

# Measuring the Benefits to Sniping on eBay: Evidence from a Field Experiment

Sean Gray  
New York University

David H. Reiley<sup>1</sup>  
University of Arizona

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## Abstract

Bidders on eBay frequently engage in sniping: that is, submitting a bid seconds before an auction closes. Using a field experiment, we attempt to measure the size of the benefit of sniping (if any). To do this we selected pairs of auctions that were as identical as possible (same item, same quality, same seller, similar closing time, *et cetera*). In one auction of each pair we submitted an early bid, and in the other we submitted the same bid exactly ten seconds before its close. Our results, from a set of 70 such pairs, indicate no benefit to sniping: we found evidence of 2.54% lower prices for the sniped auctions, but we did not find this benefit to be statistically significant. Additionally, we use our data to make a survey of the incidence of sniping and compare our findings with those of Roth and Ockenfels (2002).

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<sup>1</sup> Gray: New York University School of Law, <smg372@nyu.edu>. Reiley: Department of Economics, University of Arizona <reiley@eller.arizona.edu>. This paper grew out of Gray's senior honors thesis at the University of Arizona. Reiley gratefully acknowledges financial support from SES- 0094800, and valuable research assistance from David Mack, Steve Manos, Mike Urbancic, and Alex Shcherbakov.

## 1. Introduction

Online auctions have been in use for a little over a decade. By far the most well-known online auction site, eBay, was started in September 1995 and has since grown to include tens of millions of registered members from around the world.<sup>2</sup> As noted by many scholars, eBay's scale and diversity encourage its use as a platform for empirical studies of auction theory.<sup>3</sup>

One of the salient features of eBay, that the site's users and observers quickly notice, is the ubiquitous phenomenon of sniping. eBay employs a "hard close" in their auctions (see Ockenfels and Roth (2002)), meaning each auction has a definite, publicly known time at which it will end. Many eBay users believe it can be advantageous to submit the very last bid in a given auction, so that no rival bidder has an opportunity to react or counter the bid. For this reason, sniping is commonly perceived to increase the chance of winning an auction, decrease the final price paid for the item in question, or both.<sup>4</sup>

The default process for bidding in eBay is the proxy bidding procedure (see Lucking-Reiley (2000)). Each bidder is asked to submit the maximum amount she is willing to pay for an item. When each bid is submitted, eBay automatically increases the current price of the auction to one increment above the second highest bid submitted to that point. The exact level of the current highest bid is unknown until it can be inferred by exceeding it. Proxy bidding, thus, essentially entails a collapsed English auction between the standing high bid and each new rival bid. eBay gives the following description of proxy bidding to their users:

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2 For a more detailed history of online auctions, see Lucking-Reiley (2000).

3 We do not provide a comprehensive list of the scholarly papers based on eBay's online marketplace, as it would be beyond the scope of this present paper.

4 Roth and Ockenfels (2002)

1. When you place a bid, you enter the maximum amount you'd be willing to pay for the item. Your maximum amount is kept confidential from other bidders and the seller.
2. The eBay system compares your bid to those of the other bidders.
3. The system places bids on your behalf, using only as much of your bid as is necessary to maintain your high bid position (or to meet the reserve price). The system will bid up to your maximum amount.
4. If another bidder has a higher maximum, you'll be outbid. BUT, if no other bidder has a higher maximum, you win the item. And you could pay significantly less than your maximum price!

Proxy bidding allows bidders maximum flexibility in placing their bid (they may submit their bids at any time—day or night—during the auction period) and requires minimum effort since each bidder needs make only one bid.

If bidders submit their true maximum willingness to pay, there is no need for them to submit a higher bid later. In particular, if all bidders in an auction were to submit their true maximum willingness to pay (assuming this remains constant through the duration of the auction), there would be no benefit at all to sniping; in this situation no rival would want or need to react to a late bid.<sup>5</sup> eBay encourages this use of the proxy bidding process and admonishes each bidder to submit her maximum willingness to pay, as reflected in the following notice regarding sniping:

One way to help avoid disappointment is to ensure that the maximum bid you enter on the item page is the highest price that you're willing to pay. The eBay system automatically increases your bid up to the maximum price you specify, so entering a higher maximum may help prevent you from being outbid in the closing seconds of a listing.

Yet non-proxy bidding continues unabated. This claim is supported by our results and Roth and Ockenfels (2002) who find a large incidence of sniping. Roth & Ockenfels show that in two categories of items (computers and antiques):

20 percent of all last bids on eBay ... were submitted within the last hour ... Furthermore ... a considerable share of bidders submit their bid in the last five

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5 [Have there been any studies that model variable maximum willingnesses to pay?]

minutes (9 percent in Computers and 16 percent in Antiques) ... At the auction level: 40 percent of all eBay-Computers auctions and 59 percent of all eBay-Antiques auctions ... have last bids in the last 5 minutes ... In the 240 eBay-auctions, 89 have bids in the last minute and 29 in the last ten seconds.

Perhaps the prevalence of sniping is due to a misunderstanding by users about the nature and purpose of proxy bidding. Despite the excellent description of the bidding mechanism, some bidders may still treat eBay auctions as live English auctions. In particular, they may believe that the full value of their bid will be posted, which is more like a first-price auction than an English auction. This would discourage bidders from bidding their maximum willingness to pay for the item. It is quite common to observe a bidder rapidly submitting incrementally higher bids, implying that the bidder wishes to bid slightly more than a rival's proxy bid. This offers strong evidence that some bidders are hesitant to reveal their true maximum willingness to pay, and that they misunderstand the nature of proxy bidding.

Sniping has become so popular that a few businesses have been created for the sole purpose of facilitating the submission of last-second bids on eBay. eSnipe is one example of an online service that allows a bidder to automatically submit a sniping bid for a given online auction at the amount and time of her choosing (say, within a few seconds of the auction's close).<sup>6</sup> The ease of use of this service as well as the policy to only charge the service fee to customers that actually win the item on which they bid has facilitated the growth of sniping in the late 90s to the levels noted above.

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6 This service has 50,000 registered users—as compared to eBay's 65,000,000 users—and places more than 10,000 bids a day, worth about \$16 million per month. For reference, the value of goods sold on eBay in 2003 was \$20 billion. As the \$16 million figure from eSnipe is not the value of winning bids, but all bids, it is seen that the proportion of eBay community that uses eSnipe is quite small. While most sniping bids are submitted manually, we chose to use eSnipe to maintain consistency in the timing of our sniped bids.

We attempt to measure if there is an actual benefit to sniping relative to proxy bidding as suggested by Ariely, Ockenfels, and Roth (2003), who conducted sniping experiments in a laboratory context. They found that as bidders gained more experience in the controlled online bidding marketplace, they were more likely to place late bids; this correlation implies sniping may offer a tangible benefit to bidders. One possible explanation for late bidding they present is:

Sniping may also be a best response to incremental bidding that is observed both in the field (see Ockenfels and Roth, 2001 and 2002) and in our experimental setting. An incremental bidder starts with a bid below his value and is then prepared to raise his bid when he is outbid. Bidding late on eBay may be a best reply to incremental bidding, because this strategy would not give the incremental bidder any opportunity to respond to being outbid.

Our research is a field study attempting to detect this effect by bidding on pairs of items using each of the two different bidding methods: an early proxy bid and a late sniping bid.

## **2. Experimental Method**

We designed our experiment to measure the benefit of sniping by comparing the winning bids on two identical items listed on eBay. We bid on one item of the pair early and then placed a sniping bid for the other. In identifying potential pairs of items, we controlled for a number of variables that could add noise to our data, such as seller, shipping cost, day and time of the auction end, and starting bid level. As much as possible, we tried to set up each pair of auctions so that our bidding strategies were the only factor that varied between them. Thus, any change in the prices paid in the paired auctions would be primarily due to the respective bidding strategies used.

In choosing the types of items to purchase, there had to be a high availability of identical items for which a uniform value could be established. The types chosen were: PlayStation 2 video games, US coin proof sets, DVDs, Xbox video games, Hot Wheels die-cast cars, and Game Boy Advance video games. These items were more likely to be identical because most of

the goods were new, and therefore in the same condition. For the goods that were not new, they were of a measurable condition to which a value could be attached (e.g., the coin proof sets). The categories used were also useful in that they ranged from relatively small bidder pools (Xbox video games) to relatively large bidder pools (DVDs). This allowed us to also look at the effects when different amounts of bidders are taking part in the auction.

Once we identified the types of goods we were interested in, we selected 20 pairs of PlayStation 2 games and 10 pairs of items for each of the remaining five types, for a total of 70 pairs of items. To find these pairs of items, we browsed through each specific category of newly listed goods until we found two items with identical names listed near each other. We started with newly listed goods so that if a suitable pair were found we would be able to place an early bid in one of the two auctions. Identical item listings, including the same use of punctuation and capitalization, usually indicated that the items were being sold by the same seller. Searching for multiple identical items offered by the same seller was the fastest way to locate potential pairs of nearly identical auctions, since such auctions are very often listed at approximately the same time, last for the same number of days, have the same starting bid, require the same shipping costs, and are advertised by identical item display pages. Upon finding a potential pair of auctions, we examined the details of each to confirm that they had the same seller, shipping costs, and auction length. Unfortunately, auction closes tended to vary slightly between our auction pairs; Table 1 summarizes the distributions of these differences. Also, our data show that the average number of bidders is lower for the proxy-bid auctions than the sniped auctions, with the averages being 5.56 and 3.34. This is due to the fact that a late sniped bid keeps the price lower for a longer period of time, and thus encourages more entry.

Once we selected a particular auction pair, we needed to determine an appropriate bid level.

The bid had to be high enough to win the auction and thus enable comparison of the bidding strategies. However, we did not want it to be an unreasonably high bid, in part to avoid a large monetary risk. We decided to use the Wal-Mart retail price—conveniently found on their website—for our bid levels for specific Playstation 2 video games, DVDs, Xbox video games, and Game Boy Advance video games. The items in question were in new condition, and Wal-Mart prices are usually the lowest price at which a consumer can buy a product at an easily accessible “brick-and-mortar” store. Based on the widespread availability of Wal-Mart stores and the additional cost of shipping items won on eBay, we felt that most consumers were unlikely to bid above this threshold. The US coin proof sets and Hot Wheels die cast cars were all in mint condition and could be priced at their mint condition price guide value. The coin proof sets were valued by the Professional Coin Grading Service: <http://www.pcgs.com/prices/>, while the Hot Wheels cars were priced by Hallsguide.com online price guide: <http://www.hallsguide.com/hotwheels.html>. The authority and widespread availability of these pricing guides gave us confidence that we could win these auctions at book price without having to overbid excessively.

In half of the auctions (one item in each pair) we submitted our bid several days before the auction was to end. In the other half of the auctions, we used automated sniping software to place an identical bid exactly 10 seconds before the auction concluded. We hoped that 10 seconds before close would be as near as possible to the end of the auction while ensuring enough time to make sure that our bid would get through and be processed. Since our bids were selected to be high relative to going market prices on eBay, we tended to win both items in each pair of auctions. The important data we gained from this experiment was the differences in price between the sniped and early bid prices in each pair. If there is a benefit to sniping, then we

should find that we won sniped auctions at lower prices than those in which we placed an early bid.

### **3. Description of the Data Sample**

For each of the 70 pairs of items on which we bid, we copied both the auction page and the bidding page. Clicking for a description of the item and viewing the auction page allowed us to obtain the most basic information about an auction, including:

- Item name
- Item number
- Starting bid
- Winning bid
- Auction length
- Number of bids
- Number of bidders
- Time ended
- Seller

Clicking the link on the number of bids on the auction page allowed us to view the bidding page where there was a record of when each bid was made and by whom. These two pages provided all of the necessary data for our analysis. Descriptive statistics of bids that won their auctions and the bids we placed in each category are shown in Tables 2 and 3 respectively.

Although our raw data contained 70 pairs, we were forced to remove some of the pairs of items. Three pairs of US coin proof sets, one pair of Playstation 2 games, and two pairs of DVD movies were eliminated for the purposes of our analysis because we were outbid in one or both of the auctions, with eight total auctions affected.<sup>7</sup> Of these eight auctions, we were outbid on three sniped bids and five early bids. We needed to win both auctions in each pair to measure

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<sup>7</sup> The auctions in which we were outbid were interesting in that the winners of those auctions paid more than retail price for the Playstation 2 games and DVDs, and more than the “book value” for the coin proof sets. The behavior observed in these auctions is not seen to be normal. Perhaps these bidders placed a high value in having the good delivered to their doorsteps, or maybe they had particularly high search costs.

the benefit of sniping, so the affected auction pairs did not provide us with useful data. Also, eBay administrators removed five of the ten pairs of Game Boy Advance games due to suspicion of piracy after we had placed our bids. The total number of pairs remaining for statistical analysis was thus 59.

It is important to note that there were some auctions in which we were the sole bidder. Moreover, five complete pairs of items had no other bidders, which may potentially cause us to underestimate the benefit of sniping. In addition, there were seven individual auctions for which we were the only bidder while the other auction of the pair had more than one bidder. We do not expect these seven pairs to influence our results as much as the aforementioned five.

#### **4. Data Analysis**

We first analyze our claim that the price of a sniped good should be relatively lower than its unsniped counterpart. To get a feel for the data, we present two histograms both of the difference between the sniped price and proxy price for an auction pair. The bins are sorted by the difference in prices, and lower bins correspond to a larger benefit to sniping. A visual analysis shows that price difference is roughly normally distributed but skewed to the left for both histograms. This indicates a benefit to sniping, which we now formalize the magnitude of analytically.

Although we find a small benefit to sniping, it is not statistically significant. We again tests of means, to determine if there is a significant difference between the closing price of a sniped auction and that of the paired auction in which we placed an early bid. The mean percentage difference between the sniping price and the early-bid price is  $-2.54\%$ , with a 95% confidence interval of  $[-9.39\%, 4.13\%]$ . Therefore, on average, sniping resulted in slightly lower closing price relative to bidding early. However, the test statistic of  $-0.74$  indicates that this result is not

significant at any reasonable level. Testing instead on the absolute differences in price between the auctions in each pair (sniping minus early bid) produces similar results. The mean absolute difference was  $-\$0.50$ , with a 95% confidence interval of  $[-\$1.43, \$0.43]$ , which also suggests a possible benefit to sniping. Nevertheless, the absolute difference is also not significant at the 5% significance level, with a test statistic of  $-1.09$ .

We also do tests of proportions on prices using bidding strategy as the variable of interest. First, we assume that the proportion of pairs where sniped auctions closed at a higher price than early bid auctions is equal to 50%. This yields a test statistic of  $-1.16$ , so we cannot reject this null hypothesis at a 5% significance level. These results lead us to conclude that our data show no benefit to sniping at a 5% significance level, which is surprising in light of the laboratory research by Roth & Ockenfels (2002), which suggests there may be a benefit to sniping.

We next consider the possibility that the benefit to sniping may vary according to the number of bidders. The following are two competing stories that can be told to motivate intuition either way. It is plausible that sniping may be more effective when there are more bidders participating in an auction, since a snipe is less likely to affect the outcome of an auction that has one or zero rival bidders (there is less last minute competition). Alternatively, sniping may be less effective when there are many bidders, since the probability that the high bidder has significantly overbid using eBay's proxy bidding may increase in the number of bidders. In this case, if the sniping bid is lower than the current high bidder's overbid, it will only have the effect of raising the closing price for that winning bidder.

Sorting our dataset into two subsets, we attempt to answer whether the number of bidders affects any benefit to sniping. We sort the 59 pairs of auctions by the average number of bidders in the pair and split our dataset at the pair with the median average number of bids. Since we

have an odd number of pairs, we drop the median pair and are left with two subsets, each with 29 pairs. One subset consists of pairs with relatively low numbers of bidders; the average number of bidders for this subset is 2.62, and the average number of bidders for the high subset is 6.28.

Focusing first on the low subset, we find that sniped auctions closed an average of 2.4% or \$0.34 less than the early bid auctions. Running a test of means, the respective test statistics (percentage and absolute differences for sniping minus early bid) are  $-0.43$  and  $-.57$ , so this result—a small negative benefit to sniping—is not significant. Turning our attention to the high subset we find a similar result. Among those pairs, the sniped auctions also yielded cheaper closing prices than their proxy counterparts. On average an auction in the high subset yielded a 1.9% or \$0.50 lower sniped price versus the proxy price. However, this result is not statistically significant. A test of the equivalence of means in the two groups gives test statistics of  $-0.69$  for absolute differences and  $-0.48$  for percentage differences. Collectively, these tests imply closing prices are not significantly different between the two bidding strategies whether the average number of bidders is relatively low or relatively high.

## **5. Incidence of Sniping**

We were surprised to find no measurable benefit to sniping. There are two possibilities that could help explain our results. First, it is possible there was less sniping on eBay as a whole during the period when we were bidding on our auction pairs. Second, it may be sniping is less prevalent within the categories of goods that we chose to bid on.

To answer this, we decided to collect additional data to determine whether sniping still occurs at frequencies similar to those reported by Roth and Ockenfels (2002). To accomplish this, we mimicked their data gathering by choosing 120 laptop computer auctions and 120 antique auctions, for a total of 240 auctions. Items were chosen where the reserve price was met and the

Buy It Now option was not exercised.<sup>8</sup>

Like Roth and Ockenfels, we then sorted late bids into four overlapping bins: bids made in the last hour, bids made in the last ten minutes, bids made in the last minute, and bids made in the last ten seconds. Our results were that there 78.3% of the bids were made in the last hour, 63.8% in the last ten minutes, 50% in the last minute, and 25.4% in the last ten seconds. Roth and Ockenfels found 67.9% of bids occurred in the last hour, 55% in the last ten minutes, 37.1% in the last minute, and 12.1% in the last 10 seconds. In our data, a bit less sniping occurs within the last hour of the auction than when Roth and Ockenfels completed their study, but more of our recorded bids took place in the last few minutes of an auction. Our results actually show a noticeable increase in the prevalence of sniping with the percentage of bids occurring in the last hour, ten minutes, one minute, and ten seconds all higher in our sample than Roth and Ockenfels.

We also measured the incidence of sniping that occurred in two of the categories in which we attempted to measure the benefit to sniping, Playstation 2 games and US coin proof sets. The results are summarized in Table 4, and are qualitatively similar, with the exception of coin proof sets which garnered noticeably less sniping. Additionally, we also looked at the bidding histories of the auctions in our selected pairs to see if sniping (beyond what we ourselves were doing) occurred during our field experiment. We did the same sniping analysis on 10 pairs of coin proof sets, DVDs and Playstation 2 games as we did on laptops. Our findings appear in Table 5. The order of sniping may be of interest: sniping occurred most frequently among auctions for PlayStation 2 games, less in auctions for DVDs, and least in the coin proof set auctions.

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<sup>8</sup> In some auctions a buyer can elect to use the Buy it Now option to negate the auction format and simply directly purchase the item at a known, stated price.

## **6. Conclusion**

Previous research has implied that there may be a measurable benefit to sniping. Since experience on eBay as measured by feedback ratings is positively correlated to sniping, we would expect that there is a monetary incentive for more experienced bidders to continue to snipe. We find no statistically significant benefit to sniping, although we did observe a slightly positive benefit to sniping of 2.54%. It is possible that we simply do not have enough data to find a significant effect. Also, our findings show roughly the same frequency of sniping as occurred in the time period Roth and Ockenfels did their study. Further research should be done with other categories of items to determine whether or not these results apply to a wider range of eBay auctions.

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**Table 1. Differences in Auction Pair Close Times by Item Type**

| Item                   | Time Difference |          |         |          |
|------------------------|-----------------|----------|---------|----------|
|                        | Mean            | Max      | Min     | Median   |
| Playstation 2 Games    | 14:04:45        | 23:59:34 | 3:03:35 | 23:59:26 |
| Game Boy Advance Games | 0:00:48         | 0:02:07  | 0:00:00 | 0:00:37  |
| Xbox Games             | 3:05:13         | 3:12:20  | 2:58:24 | 3:01:48  |
| Coin Proof Sets        | 0:21:09         | 0:25:02  | 0:04:50 | 0:23:35  |
| Hot Wheel Cars         | 0:00:57         | 0:02:04  | 0:00:26 | 0:00:34  |
| DVDs                   | 0:09:16         | 1:00:00  | 0:00:25 | 0:01:49  |
| Average Total          | 2:57:01         | 4:46:51  | 1:01:17 | 4:34:38  |

**Table 2. Descriptive Statistics of Winning Prices by Item Type**

| Item                   | Winning Price |         |         |         |
|------------------------|---------------|---------|---------|---------|
|                        | Mean          | Max     | Min     | Median  |
| Playstation 2 Games    | \$13.70       | \$33.07 | \$4.95  | \$11.50 |
| Game Boy Advance Games | \$20.19       | \$26.91 | \$11.53 | \$21.04 |
| Xbox Games             | \$19.99       | \$36.00 | \$3.95  | \$20.01 |
| Coin Proof Sets        | \$17.91       | \$32.03 | \$10.50 | \$15.50 |
| Hot Wheel Cars         | \$8.83        | \$11.57 | \$6.99  | \$8.55  |
| DVDs                   | \$13.25       | \$18.50 | \$8.10  | \$13.05 |
| Average Total          | \$15.64       | \$26.35 | \$7.67  | \$14.94 |

**Table 3. Descriptive Statistics of Our Bids by Item Type**

| Item                   | Our Bid |         |         |         |
|------------------------|---------|---------|---------|---------|
|                        | Mean    | Max     | Min     | Median  |
| Playstation 2 Games    | \$27.12 | \$49.82 | \$14.85 | \$19.82 |
| Game Boy Advance Games | \$30.81 | \$34.82 | \$29.79 | \$29.82 |
| Xbox Games             | \$35.88 | \$47.72 | \$19.72 | \$44.82 |
| Coin Proof Sets        | \$32.62 | \$45.00 | \$16.00 | \$25.00 |
| Hot Wheel Cars         | \$17.19 | \$30.00 | \$10.00 | \$15.00 |
| DVDs                   | \$18.02 | \$19.98 | \$15.87 | \$17.98 |
| Average Total          | \$26.94 | \$37.89 | \$17.71 | \$25.41 |

**Table 4. Incidence of Sniping for Single Auctions, By Category**

| Percentage of |  |  |  |
|---------------|--|--|--|
|---------------|--|--|--|

| Item Type           | Bids Made Within: |       |       |        | # of Items |
|---------------------|-------------------|-------|-------|--------|------------|
|                     | 1 hour            | 5 min | 1 min | 10 sec |            |
| Laptops             | 70.0%             | 46.7% | 36.7% | 11.7%  | 60         |
| Playstation 2 Games | 90.0%             | 50.0% | 33.3% | 7.0%   | 30         |
| US Coin Proof Sets  | 70.0%             | 36.7% | 6.7%  | 0.0%   | 30         |

**Table 5. Incidence of Sniping for Paired Auctions, by Category**

| Item Type           | Percent-<br>age of<br>Bids Made<br>Within: |       |       |        | # of Items |
|---------------------|--|-------|-------|--------|------------|
|                     | 1 hour                                     | 5 min | 1 min | 10 sec |            |
| US Coin Proof Sets  | 25%  | 20%   | 5%    | 0%     | 20         |
| DVDs                | 50%  | 20%   | 10%   | 0%     | 20         |
| Playstation 2 Games | 60%  | 45%   | 30%   | 5%     | 20         |

**Histogram: Sniped Minus Proxy Price**  
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