0.3; and $X^2 = 75.99$ p < 0.001 in session of EMV 0.1).

According to Lucking-Reiley's theory, at eBay, sellers knew that they would incur a listing fee whether the item was sold or not, thus they had an incentive to set reasonably low SP to create a higher probability of resulting in a transaction; conversely, without the incentive of listing fees incurred, sellers would set a high SP strategy. In our simulated online-auction-market game, however, the choices of SPs were not as Lucking-Reiley's estimation. In the session of high transaction chance (EMV 0.3), most choices (36.3%) were given to the median SP (transaction chance = 53%, payoff = 1.5$ and cost = 0.5$.), not the low SP. It seems that if the transaction chance was close to 0.5, the interactive effect of payoff and transaction chance could become large. Therefore, the subject could use a simplified rule to compare the median SP with low SP - "try the median SP for two times, I just might win $1.5; while trying the low SP, I need at least three chances to win $1.5". Furthermore, for those choices given to the website without listing fees (Yahoo! Auction), subjects did not show significant tendency to choose high starting-price strategy with high payoff and low probability. However, subjects did exhibit weak preference to the low starting price strategy (10.7% vs. 7.8%).

In the session of low transaction chance (EMV 0.1), most choices (45.1%) were given to the low SP, when subjects chose the website with high cost. For the website without transaction cost, most choice were still given to the low starting price strategy with high transaction chance and low payoff (11.7% vs. 2.3%). Subjects were unwilling to try high and median SP at the website with high cost despite the attractiveness of high payoff, showing strong risk aversion. Interestingly, subjects were also unwilling to try high and median SP at the website with no listing fee, showing extreme aversion to absolutely low probabilities (3% for high SP and 7% for median SP respectively).

5. CONCLUSIONS AND IMPLICATIONS

This study was undertaken to understand the choices made by experiential-directed sellers on starting-price strategy in the online auction market. The key result obtained in this study is that subjects in our experiment generally gave more weight on transaction chance, compared with other two effects, payoff and listing fee. Subjects showed a strong tendency to choose auction website with high transaction chance in spite of high cost incurred. At the low level of transaction chance, subjects tended to choose low starting-price strategy, showing strong risk aversion. At a high level of transaction chance, the interactive effect of payoff and transaction chance led subjects to choose median (normal) starting–price strategy to seek a higher payoff in the game.

Since subjects generally gave more weight to transaction chance, not to listing fee and payoff, this empirical result would not necessarily mean that Yahoo! Auction should charge sellers fees to get rid

of non-serious sellers, and all the 'trash' products and have only good, highly saleable products on its site. In fact, Yahoo! Auction began to charge sellers a listing fee in January 2001. Two weeks later, eBay announced to increase the listing fee, by as much as 65 percent. Interestingly, the market response was not in Yahoo! Auction favor. While the number of auction listings on Yahoo! Auction decreased by 80 percent since Yahoo! Auction started charging users, it actually increased on eBay since eBay raised it fees. eBay's share of consumers' online auction spending rose from 57.8 percent in May 2000 to 64.3 percent in May 2001. In contrast, Yahoo's market share fell from 11.2 percent to just 4.3 percent, placing it fourth behind eBay, uBid, Egghead.[8]

The emerging stylized fact is that changes in characteristics of auction websites can generate asymmetric seller responses. When (higher cost but higher quality brand) eBay heightened its transaction fees, there were very few defections from sellers, but when (no-cost but lower quality brand) Yahoo! Auction started to charge the listing fee, there were massive defections of sellers. The argument made by our research could present a reasonable explanation: the degree of asymmetry is affected by the shape of the distribution of preferences to the transaction chance across the sellers.

The study has a few limitations. First, the laboratory research was limited to a static task environment, where there is no opportunity for simulating complicated learning conditions. Second, the study involved induced gambles for small stakes, which might limit the interpretation of the results and restrict their generality. Third, the payoff in the experiment is manipulated at a fixed value. However, in real online auction world, the payoff related to the choice of starting-price strategy is always dynamic, and it is impossible for sellers to predict their final payoff unambiguously. Thus, if a seller chooses a low starting-price strategy, she might assign both a high probability (e.g. 80%) to a low payoff (e.g. 0.5$) and a low probability (e.g. 20%) to a high payoff (e.g. 2.5$). Fourth, eBay gave sellers one free chance to relist their items which did not sell. In our experiment, we did not consider the effect of this condition.

The implications of this study for research are clear. Much can be learned by cross-fertilization of the economic, marketing and psychological approaches for the research of Internet Marketing. Three methods are productive complements in producing a fuller understanding of eBay-Yahoo! Auction phenomenon. The online auction arena is one rich in opportunities for further research. However, our knowledge of consumer behavior in auction markets is quite limited. Sellers are not always symmetrical, rational, or predictable in the online auction market. Future research on analyzing field data to determine individual sellers' behaviors and to extrapolate the differences between field and laboratory test, can be quite fruitful.

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