Auction versus posted price mechanisms in online sales: The roles of impatience and dissuasion*

Subhasish M. Chowdhury, [a] Debabrata Datta, [b] Souvik Dhar [c]

[a] Department of Economics, University of Bath, Bath BA2 7AY, United Kingdom

[b] Institute of Management Technology, Ghaziabad 201001, Uttar Pradesh, India

[c] Narsee Monjee Institute of Management Studies, Mumbai 400056, Maharashtra, India

Abstract

If all potential buyers participate in a first-price auction, then (theoretically) the auction price weakly exceeds the price placed by the seller under a posted-price mechanism. However, it is documented that in the online sellers prefer posted-price mechanism to auction. We aim to explain this empirical contradiction in terms of partial participation of the buyers in auction, prompted by impatience and dissuasion. Auction in internet often requires waiting, and hence many impatient participants may not join the auction process. Furthermore, a previous experience of failure in auction may also prompt buyers' non-participation. We show, theoretically, that in the case of partial participation the price in auction may be lower; and posted-price turns out to be payoff dominant for both the buyers and the sellers. We then run a laboratory experiment and verify the presence of impatience (through waiting cost) and dissuasion factor (through previous failure) among the subjects.

JEL Codes: C91; D44; D91

Keywords: Auction; Impatience; Dissuasion; Experiment; Posted Price

* Corresponding author: Subhasish M. Chowdhury (s.m.chowdhury@bath.ac.uk). We thank Joo Young Jeon and Sahana Roy Chowdhury for comments and suggestions. Any remaining errors are our own.

1. Introduction

With the advent of digital technology and internet in the early 21st century, online market has become increasingly popular worldwide. Even earlier, from the 1990s, 'eBay' has become a household name in the USA in the auctions of consumer durables, car accessories, antiques, books and various collectors' items. In such an online market, the aggregator provides a platform where seller offers his product for sale. The buyer also uses the platform in order to buy the product, provided there is a matching of demand and supply price.

Auction is essentially a price discovery mechanism and has been a natural choice of the sellers. In the early days of online transactions as well, the sellers usually took recourse to auction sale. In the month of January 2003, roughly 95% of commodities were placed for auction in eBay (Einav et al., 2016). However, over time the popularity of auction waned, and posted price (often termed as buy it now, or 'BIN') emerged as the popular method of sale. Consequently, it is observed from the eBay site that sellers prefer to place their commodities for the BIN option rather than in the auction block. Einav et al. (2016) document that popularity of Auction continuously declined from a level of 70% in January 2008 to a level of 30% in January 2009; and by January 2013 less than 15% of the commodities were placed for auction sale. They also point out that Google search for 'auction' lost popularity. This drastic fall in the number of commodities placed for auction shows the sellers' preference for BIN as a possible response to the buyers' reluctance to participate in the auction process.

To understand the latest situation since 2013, we privately scanned the sites of eBay USA and eBay India from April 20 to June 20, 2017 in various categories of items. For the 'auction' option, the sites follow the conventional English auction. The auction begins with a starting bid and the duration of the auction process is given. The display shows the number of participants and the number of bids. In contrast, for the 'BIN' option, a fixed price is posted. Majority of the items were placed under the BIN option.[1]

Another interesting trend is that collectors' items such as paintings, coins, and stamps are also being placed for the BIN option more frequently. An important purpose for placing such commodity in the auction block is price-discovery, as there is not much public information available about the demand price of such goods. Hence, it appears that the importance price discovery for such collectors' items is not as significant for the sellers either.

[1] Durable commodities such as motor boats, automobiles, etc. are often placed for a hybrid 'BIN auction', where a commodity is posted for a fixed price; but if no buyer quotes the fixed price, then the seller is ready to sell the commodity in auction in which the buyer placing the best offer less than the quoted fixed price gets the item.

This plummeting popularity of auction appears to be a puzzle. This is because, in theory, auction is the perfect selling mechanism to ensure discovery of the highest demand price – and, as a result, higher profit: making auction a dominant strategy for the seller over BIN. The growing popularity of 'posted price', therefore, seeks for an explanation.

In this paper we attempt to provide two possible reasons for this phenomenon through a combination of a theoretical exercise and a laboratory experiment. First, we argue that whereas a buyer can simply pay the posted price and buy the item instantaneously, for auction s/he would have to wait until the auction ends. An impatient agent (Fehr, 2002) might incur costs out of such waiting and if the cost is high enough, then s/he might opt for the posted price over auction. Second, we argue that dissuasion due to past experience of not winning the auction may provide the agent with an outcome bias (Baron and Hershey, 1988) that makes the agent opt for the posted price option over the auction option in the future.

We show, with a theoretical model, that indeed impatience through waiting cost can explain the dominance of BIN over auction. We then run a laboratory experiment with three treatments. In the first treatment we use a simple lottery with high waiting cost and show that a significant number of subjects exit the experiment. We then invite back subjects who experienced a failure in the lottery and show that they are less likely to come for such lottery (due to dissuasion). The third treatment, exactly same as the first one but with low waiting cost, results in higher participation. Together the experimental results show the existence of impatience and dissuasion, and that impatience has a negative effect on participation in auction type situations.

The rest of the paper is arranged as follows. We cover the related literature in Section 2, and develop the theoretical model in Section 3. Section 4 and 5 delineates the experiment and reports the results, respectively. Section 6 concludes.

2. Literature review

The literature on auction and posted price in online sale is vast and is scattered across various disciplines. Here we cover only the closely related studies.

Wang (1998) addresses theoretically the issue of what determines the seller's choice between holding an auction and posting a fixed price when the seller faces a finite number of potential buyers. He derives two different sets of sufficient conditions under which auction dominates posted price option in selling an object. He shows that auction is preferable on occasions when the value of the object is relatively high or when the valuation is more dispersed.

Caldentey and Vulcano (2007) analyze a revenue management problem. The seller operates an online multiunit auction and faces strategic consumers who can get the product from an alternative posted price channel. They show that for consumers with values below the list price, the optimal strategy is always to participate in the auction. For consumers with higher values the threshold is non-decreasing in their own valuation.

Wang et al. (2009) conduct survey with eBay and point out that when buyers make endogenous participation decisions according to their participation costs, BIN can increase both buyers' utility and sellers' profit, and hence it dominates auction. Their model considers a potential buyer's optimal bidding strategy, willingness to pay, probability of winning, and costs of participating in an auction. Their findings have important implications for understanding consumer behavior in the competitive environments found within auctions.

Reynolds et al. (2009) conduct a survey with eBay and Yahoo! and show that both eBay and Yahoo! allow sellers to list their auctions with a buy price at which the bidder can purchase the item immediately. However, at eBay the buy price option vanishes immediately after a bid is placed, whereas at Yahoo! that option remains even after a bid is placed. When bidders are risk averse, both types of auctions raise seller revenue for a wide range of buy prices.

Hammond (2008) finds that in CD's listings in eBay, sellers prefer to post a fixed price rather than placing the commodities in the auction block and that posted price goods sell for higher prices, while auctioned goods sell with a higher probability. Budish and Takeyama (2001) introduced a two-bidder model and show that if buyers are risk averse, the seller feels an incentive to use a BIN auctions.

Durham et al. (2004) observe that for American Silver dollars, auctions listed with buy price option yields a higher selling price than that of those listed for pure auction, while Standifird (2005) find that BIN may turn out to be the less preferred option. Anwar and Zheng (2012) argue that when there are many identical items with multiple sellers and buyers, then random matching between auctions and the bidders can cause allocative inefficiency. They show theoretically that with the BIN option, some high valuation buyers buy the item before the start of the auction. In the case of a single seller with many items for sale, this not only reduces the allocative inefficiency but also increases seller's expected revenue.

There is a steady stream of experimental literature that compare various pricing mechanisms including auctions (see, for e.g., Ketchum et al., 1984). Kagel and Levin (2010) provide a summary of the experimental results on auctions, and Kagel (2016) argues that internet auction offers good opportunities for experimentation. More specific to our interest, different ending rules in auctions can also impact buyer behavior. Whereas eBay has a fixed ending rule, Amazon allows extension of the auction after the ending time (if no bid is submitted in ten minutes the auction is ended). Roth and Ockenfels (2002) find that in eBay last minute bidding is more common than in Amazon, which automatically extends the deadline in response to last minute bids. Ariely et al. (2005) further point out that majority of the bidders in eBay place their bids towards the end of the auction. In contrast, in Amazon few bidders put their bids at the end of their auction. They conduct a laboratory experiment with various types of internet auctions and find that as bidders get experience, they are more likely to bid late under eBay conditions and less likely to bid late under Amazon condition.

The literature on 'impatience' and non-participation in the auction process is sparse, but buyer impatience might be a reason why people prefer posted price to auction. Daley (1965), Choi et al. (2000), Boxma et al (2010) investigate buyer impatience in the context of queuing theory. Grether et al. (2011) point out that impatience of the bidders can be a major cause why bidders place jump bids. With a large-scale field experiment, in which a major firm in online automobile auctions allowed the participants to change some of the parameters of auctions, they show that people opt for jump bidding due to two reasons: strategic signaling and intimidation, and impatience. Further, while the first reason leads to a fall in sellers' revenue, sellers' revenue increases when bidders jump bid due to impatience. Impatience is closely related to the 'rate of time preference' (see Andreoni et al., 2015 for a review of the experimental methods). But the experimental literature on rate of time preference / impatience and auction participation is sparse as well.

To the best of our knowledge, the literature has also not elaborated on the point that non participation of buyers could take place on account of dissuasion due to outcome bias. Outcome bias (see, e.g., Dawes and Hasty, 2001) occurs when an agent relies heavily on experienced ex-post outcomes when making decision about future event. If the outcome was unfavorable, then this leads to dissuasion effect and make buyers stay out of the future auction market.

In this paper, we focus on these two behavioral biases viz. impatience and dissuasion, and explain the phenomenon of the preference of BIN over auction in the online market.

3. A model with impatience

We consider an environment where the online seller offers a single good for sale. The seller has two options, either to go for auction or posting a price at which the good is immediately available. In case of auction, there is a reservation price, above which the buyers have to bid. But this bidding process goes on for a certain period and only at the end of such period the highest bidder gets the good. In case of posted price the buyer need not wait. Simply by offering the willingness to buy s/he gets the good. Thus, in case of auction, the buyer has to bear a cost of waiting, although, there is a possibility that s/he gets the good at a price strictly less than her reservation price.

There are n number of prospective buyers, each of whom is assumed to have a cost of waiting or impatience. The buyer participates if $q[\bar{u} - u(\tilde{p})] - c > 0$ where $\bar{u}$ is the utility of the good purchased, $\tilde{p}$ is the maximum demand price, q is the subjective probability of winning and c is the participation or impatience cost. It is assumed that $\tilde{p}$, q and c are so distributed that for some prospective buyers $q[\bar{u} - u(\tilde{p})] - c < 0$ and these buyers do not participate in the auction. Let z is the number of participating buyers, where $z \leq n$.

We further assume that the valuations of the buyers are uniformly distributed in the range $[\alpha, \beta]$. In this scenario, we put forward the following proposition.

Proposition 1. If every buyer participates in the auction process, the auction mechanism of sale weakly dominates the 'posted price' mechanism from seller's side. If everybody does not participate in the auction process, this weak dominance no longer exists.

Proof: Let us assume the bids are uniformly distributed in an English auction set up. If X is a random variable representing bid, then the probability density function is given by

$$f(x) = \begin{cases} \frac{1}{\beta-\alpha} \, if \; \alpha < x < \beta \\ 0 \; otherwise \end{cases}.$$

The corresponding cumulative distribution function $F(x)$ is:

$$F(x) = \begin{cases} 0 \; if \; x \leq \alpha \\ \int_{\alpha}^{x} f(x)dx = \frac{x-\alpha}{\beta-\alpha} \; if \; \alpha < x < \beta \\ 1 \; if \; x \geq \beta \end{cases}.$$

Let us assume that every potential buyer is participating in the auction process. Then the number of participants is n. Under uniform distribution, the PDF of the r^{th} order statistic $X_{(r)}$is given by:

$$g(x) = \frac{n!}{(r-1)!\,(n-r)!}[F(x)]^{r-1}f(x)[1-F(x)]^{n-r}$$

If W is the n^{th} order statistic, i.e., $W = \max(x_1, x_2 \ldots\ldots x_n)$ where x_i is the i^{th} individual's bid, then we can say:

$$g(w) = \frac{n!}{(n-1)!}[F(w)]^{n-1}f(w) = \frac{n(w-\alpha)^{n-1}}{(\beta-\alpha)^n}$$

The mathematical expectation (by applying integration of substitution) is:

$$E(w) = \int_{\alpha}^{\beta} wg(w)dw = \frac{n}{(\beta-\alpha)^n}\int_{\alpha}^{\beta} w(w-\alpha)^{n-1}\,dw = \frac{n\beta+\alpha}{n+1}$$

Note that $\frac{n\beta+\alpha}{n+1}$ is the expected highest demand price and expected winning bid provided all potential buyers are participating in the auction process. Let us now show that auction price mechanism is the weakly dominant strategy in this case for the seller, vis-à-vis, 'posted price'. Let b^* is the 'posted price'.

Case 1. Full participation

If $b^* > \frac{n\beta+\alpha}{n+1}$ then nobody buys the commodity with posted price. Hence auction would be a better option for the seller as well as for the buyers than the posted price b^*.

a) If $b^* = \frac{n\beta+\alpha}{n+1}$, then seller is indifferent between auction and posted price.

b) If $b^* < \frac{n\beta+\alpha}{n+1}$, then auction is preferred to the sellers.

This shows that whatever be the magnitude of b^*, auction is weakly better than 'posted price', given that everyone participates.

Now, let us assume that c is such that every potential buyer is not participating in the auction process. Let z be the numbers of buyers, participating in the auction process. Then the expected winning bid is: $E(w^*) = \frac{z\beta+\alpha}{z+1}$.

When not all buyers are participating in auction, $w^*$is the winning bid as opposed to w when everyone does.

Here $n > z$ and also$\frac{n\beta+\alpha}{n+1} > \frac{z\beta+\alpha}{z+1}$ given that $\frac{dE(w)}{dn} > 0$ when $\beta > \alpha$.

This shows that expected winning bid is more, when everybody participates in the auction process than the case when not everyone participates.

We can compare auction price with posted price in this case of non-participation.

Case 2. Partial participation

If everybody does not participate in auction, namely, z buyers are participating in auction where $n > z$, the following situations emerge:

a) If $\frac{z\beta+\alpha}{z+1} < b^* \leq \frac{n\beta+\alpha}{n+1}$, then under posted price b^*, the good will be sold but under auction, revenue realization will be less than b^*. Thus, posted price would be a better option than auction from the sellers' perspective.

b) If $b^* = \frac{z\beta+\alpha}{z+1}$, the sellers would be indifferent between the two.

c) If $b^* < \frac{z\beta+\alpha}{z+1}$, the sellers would prefer auction to posted price.

We thus observe that depending on the value of b^*, there are cases where 'posted price' is better option than auction for the seller. Note that b^* is seller's choice, whereas $\frac{z\beta+\alpha}{z+1}$ is given. Thus, seller can choose posted price than auction as s/he can choose b^* that optimizes his profit.

Now larger is the gap between z and n, that is lower the percentage of participation, posted price would become more desirable to the sellers than the auction.

The above proposition is a theoretical explanation, based on partial participation, for why posted price option is gaining popularity and auction is losing popularity. For example, we can assume that there are two potential buyers, one with maximum demand price of 500 and another with maximum demand price of 300. Let the consumer with maximum demand price of 500 is impatient and does not want to spend time and wait for the final outcome of the auction process. So, when a wristwatch is put for auction, the maximum bid will be 300. In this case, seller gains more by posted- price method, if the posted price is set in between 300 and 500.

Our theoretical model shows that posted price is a better option due to the existence of impatient buyers. We have developed an experimental design and carried out the subsequent experiment to verify the actual existence of impatience among a set of subjects, who are frequent participants in online purchase. In this experiment, we have also verified another plausible proposition. It is likely that a potential buyer, who is enthusiastic initially, will start losing interest in auction, if her previous experience is a failure. We have developed another experimental design and carried out the subsequent experiment to verify this phenomenon. We consider the following proposition in terms of experiments.

Proposition 2a. Buyers in online purchase have impatience and waiting cost.

Proposition 2b. Buyers may be enthusiastic in auction for novelty factor for the first time. Nevertheless, when they do not succeed, they become reluctant to participate in the auction process in a similar situation next time. Bad experience is a dissuading factor.

Our simulations are designed to capture impatience, opportunity cost and non-favorable experience-led dissuasion and mimic the 'auction vs posted price' scenario.

4. Experimental design and treatments

In an online auction sale, the potential buyer has to bid and then wait for the final outcome. S/he may be required to revise the bid from time to time during the auction process and therefore has to bear time cost. At the end of the auction, the potential buyer may or may not win. In case of a win, there is gain (of consumer surplus), but in case of an unsuccessful bid there is a loss due to the waiting cost. Hence, the gain of the potential buyer is probabilistic. In our experiment, we make an attempt to capture behavior of the subject with regard to waiting cost and the probabilistic gain.

Through an informal survey, one of the authors has prepared a list of students, who regularly participate in online purchase. These students belong to MBA program of Narsee Monjee Institute of Management Studies, Mumbai, India. There were 160 names in the list. Out of these 160 students, 50 names were first selected randomly with the help of a random number table, and they were duly communicated. The students were requested to participate in the experimental process but the participation was optional. As per the design of the experiment, each participant was briefed about the experiment beforehand. In each of the treatment, one fair die was thrown. If "at most 2" came up in the upper surface of the die, then each of the subjects present in the room were entitled to get INR 400. Thus, provided one is waiting till the die is thrown, there is a probability of winning the money is 1/3.

We employed three treatments. The treatments resemble the online auction purchase scenario in the sense that there is a waiting cost, after which there is gain in probabilistic term. If a person were impatient, s/he would either not show-up, or leave without waiting for the final draw. We ran one manual session for each treatment. The details are given below.

Treatment 1 (the baseline) was with high impatience cost and without dissuasion. In this treatment subjects had to wait in the room long enough (30+ minutes) before the die was thrown; but they did not have any experience of such die throwing experiment earlier. They were free to leave in between if they so wished.

In **Treatment 2** (high impatience cost with dissuasion), the subjects, who waited till the end in Treatment 1, were invited to participate in another round of the draw. Some more subjects, who left before the draw in the first game, were chosen on random basis and they were also invited to participate. The waiting time before the die was thrown in this treatment was same as before (30+ minutes). Since the first Treatment ended up giving zero payment to the subjects, the aim of this treatment was to verify whether dissuasion has any impact on desire to participate.

In **Treatment 3** (low impatience cost without dissuasion), similar to Treatment 1, these subjects were not experienced but the waiting time before the die throwing was shorter (immediate). The objective of this experiment was to verify whether reduction in waiting cost has an impact on the participation decision.

Hence, we can summarize the treatments into the following treatment table.

Table 1. Treatment Table

Treatments		Dissuasion	
		Without	With
Waiting cost	High	**Treatment 1**	**Treatment 2**
	Low	**Treatment 3**	×

Treatment 1 (the baseline) itself will help us to test the existence of waiting cost. Treatment 2 will provide us with the effects of dissuasion; while comparison of treatments 1 and 3 will provide us with the effects of the intensity of waiting cost. Below we detail the procedures, and the corresponding descriptive statistics and test results from each treatment.

5. Experimental procedure and results

5.1. Treatment 1

Out of the 50 subjects invited, 32 subjects turned up for the experiment. We provided them with numbered badges from 1-32. We mentioned after 30 minutes that they will have to wait further (a total of 50 minutes). However, a total of 23 subjects left over the course of the 50 minutes of waiting, and the remaining 9 subjects waited till the end. After the die was thrown, the number '4' turned up in the upper surface of the die. So, none of the subjects, who waited till end, got any money.

The outcome of this experiment shows the existence of impatience. The initial participation of 64% subjects (32 out of 50) shows that these subjects expected initially a positive benefit of participation. However, during the game, about 70% subjects (23 out of 32) left because of the delay. Since there was no other cost, and a positive probability of gain, only impatience can explain this behavior of leaving. Impatience, of course, may be on account of some engagements elsewhere but this also applies to waiting in case of participation in auction.

To test this formally, let p be the population proportion of subjects who are waiting till the end to the total number of subjects present initially, and $\bar{p}$ be the corresponding sample statistic. The null hypothesis of no impatience implies, $H_0: p = 1$; whereas the alternative hypothesis of the existence of impatience is, $H_1: p < 1$. We ran the one–sided t-test and the computed value of t is -9.043512, which is significant at 1% level. Hence, we reject H_0 against H_1, and the existence of impatience among the subjects appears to be statistically significant. This provides us with our following first result.

Result 1. Waiting cost (in terms of impatience) exists among subjects.

5.2. Treatment 2

The 9 subjects who waited till the end of Treatment 1 were invited back in Treatment 2. We also invited 6 other subjects, chosen at random, who did not wait till the end in Treatment 1. The subjects were communicated that the prize money was kept at INR 400, and probability of success was kept at $p = 1/3$ as before. Although there was ex-ante same waiting time (30 minutes) with Treatment 1, we rolled the die after 30 minutes of wait.

Out of the 15 students invited, only 4 turned up for this treatment. Out of those 4 subjects, earlier 3 waited till the end and one left in between in Treatment 1. In this treatment all the 4 subjects waited till 30 minutes when the die was thrown. The uppermost face of the die turned out to be '6', and none of the participating subjects received anything again.

We have conducted t-test to check the statistical significance of dissuasion. Here the null hypothesis is, $H_0: r = 1$ versus the alternative hypothesis $H_1: r < 1$; where r is the proportion of subjects not affected by earlier *bad experience* (not winning in Treatment 1) to the total number of students, who participated in earlier experiment. In other words, it is the proportion of not-dissuaded people. The computed t-value is -6.423, which is significant at 1% level, and the null hypothesis is rejected. This gives our second result.

Result 2. The experience of bad outcome dissuades people to participate in future event.

5.3. Treatment 3

We invited further 30 students on random basis, who were not invited earlier out of the original list of 160 students. We announced to them the details of the experiment. The prize money and the probability of winning remained the same, whereas the waiting cost was negligible as the die was thrown within 10 minutes of the subjects taking their seats.

Out of the 30 subjects invited, 17 subjects showed up in the classroom and all stayed until the end. When the die was tossed, "2" appeared in the uppermost face, and each of them got INR 400. This treatment shows a marked difference in participation with a reduced waiting cost. While in the first treatment, out of 50 invited subjects, only 9 subjects finally stayed back.[2]

To test whether participation has significantly increased or not after the reduction in impatience cost, we test $H_0: p_1 - p_3 = 0$ against $H_1: p_1 - p_3 < 0$. Here p_1 and p_3 are the proportions of subjects attending and staying back in Treatments 1 and 3, respectively. The computed value of t-statistic is -3.6682, which rejects H_0 at 1% level. This provides with our following result.

Result 3. Impatience cost and participation are inversely related.

6. Discussion

Since non-participation of prospective buyers in auction is prevalent, 'buy it now' or posted price option is becoming a more popular option for both buyers and sellers in the online market. We show, in terms of a theoretical model that posted price may be better option for the seller in presence of impatience and waiting cost. We then run an experiment to show the existence of such impatience, and the possible effects of dissuasion due to previous failure in auction. Our results show that buyers with waiting cost and dissuasion are unlikely to participate in the auction process. This non-participation leaves the possibility of auction price being less than the posted price, and the seller can optimize profit by choosing appropriate posted price.

Our experiments have certain limitations that also allow for avenues of future research. First, the cohort size of each treatment is rather small and a replication of the experiment with a larger

[2] A similar t-test shows that the null hypothesis of zero impatience is rejected here as well. Thus, impatience exists even when the waiting cost is low.

cohort (while controlling for various demographic attributes) would strengthen the results. Second, we employed student subjects, who use online purchases frequently. An online version of such experiment with general population and with actual auction will allow better external validity. Since the subjects' role were of a passive player and there was no opportunity of strategic movement, using actual auction might reduce impatience cost due to engagement. Third, the test of dissuasion involved students who were self-selected (decided to join even after a negative outcome with a long delay), a different design with different type of failure mechanism can be employed to avoid this issue.

Furthermore, there may be additional behavioral biases, beyond the scope of this study, that contribute to the reduction in the popularity of online auction that can be investigated both theoretically and experimentally. It will also be possible to extend the issues of impatience and dissuasion in the area of all-pay auction (e.g., Chowdhury, 2017), or contests and conflict (e.g., Chowdhury et al., 2018) both theoretically and experimentally. Finally, it is well known that risk and time preferences are often intertwined (see Anderson et al., 2008). A thoroughly designed experiment controlling for such issues will help us understanding the issue better.

References

Andersen, S., Harrison, G. W., Lau, M. I., & Rutström, E. E. (2008). Eliciting risk and time preferences. Econometrica, 76(3), 583-618.

Andreoni, J., Kuhn, M. A., & Sprenger, C. (2015). Measuring time preferences: A comparison of experimental methods. Journal of Economic Behavior & Organization, 116, 451-464.

Anwar, S., & Zheng, M. (2015). Posted price selling and online auctions. Games and Economic Behavior, 90, 81-92.

Ariely, D., Ockenfels, A., & Roth, A. E. (2005). An experimental analysis of ending rules in internet auctions. RAND Journal of Economics, 890-907.

Baron, J., & Hershey, J. C. (1988). Outcome bias in decision evaluation. Journal of personality and social psychology, 54(4), 569.

Boxma, O., Perry, D., Stadje, W., & Zacks, S. (2010). The busy period of an M/G/1 queue with customer impatience. Journal of Applied Probability, 47(1), 130-145.

Budish, E. B., & Takeyama, L. N. (2001). Buy prices in online auctions: irrationality on the internet? Economics letters, 72(3), 325-333.

Caldentey, R., & Vulcano, G. (2007). Online auction and list price revenue management. Management Science, 53(5), 795-813.

Choi, B. D., Kim, B., & Chung, J. (2001). M/M/1 queue with impatient customers of higher priority. Queueing Systems, 38(1), 49-66.

Chowdhury, S.M. (2017). The All-pay Auction with Non-monotonic Payoff, Southern Economic Journal, 84 (2), 375-390.

Chowdhury, S.M., Jeon, J.Y., & Ramalingam, A. (2018). Property Rights and Loss-aversion in Contests, Economic Inquiry, 56(3), 1492-1511.

Daley, D. J. (1965). General customer impatience in the queue GI/G/1. Journal of Applied probability, 2(1), 186-205.

Dawes, R. M., & Hastie, R. (2001). Rational choice in an uncertain world: The psychology of judgement and decision making. Thousand Oaks, CA: Sage Publications.

Durham, Y., Roelofs, M. R., & Standifird, S. S. (2004). eBay's buy-it-now function: who, when, and how. Topics in Economic Analysis & Policy, 4(1).

Einav, L., Farronato, C., Levin, J., & Sundaresan, N. (2018). Auctions versus posted prices in online markets. Journal of Political Economy, 126(1), 178-215.

Fehr, E. (2002). Behavioural science: The economics of impatience. Nature, 415(6869), 269.

Grether, D., Porter, D., & Shum, M. (2011). Intimidation or Impatience? Jump Bidding in On-line Ascending Automobile Auctions.

Hammond, R. G. (2010). Comparing revenue from auctions and posted prices. International Journal of Industrial Organization, 28(1), 1-9.

Kagel, J. H., & Levin, D. (2010). Auctions (experiments). In Behavioural and Experimental Economics (pp. 14-22). Palgrave Macmillan, London.

Kagel, J. H., & Roth, A. E. (Eds.). (2016). The Handbook of Experimental Economics, Volume 2: Princeton university press.

Ketcham, J., Smith, V. L., & Williams, A. W. (1984). A comparison of posted-offer and double-auction pricing institutions. The Review of Economic Studies, 51(4), 595-614.

Reynolds, S. S., & Wooders, J. (2009). Auctions with a buy price. Economic Theory, 38(1), 9-39.

Roth, A. E., & Ockenfels, A. (2002). Last-minute bidding and the rules for ending second-price auctions: Evidence from eBay and Amazon auctions on the Internet. American economic review, 92(4), 1093-1103.

Standifird, S. S., Roelofs, M. R., & Durham, Y. (2005). The impact of eBay's buy-it-now function on bidder behavior. international Journal of Electronic commerce, 9(2), 167-176.

Wang, R. (1998). Auctions versus posted-price selling: the case of correlated private valuations. canadian Journal of Economics, 395-410.

Wang, X., Montgomery, A., & Srinivasan, K. (2008). When auction meets fixed price: A theoretical and empirical examination of buy-it-now auctions. Quantitative Marketing and Economics, 6(4), 339.

Appendix: Experimental Instructions

Instructions for Treatment 1:

Background work: Through an informal survey, one of the authors has prepared a list of students of MBA program of Narsee Monjee Institute of Management Studies, who regularly participate in online purchase. There were 160 names in the list. Out of these 160 students, 50 names were selected randomly with the help of random number table and they were duly communicated. The following instruction sheet was distributed among these 50 students.

1) Kindly note that this experiment is for academic purposes only and no commercial interest is involved.
2) Your participation is optional.
3) If you want to participate in the experiment, then you are requested to visit Room no: 705 at 2.45 pm on 10/04/2017. Late arrivals will not be able to enter.
4) After you come to the classroom I will give you a badge displaying your serial number. Please do not lose the badge.
5) Sometime after 3.15 pm, a fair die would be tossed in the classroom. If “at most 2” comes up on the upper face of the die, each one of you would be given INR 400; otherwise you will be given nothing.
6) You may leave the classroom at any time and forgo the chance of getting INR 400, if you wish to do so. Nobody will force you to wait till the end.
7) No communication between participants will be allowed.

On the day of the experiment, the subjects were sent to their seats on arrival along with their badges, and points 5 to 7 were repeated.

Instructions for Treatment 2:

Background work: 9 subjects, who waited till the end in the Treatment 1, were listed. Another 6 subjects were selected at random from the remaining 23 subjects who left midway in the previous experiment, with the help of a random number table. These 15 subjects were provided with the following instruction sheet.

1) Kindly note that this experiment is for academic purposes only and no commercial interest is involved.
2) Your participation is optional.
3) If you want to participate in the experiment, then you are requested to visit Room no: 705 at 2.45 pm on 14/04/2017. Late arrivals will not be able to enter.
4) Please bring your badges provided during the earlier experiment.
5) Sometime after 3.15 pm, a fair die would be tossed in the classroom. If "at most 2" comes up on the upper face of the die, each one of you would be given INR 400; otherwise you will be given nothing.
6) You may leave the classroom anytime and forgo the chance of getting INR 400, if you wish to do so. Nobody will force you to wait till the end.
7) No communication between participants will be allowed.

On the day of the experiment, the subjects were sent to their seats on arrival, and points 5 to 7 were repeated.

Instructions for Treatment 3:

Background work: 30 subjects were selected at random, with the help of a random number table, from the list in Treatment 1, but were not invited earlier. They were communicated with the following instruction sheet.

1) Kindly note that this experiment is for academic purposes only and no commercial interest is involved.
2) Your participation is optional.
3) If you want to participate in the experiment, then you are requested to visit Room no: 705 at 5.00 pm on 17/04/2017.
4) After you come to the classroom, I will give you a badge displaying your serial number. Please do not lose the badge.
5) After you sit in the room, a fair die would be tossed in the classroom. If "at most 2" comes up on the upper face of the die, each one of you would be given INR 400; otherwise, you will be given nothing.
6) You may leave the classroom at any time but then you forgo the chance of getting INR 400. Nobody will force you to wait till the end.
7) No communication between participants will be allowed.

On the day of the experiment, the subjects were sent to their seats on arrival, and points 5 to 7 were repeated.