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The Effect of Social Cues on Sniping Behavior in Internet Auctions: Field Evidence and a Lab Experiment

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Abstract

This research explores how social cues presented in an online auction affect sniping behavior. Sniping is a strategy of placing a bid on an item in the very ending stages of an auction with a pre-determined ending time in an attempt to win the auction. Such a strategy conceals the intentions of the bidder until the last moments of the auction and minimizes the possibility of other opposing bidders submitting higher bids due to the short period of time left to respond. The research includes two field studies and a lab experiment indicating that sniping appears to be influenced by social factors, that is, when there are a greater number of bidders in the auction or the auction site provides social information about the bidders, the relative use of sniping increases. This research supports the perspective that bidders rely on others' bidding behavior and characteristics as an indication of the true value of the item on sale, and is one of the first studies in the literature which takes this perspective.

Keywords: Auctions; Bidding behavior; Online auctions; Social cues; Sniping

Background

Auctions are among the most popular mechanisms to conduct business transactions these days. Smith (1989) argues that auctions are special in that they are social processes capable of defining and resolving inherently ambiguous situations. Internet auctions are software-based implementations of the traditional auction format. The popularity of internet auctions has led to the expansion of various bidding strategies (Bapna et al. 2004), one of which is sniping, broadly defined as bidding at the very ending stages of the auction (typically defined as being within the last few minutes of the auction), with the intention of leaving other bidders no time to respond to raise their bids.

The study of sniping is important for three reasons. First, it is a phenomenon that is frequently observed in auctions with a specified end time (i.e., hard close) (Roth and Ockenfels 2002). Secondly, it is a strategy which is not without controversy, causing psychological regret when a bidder loses an item in the last seconds of the auction (Ariely and Simonson 2003), resulting in the creation of alternative auction sites and models to avoid the phenomenon (e.g., uBid, overstock, and Swoopo). Such sites effectively eliminate the presence of sniping by extending the auction length by a fixed amount of time if a bid comes in during the last moments of the auction. Finally, sniping has been shown to impact the final price that consumers pay for a good in an auction context when compared to bidding earlier on in an auction (Roth and Ockenfels 2002; Wenyan and Bolivar 2008). When combined with the fact that it is an auction strategy which is frequently used (Roth and Ockenfels 2002), this makes it worthy of study. While sniping seemingly allows the bidder to remain camouflaged until he/she is ready to strike, this very notion suggests that it is a social phenomenon. That is, the bidder is accounting in some form for the presence of others and deriving his/her strategy as a function of others. Wenyan and Bolivar (2008) assume that sniping is used for occasions in which bidders

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are "extremely anxious to win the item" and under conditions when the item is rare. While this may be true, we shall see that sniping is frequently used even for common items, and therefore the explanation for why it is used must go beyond the simple consideration of the particular item up for sale. Therefore, the present study was undertaken to examine whether sniping behavior can be explained at least in part from a social perspective, a view which surprisingly has not been investigated in any detail, as the phenomenon has traditionally been studied in the domain of economics. As noted, the prevalent use of sniping in on-line auctions has been reported in several studies. Roth and Ockenfels (2002) report that 40% of all tested eBay Computer auction bids and 59% of all tested eBay Antique auction bids occurred in the last five minutes, while Gray and Reiley (2007) report that across four product categories, bidding occurred within the last five minutes 46.7% of the time. Such a prevalent usage of sniping suggests that consumers may in part be motivated to snipe based upon certain cues that are characteristic of the specific auction they are participating in. As noted, Wenyan and Bolivar (2008) have suggested that one such cue is the rarity of the item. However such an observation does not explain why sniping occurred 40% of the time in the computer category (Roth and Ockenfels 2002); or 50% of the time for Playstation 2 (Wenyan and Bolivar 2008). Clearly, such items can hardly be considered rare, as similar or identical computers and Playstation sets could be purchased many times in a given day on eBay from a myriad of sellers inclusive of the same seller.

The key to why sniping occurs may be better understood by focusing on the negative emotions felt by a bidder when an item is lost at the last possible moment. Indeed Ariely and Simonson (2003) reported on a larger "Loser's" than "Winner's" curse when bidders participated in on-line auctions. That is, the bidder was significantly more concerned with the regret of not having bid high enough to win the item than of bidding too high upon winning. To avoid the emotional trauma which occurs when one is faced with the regret of a loss, the importance of using a strategy which is believed to have a better chance of winning becomes paramount. This may be particularly the case when your biggest competitor is identified as the winner! Enter the strategy of sniping, where the higher bid is launched at a point in the auction when the end is near, leaving no time left for the competition to respond. This perspective is consistent with Wenyan and Bolivar's perspective of the use of sniping as a strategy when one is "extremely anxious to win the item."

Using online auction data from the sale of notebooks, Chan, Kadiyali, and Park (2007) use breadth (how many items similar to the present item in product attributes are on sale concurrently) and depth measures (how many of those similar items on sale concurrently also are of the same brand) to characterize the market competition. They argue that bidder's Willingness To Pay (WTP) in the first-price English Auction framework is a function of the auction market environment which includes a measure of competition among bidders and bidders' and sellers' characteristics. Hence an explanation of sniping behavior might be found in an examination of the interpersonal drivers of sniping, and the behavior may be better understood as a function of a social expression intrinsic to the auction itself (e.g., the amount of interest in the auction through the knowledge of who and how many participants are bidding or watching). These are part of the online auction design attributes that can be controlled by the auction site and the seller. But sniping is only important, if it is perceived by participants to be an effective and winning strategy. It is to this issue that we turn next.

Having a Higher Probability to Win

Brint (2003, p 1183) astutely comments that auction participants may overestimate their success in sniping simply because "late bids that would not be successful would not be placed as they would be below the current price." That is, snipers may not be able to participate in some auctions simply because the price at that late point in the auction exceeds the maximum amount they are willing to snipe, and they do not attribute these occasions as a failure of the sniping strategy!

To determine whether online auctions participants believed sniping to be an effective strategy, a web-survey was conducted among 103 bidders from the age group of 25–44. The data was collected in October 2010 confirming that frequent snipers rated the probability of winning the auction through the use of a sniping strategy as significantly higher than in-frequent snipers (6.28 vs. 4.33, $F(101)=6.54$, $p<.02$,[1] one tailed t-test). This confirms the value of sniping for those who snipe more frequently. Additional empirical evidence further confirmed that people who bid just a single time, during the last moments of an eBay auction, are the most likely to win (Yang and Kang 2006).

Theoretical Reasons for Why Consumers Snipe…The Economic Perspective

A number of economists have sought an explanation for the prevalence of sniping behavior but with conflicting results. These explanations include: (1) tacit collusion, (2) reaction to a naïve bidder, (3) multiple listings, (4) protection from squeezing and (5) ending rules of the auction. The tacit collusion argument for sniping (Ockenfels and Roth 2002) hinges on the fact that a late bid may not go through and cannot be retaliated against. This would lead to softened competition and lower prices as some retaliatory bids have a probabilistically non-zero chance of not arriving in time, particularly those that are in response to a snipe. Several researchers (e.g., Ku, Malhotra, and Murnighan 2003; Gonzalez, Hasker, and Sickles 2004) however have found empirical results to be inconsistent with the tacit collusion hypothesis. More recently, Ockenfels and Roth (2006) proposed that sniping may be a response to naïve bidders. Their theoretical model identifies a naïve bidder in an online auction as an individual who behaves as if in a live auction, upping his/her bids as a response to others until he/she reaches a reservation price (a "nibbler"). These authors show that sniping is an equilibrium strategy when a competitor is facing such a bidder as it may not allow the nibbler to respond to a

[1] The question asked in the survey was: "To what degree would you agree or disagree with the following statements: When bidders snipe, they have a higher probability of winning the auction? (1—Strongly Disagree; 7—Strongly Agree)".

particular bid if there is little time left on the clock. The naïve bidder model however fails to consider the cost of sniping (e.g., monitoring the auction's deadline or paying for the software which does this for you) that could actually lead to situations where the expected utility of a late bid is negative. This may explain why Gonzalez, Hasker, and Sickles (2004) fail to find empirical support for this explanation.

Others have noted that nibbling can be effective in online bidding when there are multiple listings (Peters and Severinov 2006). This is not an argument for sniping per se; rather, it explains why nibbling can occur and why one might end-up bidding late. Bapna et al. (2004), identify a similar type of bidder called as an "Opportunist" who places minimum required bids just before the auction closes because of perceptions of a bargain.

A fourth explanation lies in the suggestion that unethical behavior elicits sniping. Barbaro and Bracht (2006) argue that sniping is a weakly dominant strategy when faced with "squeezing" behavior, a practice designed to uncover a legitimate bidder's hidden maximum bid. Sniping is an effective counter-measure to the "squeeze play" as it does not provide the seller with one's maximum bid until it is too late to squeeze. However, eBay has a strong policy against squeezing and has been actively banning sellers who partake in this illegal activity.

Finally, the ending rules of the auction have been said to regulate the frequency of sniping behavior (Roth and Ockenfels 2002; Ockenfels and Roth 2006). That is, auctions with a predefined ending ("hard-close" auctions) result in a greater amount of sniping than those that extend the bidding window ("soft-close" auctions) (Roth and Ockenfels 2002; Ockenfels and Roth 2006). This finding is not at all surprising, since without a fixed deadline after which the auction site does not accept bids, bidding within the last moments of the auction becomes impossible, since a bid simply extends the auction.

In sum, although several explanations have been offered to justify sniping as a rational behavior, there is a lack of convincing empirical support for these explanations. Further, when there is support, it is limited to narrow circumstances (e.g., antiques or rare items), specific types of bidders, or implies illegal activity on behalf of sellers (e.g., squeezing). Moreover, the findings do little to keep a bidder informed as to whether or not a given auction he/she has entered is particularly susceptible to sniping behavior. Our research takes a different tack by suggesting that a social aspect underlies sniping behavior, one that provides the bidder with clues from the auction itself. We turn to this perspective next.

Sniping as a Function of Interpersonal/Social Factors

Several studies seem to imply that the underlying basis for sniping behavior can be explained from a sociological perspective that is linked to uncertainty about the common value of an item (Roth and Ockenfels 2002; Bajari and Hortacsu 2003; Bapna, Jank and Shmueli 2008). This perspective is consistent with other studies that suggest that social cues affect the perception and behavior of internet consumers. For example Wang et al. (2007) propose that Web site social cues impact the social perceptions of retail consumers, and that Web site social perceptions influence consumers' shopping experience with online providers.

The asymmetry of information in auctions is a crucial element of their characteristics and therefore we believe play a significant part in the motivation for sniping. That is, the seller doesn't know the bidders' valuation while the bidders don't know exactly how much the item is really worth, what the quality of the item is, and what risk he/she has in buying the item. In such a vague environment, bidders search for cues that will signal to them the true value and quality of the item, and many of these clues are played out strategically as the auction moves toward its conclusion. It has been found that bidders' valuations depend not only upon their own signals but on the information they obtain during the auction, such as the number of bids, number of bidders and number of page views (Dholakia and Soltysinski 2001; Ariely and Simonson 2003). When more people bid on the auction they increase the bid price, while more views of the offering cues a higher value (Kamins, Drèze, and Folkes 2004). Indeed, Andreoni and Miller (1995) and Kagel and Levin (1986) report, across different research methods and product categories, that bidders in relatively larger groups suffer from a stronger winner's curse as opposed to bidders in smaller groups. That is, bidders were willing to bid more in the face of greater competition. This result provides circumstantial evidence which suggests that social clues in the bidding environment influence bidding behavior.

Bids in and of themselves provide information about the value of an item, particularly if a participant you respect has entered the fray, or someone with a large feedback evaluation shows up. Indeed, Marcoux (2003) actually discusses different types of bidders (e.g., stalkers, nibblers, etc.) who use others' participation or interest in an auction as a cue, lending further support for the belief that sniping could be motivated by social dynamics which occur in the auction environment. Bidding late however has the advantage of ensuring that the competitor's access to your information when formulating their bid is limited. As Marcoux (2003) further notes, if the sniper is known to the bidding community or as an expert, they may not want to give away their interest in the auction at an earlier point in time, since this may trigger others to enter.

The importance of not revealing your personal interest in an item as a justification for sniping has been validated by observations of bidding for antiques, where information about experts' valuations can be quite important (Ockenfels and Roth 2002). However as noted earlier, such an explanation does not reconcile the presence of significant sniping behavior for less expensive items (e.g., Playstation) that are repeatedly offered over time (Hossain and Morgan, 2006) unless one makes the argument that a large segment of bidders see an auction as a social exercise in which a competitive advantage in general, should not be given to one's competitors. Heyman, Orhun, and Ariely's (2004) finding that snipers hold back information until the last minute of the auction, to avoid price wars that the competition triggers, is consistent with the belief that such information, if it became public, would give the competition an edge. In this regard, Dholakia and Simonson's (2005) belief that one can consider sniping to be a product of more cautious planning against specific competitive bidders also implies a social basis to the strategy.

If other auction participants influence bidding participation and auction prices, one could infer that competition has an impact

on one's bidding strategy. Indeed, Friedman (1956) made an early observation of the importance of cues in traditional auctions arguing that a bidder should study the past behavior of his/her competitors to discover patterns that govern their bidding behavior and should consider the presence of several other competing participants who may push the bidder into making too aggressive bids.

In internet auctions one does not always know if there are any potential bidders at all. It depends on the Web site and if it provides any sort of information about the participants, potential participants and their interest in the auction. One method of presenting social information in online auctions is through the use of a counter technique as provided in eBay auctions (eBay 2010). This counter presents the number of viewers who watched the specific listing and can be turned "on" or "off" at the discretion of the seller. But as we shall see, there are implications and consequences for the buyer as well as the seller in doing so.

These viewers could be classified as potential bidders to be considered in the decision to utilize the strategy of sniping. Indeed, interest of participants in an online auction is expressed (and sometimes displayed) by the auction site not only by the number of viewers but also through the actual number of bids in the auction.[2] The second measure is considered stronger since it examines actual bidding behavior and not simply observation.

As the number of other potential bidders' increases, the belief may hold that it would take a special strategy to win the auction, a strategy that one perceives as having a high value of success such as sniping. Hence, the potential for sniping should be higher, when the count of the number of viewers for a given auction increases. We hypothesize:

H1. Sniping occurs more frequently as the number of those who view the auction increases.

H2. Sniping occurs more frequently as the number of bids in the auction increases.

H3. More bidders will be engaged in sniping as the number of those who view the auction increases.

The extent of social presence and its impact on the bidder's behavior may be a function of the number of cues given on the nature of others. Social presence affects the way individuals perceive both the medium and the people with whom they interact. Social presence theory asserts that such a social presence is a variable in mediated communication (Short, Williams, and Christie 1976). It is defined as the sense of intimacy, presence and immediacy, leading to increased satisfaction, involvement, task performance and social interaction (Lombard and Ditton 1997). We propose that when more social cues are provided about those in the instant environment, the level of social presence increases. Indeed, Rafaeli and Noy (2005) found that in the context of simulated online auctions, virtual presence, which is one type of a social cue, affects bidder behavior on the following dimensions: purchasing decision, winning bid and number of bids. Combined with the finding of Chan, Kadiyali, and Park (2007) regarding the effect on WTP, we can assume that bidders in online auctions will be more aware of the competition in the auction and will be more determined to win it—when more personal information is provided about their competition. In such situations they will rely on a given strategy that they perceive has a higher probability to win the auction. These observations lead to the assumption that when cues that provide more detailed social information on others' participation in the auction are provided, the relative occurrence of sniping behavior will significantly increase. Accordingly:

H4. Sniping occurs more frequently when a seller provides information about the viewers who have examined the auction and provides the full identity of the bidders.

This paper includes three studies that examine the proposed hypotheses using both field studies conducted on eBay and a lab experiment. Table 1 presents the allocation of various social cues to the studies conducted inclusive of: a counter which presents the numbers of viewers who watched the item on sale (common to all studies); the number of bids submitted; and personal information which includes the user name of the bidder.

Table 1
Allocation of social cues to the different studies of this research.

Social cue	Study 1	Study 2	Study 3
Counter	✓	✓	✓
Bids	✓		
Personal information		✓	✓
Research method	Field study	Field study	Lab experiment

Study 1—Field Study

Method

This study examines actual eBay auctions by conducting a field experiment. The study uses the actual counter supplied by eBay as a measure of the interest in the auction. The counter, which is displayed beneath the item's image, displays the number of viewers of the auction. The counter is an optional component which the seller can add to his/her auction on eBay. As a test of H_1 in this context, the experiment examined data from 141 auctions placed by one of the authors on eBay from January of 2008 through May of 2008.[3] Each auction included a counter representing the number of unique views of the auction page. In addition, the experimenter kept track of the number of actual unique bidders participating in the auction as well as the number of individuals who had sniped within the last two minutes of the auction. The auctions were identical, lasting 72 h and involved selling a pair of Indian pennies which dated from between the year 1900 through 1907 (e.g., 1901 and 1904, 1902 and 1907). The coins were all graded by a professional numismatist as good (4) on a scale of coin condition and quality and the pair of dates offered

[2] The number of bidders is an alternative measure of interest but is no longer available on eBay since such auctions are private in that the bidders' identity is no longer disclosed.

[3] Note that during this time eBay changed their auction from public to private, however most of the auctions we conducted were public in nature.

for sale in a given auction were randomized. By design, one day elapsed between the close of each set of auctions offered for sale so that they didn't overlap. The prices realized in these auctions ranged from $2.01 to $16.50.

The dependent measure examined the percentage of auctions in which sniping behavior occurred (as noted, a bid placed within the last two minutes of the auction). The experiment created two conditions through measurement by the use of a median split between the auction offerings which contained a number of page views above the median (n=70), versus those which contained a count equal to or below the median (n=71). The median number of page views was 22 across the set of 141 auctions.

This experiment's auction lots were placed within the Collection/Lots subcategory of coins within eBay. All the auctions completed during our study were genuine in that the coins were placed on sale and were actually delivered to the buyer who paid the highest price. All one hundred and forty one auctions ended with a winner. When each of the auctions ended, the experimenter determined unobtrusively (by clicking on the "bid history" icon of the auction page itself) whether there was the presence of a sniper as defined previously.

Results

Based on the median split, 71 auctions were assigned into the "low number of others" condition (page view counter <23) and 70 auctions were assigned into the "high number of others" condition (page view counter >= 23). Results were supportive of H_1, since in the "low number of others" condition, sniping occurred in 8/71 auctions or 11.3% of the time; whereas in the "high number of others" condition it occurred in 29/70 auctions or 41.4% of the time. Use of a *t*-test revealed a highly significant difference between these percentages ($t_{(139)}=4.06$, $p<.0001$), suggesting that bidders utilized sniping as a strategy significantly more often when having a high number of other viewers of the auction. These findings were replicated in a binary logistic regression, when the counter was addressed as a continuous variable and the presence or absence of a snipe was the dependent measure ($Wald=6.48$, $p<.05$).

Given that a snipe occurs, we may further examine whether more snipers participate in the auction when the counter is relatively high as compared to when it is low. Results show that under the "high" counter condition (e.g., above the median), when a snipe occurs, on average ($M=1.55$, $s=.76$) snipers participate in the behavior. Comparatively, when the counter is "low" that participation rate significantly drops to ($M=1.11$, $s=.35$, $t_{(35)}=2.33$, $p<.05$). This result supports H_3 and suggests that a higher counter serves as a signal not only to encourage sniping behavior, but for more snipers to participate in the auction.

We further examined whether the number of bids placed in the auction (a variable always revealed to the eBay participant as opposed to the number of unique bidders, which is a derived variable), influenced the relative frequency of sniping behavior. The analysis this time used a median split on all 141 auctions in terms of the number of bids in each auction. It was observed that 79 auctions had 6 bids or less and 62 had more than 6 bids. Results show that under the lower bids condition, a snipe occurred in 13/79 auctions or 16.5% of the time. However, when the number of bids is relatively higher (e.g., 7 or more bids), a snipe occurs in 24/62 auctions or 38.7% of the time. Use of a *t*-test revealed a highly significant difference between these percentages ($t_{(139)}=2.98$, $p<.001$) which is supportive of H_2 and indicative of a social perspective (in the form of the actual participation of bidders) on the regulation of sniping behavior. These findings were replicated in a binary logistic regression, when the number of bids was addressed as a continuous variable and the presence or absence of a snipe was the dependent measure ($Wald=7.94$, $p<.05$).[4]

This result shows that social factors in the form of number of page views and number of bids influence the use of sniping as a bidding strategy for a relatively frequently appearing item. In addition, it suggests that bidders use sniping strategically, as they seemingly use the counter and actual bidding behavior as cues regarding when to snipe or not. This strategic perspective is consistent with prior studies on sniping which suggest that sniping may be considered to be a product of more cautious planning (since the bidders wait until the last phase of the auction to place their bid), in an attempt to hold back information to strategically avoid price wars triggered by the competition (Heyman, Orhun, and Ariely 2004; Dholakia and Simonson 2005) (Table 2).

Table 2
Study 1 variables.

Independent variables	
Number of auctions	141
Number of auction with high number of others	70
Number of auction with low number of others	71
Number of auction with high number of bids	62
Number of auction with low number of bids	79
Dependent variables	
Sniping percentage in *high number of others* condition	41.4%
Sniping percentage in *low number of others* condition	11.3%
Difference in *sniping percentage* between the *high* and *low* number of others	Binary logistic regression: $Wald=6.48$, $p<.05$ *t*-test: $t_{(139)}=4.06$, $p<.0001$
Number of snipers in *high number of others* condition	$M=1.55$, $s=.76$
Number of snipers in *low number of others* condition:	$M=1.11$, $s=.35$
Difference in the *number of snipers* between *high* and *low* number of others	Pair-wise *t*-test: $t_{(35)}=2.33$, $p<.05$
Sniping percentage in *high number of bids* condition	16.5%
Sniping percentage in *low number of bids* condition	38.7%
Difference in *sniping percentage* between the *high* and *low* number of bids	Binary logistic regression: $Wald=7.94$, $p<.05$; *t*-test: $t_{(139)}=2.98$, $p<.001$

[4] Interestingly, the amount of first bid, was also found to significantly influence the likelihood of sniping ($Wald=8.16$, $p<.05$).

Study 2—A Second Field Study

If the motivation for sniping behavior is in part due to the behavior of others in an auction framework, then any experiment conducted should reveal sniping behavior significantly less frequently when cues which provide information on other participants (who either bid in the auction or show interest in it) are removed. An additional field study in the form of an experimental design was used to test H_4. eBay provided the seller with two important options in this regard. That is, the seller has the choice whether or not to have a counter. If the decision is to eliminate the counter, this effectively serves to close a window on those who have viewed the auction page, and hence the buyer and the seller have no idea of the magnitude of others' interest in the auction.

The second option (which was available when we collected our data for this specific study), was used by eBay until it was made mandatory. A seller could opt to make an auction private as opposed to public. Such a choice causes eBay to blot out each bidder's identity (i.e., the chosen name assigned to each bidder in the eBay environment) with the result that one can only determine that a bid has been made, but not the identity of a given bidder or the determination that a given bidder has placed multiple bids. After several changes in eBay bidding and privacy policies, making all auctions private, all bidders are now assigned anonymous names.

Method

The procedure in this study was similar to the one described in the first study with one major difference: The experimental conditions were created via manipulation rather than through measurement. That is, 286 auctions were conducted on eBay during November 2007 through January of 2008, where the counter was either hidden or displayed and the auction was either public or private. This created a 2×2 experimental design as follows: 2 (hidden versus displayed counter) by 2 (private versus public auction). The dependent measured examined whether or not sniping occurred in the auction. The auctions were similar to that used in Study 1 and again involved selling a pair of Indian pennies over 72 h which dated from between the year 1900 through 1907 with identical quality. Again, one day elapsed between the close of each set of auctions offered for sale so that they didn't overlap.

Results

Analysis of the existence of sniping in the auction (a bid in the last two minutes of the auction) as a function of presence/absence of a counter and the nature of the auction (private/public) revealed a significant effect of the auction type only in the presence of the counter. Specifically, when the auction displayed the counter, sniping took place in 23.6% of the public auctions compared to 10% of the private auctions (*Chi-square* = 4.68, $p < .05$). However, when the counter was hidden, there was not a significant difference in the percentage of sniping between experimental conditions. The frequency of sniping was similar when the auction was private (15.3%) and when it was public (16.9%, *Chi-square* < 1). The data shows that the relative frequency of sniping is highest when the counter is present and the auction is public (i.e., both cues are present). This result is consistent with H_4 however, there is only a public versus private effect when the counter is present which makes sense if one considers that the information which the counter conveys to the bidder is only relevant if page views which translate into bids ultimately can be identified as coming from a specific source.

Interestingly, examination of the amount of the winning bid as a function of the presence/absence of a counter, the nature of the auction (private/public), whether or not sniping occurred and number of bids as a covariate, revealed a significant 2-way interaction between the presence or absence of sniping behavior and the nature of the auction ($F_{(1,127)} = 7.50$, $p < .01$). When the auction was private, the winning bid was marginally lower in the case when sniping took place than when it did not ($5.38 vs. $6.14, $t_{(99)} = 1.76$, $p < .08$). However, when the auction was public, snipers paid marginally higher prices than non-snipers ($6.93 vs. $5.20, $t_{(35)} = -1.86$, $p < .07$). The number of bids was significantly correlated with the amount of the winning bid ($F_{(1,127)} = 37.75$, $p < .001$). The latter findings fit common sense, in that having more bids increases the amount of the winning bid. However, the former finding for public auctions was counter-intuitive to what consumers expect from a sniping strategy, which is to win the auction but at a lower price than by bidding early. The results could be interpreted, however, as reflecting the fact that sniping was used as an effective tool to win against a specific opponent or opponents at any cost since their identities were revealed and in order to do so, some bidders may have abandoned their reserve price in an effort to win the auction at any cost.

Additional ANOVA analysis of the winning bids as a function of the presence/absence of a counter and the magnitude of the counter pointed out a significant main effect of the counter ($F_{(1,132)} = 4.02$, $p < .05$). Specifically, the winning bids were higher when there were more potential bidders interested in the auction than when there were fewer of them ($6.13 vs. $5.51) (Table 3).

This second experiment shows that it is the presence of a counter and public auction context which leads to the highest degree of sniping behavior. However, this finding does not address the magnitude of the counter and therefore the information it conveys. If we are correct in our contention that sniping is a social phenomenon, it should be the case that not only is the presence of a counter needed in the context of a public auction, but the counter must indicate a relatively high level of interest to motivate considerable sniping behavior. Therefore, in our next study, we replicated Study 2 in a laboratory context, by considering again a public versus private auction, but with the presence of a counter at a high versus low level. We anticipate that sniping behavior will be maximized when the auction is public and the counter reveals a relatively high magnitude of interest. To tackle the perspective that it is not simply the counter that matters, but what it shows, we designed the following lab experiment.

Table 3
Study 2 variables.

Independent variables	
Number of auctions	*286*
Counter visibility	*Visible/hidden*
Auction type	*Private/public*
Bidder type	*Sniper/non-sniper*
Dependent variables	
Sniping percentage when *counter was visible* in *public condition*	*23.6%*
Sniping percentage when *counter was visible* in *private condition*	*10%*
Difference in *sniping percentage* when *counter was visible* between the *public* and *private* conditions:	*Chi-square = 4.68, p < .05*
Sniping percentage when *counter was hidden* in *public condition*	*16.9%*
Sniping percentage when *counter was hidden* in *private condition*	*15.3%*
Difference in sniping percentage when *counter was hidden* between the *public* and *private* conditions	*Chi-square < 1, N.S*
Difference in *existence of sniping behavior* between *public* and *private* conditions	*F(1,127) = 7.50, p < .05*
Winning bid of *non-snipers* in *private* condition	*$6.14*
Winning bid of *snipers* in *private* condition	*$5.38*
Difference in *winning bid* between *snipers* and *non-snipers* in *private* condition	*t(99) = 1.76, p < .08*
Winning bid of *non-snipers* in *public* condition	*$5.20*
Winning bid of *snipers* in *public* condition	*$6.93*
Difference in *winning bid* between *snipers* and *non-snipers* in *public* condition	*t(35) = −1.86, p < .07*
Correlation between *number of bids* and *winning bid*	*F(1,127) = 37.75, p < .001*
Winning bid when counter was *visible*	*$6.13*
Winning bid when counter was *hidden*	*$5.51*
Difference in *winning bid* between counter was *visible* and counter was *hidden* conditions	*F(1,132) = 4.02, p < .05*

Study 3—Lab Experiment

To control for the presence of other bidders, the display of their identity and the interest they showed in the specific auction, the authors utilized a computer simulation which replicates an online auction environment. Participants were engaged in bidding in online auctions where the experimenter controlled the auctioned item up for sale. The appearance and bidding behavior of other bidders were simulated.

All simulations are based on a simplified but accurate representation of various aspects of the real world (Maidment and Bronstein 1973). Developing a simulation that models the behavior of human beings in a social context is harder than the development of a physical simulation. Therefore the auction simulation infrastructure simplifies the characterizing variables of the simulated auction bidders to a minimal set, which still meets the goals of the experiment. For the current study, the simulation was configured to replicate an English auction (ascending price which is similar to eBay).

Method

One hundred and three participants in the age group of 25–44 participated in the study in October 2010. All of them had previous experience in online auctions. To set the experimental guise, the experimenter invited the participants via electronic invitation to take part in an international study on college students' bidding behavior. The experimenter informed subjects that within the study they will participate in an auction session. Participants read online instructions regarding the rules of the auction, what it would look like and the average market price of the old coin which was offered for sale.

After entering the auction, participants could view an online screen which presented the items on sale, monitor the remaining time in the auction, inspect an imaginary number of viewers who previously viewed the auction (this number was controlled by the experimenter), watch the bids posted by others (the simulated bidders) or by themselves, and react to the particular circumstances by posting a bid or multiple bids (if time remained) before the auction ended. Afterwards they answered a few questions online and responded to questions measuring their involvement in the process. For their participation, subjects received a sum of money. In the case where they won the auction at a price lower or equal to the average market price, they were awarded an additional fixed sum of money, so essentially there was "skin in the game."

A 2 × 2 experimental design was created by manipulating two independent variables. The counter which showed an imaginary number of viewers was arbitrarily set to either a low number (3) or a high number (266). The counter could be used to indicate the general interest of bidders in the auction, since it registered each page view by a potential bidder. The second independent variable was the disclosure of the bidder's name. The name of the bidder was either displayed as in a public auction or distorted in the format a***b similar to what eBay does presently, where 'a' and 'b' were letters included in the bidder's name without an ability to recognize it (private). While real online auctions last days, we could not replicate such a long duration auction in a lab setting since an early pre-test lab result showed that participants become bored after more than a few minutes of involvement. Participants in the lab experiment joined the simulation only in the last minutes of the auction. Sniping behavior was considered only if the bidder posted a bid in the last 60 s of the auction. The simulation infrastructure counter-balanced between subjects and randomly assigned each of them to one of the four conditions. Beside the appearance of the two variables, all other parameters were identical in all the conditions: participants joined the auction at the same time in the auction, the same list of bids was presented to them when they joined the auction, and the simulated bidders posted identical bids at exactly the same moment in the auction. Essentially this experiment replicated the experimental conditions in our field study.

Results

Analysis of the existence of sniping in the auction (a bid in the last minute of the auction) as a function of the type of display and the counter conditions (low versus high) revealed the following: When the counter was high, sniping took place in 72.7% of the auctions when the full name of the other bidders was displayed in a public auction, compared to 35% of the auctions when the name of

the other bidders was hidden in a private auction format (*Chi-square*=6.02, $p<.05$). This significant effect indicative of a significantly higher degree of sniping when the counter was high between the public versus private condition is similar to our findings reported in the field Study 2 when a significantly higher percentage of sniping was present when the counter was visible. We rechecked the data by additional analysis of the appearance of sniping during the last 10 s of the auction and found similar tendencies (*Chi-square*=6.64, $p<.05$), showing the generalization of our findings to other measures of sniping behavior. Under the low counter condition, there was no significant difference in the likelihood of sniping when the auction was public (55%) relative to when it was private (50%, *Chi-square* <1), again a result consistent with our field study on eBay when the counter was not present. Hence when combined with the findings of Study 2, the data suggests that it is not the presence of the counter which matters the most as a motivator of sniping behavior per se, but rather the information that the counter conveys. As sniping is most frequent when the auction is public and the counter is high, the findings point to a definitive social basis for the behavior (Table 4).

Discussion

The findings of this research shed new light on the determinants affecting sniping in internet auctions providing evidence that the behavior is regulated not just by internal beliefs and auction rules but by social factors. While previous auction literature focused on the environmental conditions affecting sniping (e.g., the ending rules of the auction) and intrapersonal factors (e.g., experience in auctions), the findings presented in this manuscript demonstrate that there is also a social component to this behavior. The impact of social factors is most probably derived from beliefs that auction participants have about the nature of sniping (i.e., that it is an impactful technique which allows the bidder to have a greater propensity to win the auction at a lower price).

Table 4
Study 3 variables.

Independent variables	
Number of auctions	*103*
Counter	*High (266)/low (3)*
Auction type	*Public/private*
Dependent variables	
Sniping percentage when *counter was high in public* auction	*72.7%*
Sniping percentage when *counter was high in private* auction	*35%*
Difference in *sniping percentage* between *public* and *private* auctions when *counter was high*	*Chi-square*=6.02, $p<.05$
Sniping percentage when *counter was low in public* auction	*55%*
Sniping percentage when *counter was low in private* auction	*50%*
Difference in *sniping percentage* between *public* and *private* auctions when *counter was low*	*Chi-square* <1

Three studies were used to examine the effect of social cues on sniping. Results support H_1–H_4 which essentially maintain that sniping is driven at least in part by a reaction to social information available in the given auction. Study 1 showed that as the "number of others" viewing the auction increased so did the propensity to snipe. These results were supportive of H_1. An additional finding in this study was that as the actual number of bids in a given auction increased, so did the prevalence of sniping as a bidding strategy which was supportive of H_2. Finally we found a significant difference between the number of snipers when the counter was high relative to low, which was supportive of H_3. Study 2 results showed that the relative frequency of sniping is highest when the auction is public and the counter is present, both conditions indicative of the conveyance of social information about potential and actual bidders, and supportive of H_4. Study 3 which was similar to Study 2 in a simulated auction environment revealed that sniping is likely to occur more frequently when the full identity of the participants was shown, hence supporting H_4. In Study 3 we used high and low counters as one of the independent variables (as in Study 1) and compared sniping percentage in private/public conditions. While we found that sniping was significantly more prevalent when the counter was high in the public versus private condition, we did not find the same effect when the counter was low. This result suggested that while the presence of a counter is important as a regulator of the relative occurrence of sniping, it is the information which the counter contains that is even more important, that is that the counter should be relatively high.

Our results also imply that sniping is used strategically by auction participants as they seemingly rely on the auction counter and the number of actual bids to serve as a measure of outside interest in the auction which serves to trigger action or inaction as the clock ticks toward a hard close. This fits in nicely with the research of Roth and Ockenfels (2002) who report that bidders bid late to avoid bidding wars and to side-step disclosing valuable information with other bidders. The finding in Study 1 that sniping was approximately four times as frequent when the auction counter was high as opposed to when it was low is particularly noteworthy in this regard and has implications for all bidders, not just snipers. For example, it seems that bidders who plan to snipe, should pay attention to the relative magnitude of the counter when placing bids on items they feel a necessity to win. Given the correlation between the magnitude of the counter and the presence of a snipe bid in the auction, those who plan to snipe should avoid auctions where the counter is relatively high to sidestep the situation of dueling snipers. Recall that in Study 1, not only did sniping occur more often in auctions where the counter was high, but significantly more snipers participated in such auctions. For those who plan to bid early in the auction with no intention to snipe, attention to the relative magnitude of the counter as the auction progresses should be a tip-off to the potential presence of snipers. If the counter seems high and the possibility of a snipe seems likely, then early bidders who are the highest current bidders might attempt a "road-blocking" strategy to discourage sniping. That is, they may choose to increase their bid, which on an auction site such as eBay does not increase the price, but rather is documented as the lead bidder having made

the two highest bids. This presents a formidable barrier for the sniper to overcome since now the sniped bid must be high enough to jump over two higher incremental bids made by the current leader.

This research has some limitations. First, it is possible that the counter used in our eBay field studies measured the presence of a single sniper who updated the page several times toward the end of the auction as opposed to documenting the presence of different individuals. If this is the case, our assumption that the counter marks the presence of several bidders who watched the item may be off the mark. However, in Study 3, (the lab experiment), this issue is not present, and yet many findings found in the lab matched those found in the field. Indeed, our choice of experiments conducted both in a lab and in the field allowed us to converge toward a valid and reliable explanation of the phenomenon under study and at least account (if not minimize) such alternative explanations.

An additional limitation is the sequence of the tasks undertaken in Study 3. Performing a survey immediately after each respondent completed the lab experiment may bias the survey results which were reported in the initial section of this manuscript and were used to report bidders' beliefs.

For future research, while auction participants seem to believe that sniping is an effective strategy which results in a higher probability of winning the auction at potentially a lower price, it would be interesting to examine whether or not in the field, auctions in which bidders placed early bids, versus those in which bidders sniped, lead to differing probabilities of winning and at a lower cost. Such a study would be particularly beneficial if the experimenter were able to bid early or snipe at consistent times for matched auctions which were offered by the same seller.

The present research does not aim to focus on the effect of sniping on the final outcome of the auction but rather on bidding behavior. It is worth mentioning that other studies that deal with this question present contradicting results about the true benefit of sniping to the bidders. While some claim that sniping is a preferred bidding strategy which increases winning percentages and lowers winning price; others report the contrary (Gray and Reiley 2007; Bramsen 2008; Ely and Hossain 2009). The findings of this research show that when the auction is public and social information is present, sniping is not a preferred bidding strategy. Under such conditions, snipers paid marginally significantly higher prices than non-snipers. However when the auction is private and social information is hidden, sniping resulted in marginally lower winning prices than when sniping was absent. This interesting finding may be the result of arousal of competition, a phenomenon linked to the circumstances which occur when the auction is public. That is, when the auction is public, bidding identities are revealed and sniping may be used as an emotionally laden bidding tactic to win at literally any cost against a specific opponent who has wronged the bidder in the past or for those with a strong competitive clock.

Alternatively, a more cognitive explanation for the effect is that when all/most of the bidders are aware that the auction is public, they may postpone their bids to avoid signaling their interest in the auction. This behavior can cause multiple bids in the last moments of the auction and increased competition at that point which may result in relatively higher winning prices.

The results of the present research can assist decisions of auction platform managers who have the ability to include social cues in their platform. While these cues can increase the sense of intimacy and immediacy, satisfaction, involvement, task performance and social interaction, they also increase competition among bidders. While some scholars claim that competition causes the final price of the product in an ascending price auction to increase, the present research finds that sniping also increases in this condition. Hence platform managers should counter balance between the manipulation of effective cues to decrease the impersonality of the auction site which although it may attract more bidders who value such transparency may inadvertently cause abandonment of the site by others as competition becomes too hot.

If social dimensions heavily influence sniping, it is important to extend the research to other internet fields where online interaction has an effect on internet consumers, and where the virtual group can affect the behavior of the individual. Examples are online games and online gambling settings as well as virtual worlds. The assumption is that in a competitive setting, because of the analogous influencing conditions, social cues can affect the individual's behavior and will cause him/her to avoid sharing information or behave differently compared to other circumstances with the absence of social cues.

Other fruitful areas for further research involve examining sniping in the presence of a reference price as the "Buy-It-Now" price which is used in eBay. Buy-It-Now gives risk-averse bidders an option to purchase the item in the auction without the risk of having to pay more for it in an open auction environment side-stepping sniping activity. Such an offering provides a profitable method for bidders with time preferences who want instant gratification. Would sniping occur as frequently if there are other auctions available with buy-it-now options which serve as a reference point? Likewise, does a "reserve" which provides the point at which the seller would let go of the item, discourage sniping due to the presence of a cue which serves as a reference point as well as a hidden barrier which the snipe bid must exceed?

Finally, while the use of an experimental design for auction research is common in economic, marketing and behavioral research, the application of such a design to the field in the present research is rather rare and has led to important insights regarding actual bidding behavior when studied in conjunction with simulated bidding behavior.

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