The Impact of Online Auction Duration

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One view regarding auction duration suggests that longer auctions would result in more bidders and more bids, which in turn would result in higher prices. An opposing view is that shorter auctions might appeal to impatient bidders, or alternatively, that shorter duration might lead to more competitive dynamics. To examine these competing notions, we conduct pairwise comparisons of simultaneous auctions identical in all but duration. The auctions are conducted on two different platforms—eBay and a local auction site. We find that in eBay auctions, longer duration increases the number of bidders and bids, and consequently increases final prices by about 11%. On the local auction website, with far fewer auctions and a more steady set of participants, the effect is reversed, and shorter auctions generate higher prices by about 20%. Both sets of effects are robust and significant. We look at bidding activity on both sites to try to get at the root of that reversal. We find that in eBay auctions, the higher price in the longer-duration auction is accompanied by a higher number of participating bidders and a higher number of bids placed in the auction. In the local site, we find that the auction duration does not significantly affect the number of participating bidders or the number of bids placed in an auction. However, the magnitude of jump bids is negatively and significantly correlated with duration. These jump bids are in turn shown to impact final prices.

Key words: auctions; field experiments; duration; frenzy; jump bids

History: Received on April 10, 2009. Accepted by L. Robin Keller and guest editors Robert F. Bordley and Elena Katok on May 26, 2009, after 1 revision. Published online in Articles in Advance August 20, 2009.

1. Introduction

One important feature of online auctions is participation by a geographically dispersed population of bidders over a period of several days. This has made auction duration a particularly salient attribute. Whereas a traditional offline auction may last several minutes or even seconds, most online auctions run over several days. On eBay, sellers can choose between durations of 1, 3, 5, 7, or 10 days. For sellers, the selection of specific auction durations may have a significant impact on profitability.

It has been proposed that longer auctions attract more bidders (Cox 2005). In general, if bidders’ arrival time at the auction site is a random variable—bidders visit at different times—then longer auctions would be seen by more bidders and more bidders would participate. More bidders should in turn lead to higher selling prices (e.g., Bulow and Klemperer 1996). It has also been proposed that a larger number of bidders may result in herd behavior, resulting in higher prices (Dholakia et al. 2002).¹ Empirically, Cox (2005) found that longer auctions result in significantly higher prices. In contrast, Ariely and Simonson (2003) found that shorter-duration auctions result in higher prices.

Although longer auctions are typically expected to draw more bidders, there are several reasons offered for a higher premium in shorter auctions. The first is impatience (Mathews 2004, Isaac et al. 2007, Kwasnica and Katok 2007, Katok and Kwasnica 2008, Wang et al. 2008).² Impatience has implications for jump

¹ Specifically, Dholakia et al. (2002) found that bidders gravitate toward listings with existing bids, while demonstrating no consideration for listings without any existing bids.

² Kwasnica and Katok (2007) systematically varied in the laboratory the opportunity costs associated with fast bidding. They found that when time is more valuable (bidders are more impatient), bidders respond by choosing larger jump bids. Katok and Kwasnica (2008) showed that revenue in fast Dutch auctions is lower than slow Dutch auction and attributed the difference to impatience.
bidding—defined as bidding in increments greater than the minimum increment. Jump bidding is a commonly observed phenomenon in many auction settings, ranging from standalone consumer auctions to multiple unit auctions, including Federal Communications Commission and 3G spectrum auctions (Isaac et al. 2007).

Kwasnica and Katok (2007) showed that when bidders are impatient (the opportunity cost of time is higher in one experimental manipulation in that study), bidders respond by choosing larger jump bids. Kwasnica and Katok (2007) noted that revenue would be expected to decline with high jump bids due to poorer allocative efficiency. That argument, however, only holds for standalone auctions. In competitive auctions, the opposite is the case. Jump bidding implies that a bidder may find himself committed to a higher price than he could otherwise obtain in competing simultaneous auctions. Therefore, revenue for the auction is expected to increase.

A second argument is increased bidding activity as a result of excitement or competitive arousal in shorter auctions, also known as frenzy (Ariely and Simonson 2003, Häubl and Popkowski Leszczyc 2003). Frenzy refers to a mental state induced by the dynamic interaction among bidders in an ascending bid auction and characterized by a high level of excitement, a strong sense of competition, and an intense desire to win (Häubl and Popkowski Leszczyc 2003).

Jank et al. (2008; and see Dass et al. 2009) examine models to predict the price of an auction in progress (intermediate price rather than final price). They measure competition between pairs of bidders in simultaneous auctions, both within the same auction as well as across different simultaneous auctions, and include competition as an explanatory variable. They find that competition reduces the need to include price velocity (speed of price increases) as an explanatory variable, suggesting that bidder competition may be a major source of the price dynamics, consistent with notions of competitive arousal.

Another view on the relationship between auction duration and the final price is offered in Bapna et al. (2008), who find that longer auctions can negatively affect the price dynamics because of a “bidding drought,” which typically occurs in the middle of the auction.

In this work, we conduct field experiments on auctions of different durations. In these field experiments, bidders arrive at auction websites for the purpose of purchasing, or attempting to purchase, an item. The availability of data on eBay has prompted many researchers to collect bidding data and analyze them, and it is not uncommon for researchers to conduct their own auctions for the purpose of greater control. One innovation here is that we run pairs of auctions simultaneously (as well as sequentially). Therefore, we have two auctions competing with one another.

As such, we are able to not only say which auction results in a better price, but also which one draws more bidders, and that auction can be said to be “preferred” in a way to the other auction running simultaneously. The simultaneous pair design also permits us to fully control for temporal effects that are taking place at that time of day, week, month, or year. We compare auctions of different durations by pitting a short-duration auction lasting one day against a longer-duration auction that ends at the exact same time. This allows us to tease out the competing explanations listed above (see Haruvy et al. (2008) for an overview of research involving competing auctions).

We examine two auction platforms. The first is eBay, where millions of bidders gather and bid. The advantage of eBay is that it is a well-known platform with direct consequences for many sellers. However, we have no control over the time at which the buyer pays and obtains the item or over the set of bidders.
exposed to the auction. In addition to eBay, we examine a local website with approximately 4,000 registered users. These users are notified at the same time regarding upcoming auctions, and these auctions take place over a prespecified limited duration. Hence, the set of bidders and their arrival times are less spread out, and their attention to auctions is focused on a limited number of auctions. It is therefore reasonable to expect (as we will shortly confirm) that the number of bidders will not vary greatly for auctions of different durations. This allows us to isolate the bidder entry effect from the other two explanations discussed earlier.

2. Experiments

2.1. eBay Platform

The experimental design involves pairs of identical items sold simultaneously in eBay auctions. The seller is the same for the pair of items and is one of two seller identities we used for this study. Both identities had a large number of ratings, where these ratings are the number of feedback responses by unique buyers (seller ratings in the 500s and 600s, respectively); of these ratings, only one feedback was negative for the first seller. There were zero negative feedbacks for the second seller.

The two auctions in a pair always had the same ending time. The picture and description of the items were the same in both auctions.

Between conditions, we varied duration in 17 pairs of auctions (experimental pairs). The duration was one day for one auction in a pair and three days for the other auction in the pair. As a control, in 241 auction pairs (control pairs), we did not vary the duration between the two auctions. The duration was three days in both auctions in those pairs. No control treatment is available for the one-day auctions. The bid history includes the timing, the bid amount, and the bidder ID of each bid placed in an auction. Winning bidders collected and paid for their items at a local retail outlet. To rule out a possible incentive for time-sensitive or impatient bidders to bid in shorter-duration auctions, bidders were informed that items would only be available for pickup after all auctions (in a batch) were completed. Auctions did not have a buy-it-now option, so bidders could not use such an option to avoid longer auctions.

A simple design was used where 164 different pairs of auctions (items were identical within a pair of auctions but different between pairs of auctions)
were sold sequentially either in auctions with 1-day or 10-day durations. The study was conducted in two batches (distinct time periods) where each of the items was sold in both a 1-day and a 10-day auction. Within each batch, half of the products were randomly selected to be sold first in a 1-day auction, followed by a 10-day auction; the other half of products were first sold through a 10-day auction, followed by a 1-day auction. In this way we kept the day of the week and the number of auctions ending on a day balanced across conditions. Each auction started at 9:00 PM in the evening and ended 1 or 10 days later at 8:00 PM in the evening. In total, 164 different unique items were sold in this pairwise design, for a total of 328 auctions. The auctions were run over a period of two months. The items included electronics, computer products, musical CDs, health and beauty items, tools, toys, collectables, handicrafts, jewelry, gift certificates, and household items. In many cases, bidders placed bids in multiple auctions. There were 148 instances of bidders placing bids in both auctions for a given item.

2.3. Differences Between the Two Studies
With field experiments, there is far less control of external factors relative to laboratory experiments. Every potential confound controlled for in the design may result in another. The researcher’s goal, in some sense, is to make acceptable trade-offs.

The two studies we ran involved different complications and therefore different experimental design considerations. The main experimental concern on eBay is the large number of auctions that could be considered substitutes to the ones being designed by the researcher. For Harry Potter books, in particular, there were several auctions running concurrently with ours, although none with the same ending times. It was therefore important to take several precautions. One was to make the design pairwise (simultaneous pairs), so that whatever else was happening on the eBay site was comparable between the two auctions in a pair. Another was to choose products carefully. Virtually all the baby products we listed had nearly zero auctions running in parallel with ours.

With the local Internet auction site, the design considerations were almost opposite to those on eBay. The auction site had thousands of registered active users as opposed to the millions of bidders on eBay, so a sequential auction design made more sense. There were no competing substitutes on the auction platform (there are always substitutes outside of the platform, but this is one of the acceptable confounds that has no good solution), and so all we had to control for was the temporal aspect, which we handled by varying the order of the short and long auctions. The choice of products was likewise different in that, on the one hand, we did not have to choose our products by worrying about substitutes, but on the other hand, our smaller market could not absorb too many repetitions of the same product, so greater diversity of products was needed.

The duration decisions were driven by the norms on each site. Therefore, the durations themselves are not perfectly comparable. On eBay, the comparison was between 1 and 3 days. On the local auction site, it was between 1 and 10 days. These different durations do not allow us to test nor rule out theories of non-monotonic effects of duration on price, such as price increasing in duration from 1 to 3 days, but decreasing from 3 to 10 days.

Because of these opposing considerations, the studies are not directly comparable. In addition to the experimental design differences, there are obvious platform and bidder base differences that make this comparison difficult to make. Hence, instead of looking at the two studies as experimental treatments of the same construct, one should look at them as two separate investigations of the effect of duration on prices in two auction platforms. We find diametrically opposite effects in the two platforms, and our empirical analysis sheds some light on why these different results occur.

3. Results for eBay Auctions
Summary statistics for both studies are provided in Table 1. For each experimental condition, the table displays the average number of bids entered, average number of bidders, and average selling price. Note that the eBay data comes from sets of two simultaneous auctions with identical ending times but different durations.

On average, bidders in the one-day eBay auctions paid $21.49, versus $23.93 in three-day eBay auctions, for identical items sold by identical sellers, in pairs of auctions that ran simultaneously and ended at
We also conducted a similar test for the number of bids. Although the results are similar to the results for the number of bidders, the mediated model shows that the number of bids is more of a mediator than the number of bidders, because the coefficient for duration is lower and only marginally significant in the mediated model ($\beta = 0.682$, $p = 0.06$).\footnote{The correlation coefficient between bids and bidders is 0.85 and is highly significant, so we do not expect great differences in results for the two measures. But the variance on the number of bids is higher, and so it is a slightly worse mediator.} Hence, both the number of bidders and the number of bids mediate the effect of duration on selling price, but only partially.

**Bidding Activity.** Bidders on eBay submit bids in a box titled “Maximum Bid.” When the maximum bid entered by a bidder is greater than one bidding increment above the highest currently shown bid, then the eBay proxy mechanism will bid up the price incrementally to one’s maximum bid. In a standalone auction, whether bidders bid incrementally or report their true valuations, theoretically there should not be a difference in final price. However, when there are multiple auctions, competition between auctions might be reduced if bidders entered their true valuations (as eBay recommends) and did not shop around for the best price. We examine the extent to which bidders bid incrementally by measuring the average jump. A jump is defined as the difference between the maximum bid entered and the currently shown highest bid. The average jump is $4.59 in the short-duration auctions versus $4.51 in the longer-duration auctions. This difference is not significant ($p$-value $= 0.86$). Hence, the difference in final price between short and long durations does not appear to be caused by more aggressive bidding in one auction duration versus another.

Together these results show that selling prices are higher in longer auctions, which is in part due to increased bidding activity (i.e., a greater number of bidders and bids). However, this increased competition does not appear to result in more aggressive bidding in longer auctions.
4. Results for the Local Auction Site

Summary statistics for the local auction site are provided in Table 1. For each treatment, Table 1 displays the number of auctions, average number of bid entries, average number of bidders, and average selling price.

First, we note the effect of duration on final prices. On average, bidders in the 1-day auctions paid $20.17, versus $17.29 in 10-day auctions, for identical items. Hence, looking at the difference between prices over all items, 1-day auctions resulted in a 16.6% increase in the average price over their longer counterparts. A possibly more informative statistic is the average percentage difference over items. The average percentage difference is 20.6%. This difference is highly significant ($t = 2.5, df = 163, p = 0.014$). In contrast to the eBay study, shorter auctions here attracted slightly more bidders, although this difference is not statistically significant ($t = 1.02, df = 163, p = 0.31$). Similarly, the difference in the number of bids was not statistically significant ($t = 0.47, df = 163, p = 0.64$). When we consider the specific product categories, we find that for half of the product categories shorter auctions resulted in significantly higher selling prices, and in none of the cases did longer auctions lead to higher selling prices. The product categories for which we did find a significant effect of duration included particular items that tended to be more difficult to assess (e.g., collectables, handicrafts, jewelry, household items, and certain computer items).

It does not appear in the aggregate that individuals are doing anything different over the two durations in terms of frequency of bids in this auction site. That is, a similar number of bidders enter comparable numbers of bids across durations. The main difference in individual bidder behavior across durations is in the jump bids, which are substantially larger in short durations. The average jump is significantly different: $3.20$ versus $2.70$ for durations of 1 and 10 days, respectively ($p = 0.008$). Moreover, the size of the jump bid is negatively correlated with the response time of the previous bidder’s bid. The correlation coefficient is $-0.06$ ($p = 0.02$). This means the shorter response time by a competitor will increase the jump of an opponent’s subsequent bid.

The correlation between the jump and the response time is relevant to the argument of frenzy raised in support of shorter durations (Häubl and Popkowski Leszczyc 2003).

Finally, because the jump bids are different between durations, it is interesting to see whether we can observe a relationship between the magnitude of the jump bids and final prices. The regression results in Table 2 show that when one accounts for the average jump in an auction, the duration is no longer a significant explanatory variable in predicting final price; that is, the effect of duration on final price is entirely mediated by the average magnitude of jump bids in the auction.

Table 2 Regression Coefficients

<table>
<thead>
<tr>
<th>Duration auction</th>
<th>Estimate</th>
<th>Standard error</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.153</td>
<td>1.585</td>
<td>0.10</td>
<td>0.923</td>
</tr>
<tr>
<td>Duration</td>
<td>0.230</td>
<td>0.172</td>
<td>1.34</td>
<td>0.181</td>
</tr>
<tr>
<td>Jump bid</td>
<td>6.102</td>
<td>0.312</td>
<td>19.54</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Note. Dependent variable: price.

5. Conclusion

The empirical evidence in the literature has been mixed in regard to the effect of duration on price. Typically in regressions on eBay data, the effect of duration on final price comes out positive. However, this effect is also typically accompanied by more bidders and, consequently, more bids, so the net effect of duration on price is ambiguous. In past results from laboratory experiments, where the number of bidders can typically be controlled, the evidence seems to indicate that shorter auctions may result in higher prices.

To examine the desirability of auction duration for bidders with the maximum control possible, we ran short auctions paired with longer auctions. We ran such experiments on two platforms—eBay and a local auction site, which has a more stable set of bidders. As expected, longer auctions on eBay resulted in more

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6 The average of the percentage differences is not the same as the percentage difference of the averages.

7 One cannot simply enter number of bids and number of bidders as explanatory variables for the dependent variable of final price. They are endogenously determined together with price. With enough identifying restrictions, a system of equations can be estimated, but the estimates will crucially depend on the structure of the system.
bidders and more bids, and this was accompanied by higher prices in the longer eBay auctions. On the local auction site, the number of bidders and bids was roughly comparable between auction durations. This is particularly remarkable in light of the fact that the auction pairs on eBay were much closer in duration to one another than in the local auction site (the eBay auctions were 1 day and 3 days, whereas the local auctions were 1 day and 10 days). Results of mediation analyses indicate that at least some of the positive effect of duration on price can be attributable to the number of bidders that such auctions draw on eBay, where bidder arrival time is spread out over time. In contrast, in the local auction site with preannounced auctions running for a limited time, the number of bidders is steadier and there is no effect of duration on the number of bidders. In that setting, the negative effect of duration is evident.

One explanation for higher prices in shorter-duration auctions on the local auction site is impatience. To rule out time discounting, bidders in the local auction experiment were informed that items would only be available for pickup after all auctions in a batch were completed. Moreover, auctions on the local site did not have a buy-it-now option, so bidders could not use such an option to avoid longer auctions. These controls are imperfect. Uncertainty in itself may have a disutility associated with it, and we cannot rule out impatience as a factor in the current result. The higher jump bidding we observed in the shorter auctions on the local auction site is consistent with Kwasnica and Katok’s (2007) prediction of what impatient bidders would do. Hence, to the extent that shorter auctions draw more impatient bidders, our results are consistent with the argument by Kwasnica and Katok (2007) and indicative of impatience as a factor.

Another argument for higher prices in shorter auctions is that shorter auctions might lead to more intensive bidding and a potential state of competitive arousal (bidding frenzy). Different measures have been proposed in the literature, which generally involve the number of bids, number of bidders and bids submitted per bidder (Dholakia and Simonson 2003), and the intensity of bidding, i.e., the speed of competitive reaction (Häubl and Popkowski Leszczyc 2003). None of these measures was found to be significantly different across auction durations.

Kwasnica and Katok (2007) argued that jump bidding would result in lower revenues in a standalone auction due to poorer allocative efficiency. In competitive auctions, jump bidding has a different implication—a jump bidder can overpay in one auction relative to what he could obtain in another. In regression analysis, we find that jump bids, as opposed to other factors, are directly responsible for the difference in final prices.

In summary, duration is consequential, but the direction of duration’s impact on final prices critically depends on both the arrival process of bidders and the opportunity cost of time for the bidders. In this investigation, we provided intriguing empirical evidence suggestive of these opposing effects of duration. A new set of theories is needed to account for both bidder entry and the bigger jump bids in shorter-duration auctions.

Acknowledgments
This research was supported by grants from the Social Sciences and Humanities Research Council of Canada, and the University of Alberta GRA Rice Faculty Fellowship.

References

One might argue that higher jump bids may simply be correlated with higher valuations. In the local auction site, where jump bids are observed, we obtained the maximum bids (presumably willingness to pay) for all bidders, including the winner. There was no significant difference in average willingness to pay between short and long auctions.

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