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Jumping and sniping at the silents: Does it matter for charities?

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ABSTRACT

Despite its popularity as a fundraiser for charities, very little research has been done on the bidding and revenue properties of the silent auction. This paper examines the consequences of two behaviors common in silent auctions, jump-bidding and sniping, in laboratory experiments with endogenous participation. Our results suggest that deliberative jumping, the result of impatient bidders attempting to telescope time, tends to increase revenue, while deliberative sniping by experienced bidders tends to decrease it. We also show that when charities can encourage jumping and discourage sniping, silent auctions can perform as well as their sometimes more entertaining but more expensive alternative, the English auction.

1. Introduction

It comes as no surprise that three quarters of the corporate community involvement staff surveyed by the LGB Research Institute (2009) have reported an increase in requests from charitable organizations during the current recession. The surprise, perhaps, is that annual inflation-adjusted charitable contributions in the United States fell just 3.2% in 2009 and still exceeded $300 billion (Giving USA, 2010). In fact, corporate donations, which constituted $14.1 billion of this total, rose 5.5%, but much of this increase came from donations in kind, which swelled almost 30%. Because charities and non-profits have no direct use for some of these gifts, the problem of how best to transform them into cash has become more important than ever.

Auctions represent one of the best known solutions to this “transformation problem.” For example, a recent survey by Giving USA (2008) found that almost 85% of non-profits hold at least one special event to raise funds, and that almost 30% of these events involved dinner and an auction. Not all charities choose the same format, but the silent auction is one of the most common: Chris Cowdrey, whose North London firm FunRaising Events organizes charity auctions, reports that silent auctions are responsible for 70% of his revenue in the current economic climate (Parkhouse, 2009).

Casual empiricism is consistent with this observation: most of us know schools or churches or other non-profits that use silent auctions to raise some of their revenue. At the typical silent auction, guests walk around exhibit tables, where multiple items and their corresponding bid sheets are displayed openly. The bid sheets describe the item to be auctioned, and list both the current highest bid and all previous bids, with bidders identified by either name or number. There is a publicly announced closing time, one that is usually, but not always, common to all items. As guests travel around the room, they can identify items of interest, and make note of the number of bids, the number of unique bidders, and the current highest bid for each item.

The appeal of the silent auction stems from the low expense and ease with which it can be implemented—no professional auctioneers are required, for example—its scalability, low pressure atmosphere, familiar rules, and its complementarity with other event entertainment. This comes at a cost, however: one advocate of online charity auctions, for example, describes the same complementarity as a “social distraction (that) suppresses bidding,” and further believes that bidders' reluctance to “fight the crowd” as time expires reduces revenue (Carson, 2010). Some have also wondered whether the “competitive arousal” that is characteristic of some live auctions is attenuated in silent auctions.

Motivated by the perceived trade-off between ease and effectiveness, our focus is two behaviors common to silent auctions, “jumping” and “sniping,” and their revenue implications for charities. Jumping, which occurs when participants increase their bids substantially more than the minimum increment, has several possible explanations, with quite different consequences. For example, bidders may jump in an attempt to signal high private valuations and/or intimidate others, in which case jumping will tend to decrease revenues.

On the other hand, jumping can increase revenues when impatient bidders try to “telescope time” (Isaac and Schnier, 2005) and, as a

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result, bid more than necessary to win the auction. Bidders are sometimes competitive for other, less deliberative, reasons, and to the extent that inately competitive bidders jump more often, their presence can further enhance revenues: as one observer puts it, fundraisers should attempt to "create an atmosphere in which bidders compete to overpay" (Panepento, 2008).

In contrast, the effects of sniping, a feature of all fixed deadline mechanisms, would seem easier to predict. Sniping occurs in a silent auction when bidders wait until the final seconds to write down their first bid. To the extent that costly (to the bidders, at least) bidding wars are avoided, revenues may be suppressed.

An advantage of our study is that we adopt an experimental approach that allows us to circumvent three problems common to the empirical literature on auctions. First, building on Smith (1976) and more recently on Schram and Onderstal (2009), we are able to induce not just heterogeneous private values, but also a common revenue proportional benefit that accrues to all bidders and, in the case of winners, an additional "warm glow" that we believe to be important features of charity auctions, all of which are difficult to measure in naturally occurring settings.

Second, in the spirit of earlier field work (Carpenter et al., 2008) of ours and the theoretical work of Menezes and Monteiro (2000) and Carpenter et al., 2010b, which showed that the number of active bidders was an important determinant of auction revenue, our design endogenizes the participation decision. Furthermore, we adopt a conservative approach to estimation: despite the fact that we induce or collect information on many plausible observables, we build an explicit identifier into the experiment.

Third, because it is hard to imagine an empirical study of auction revenue in which bidding behaviors like jumping and sniping are not endogenous, we construct auction treatments to turn the deliberative forms of these behaviors either "off" or "on," a feature that creates an exogenous source of behavioral variation and allows us to identify the effects of these particular behaviors on revenue. Our baseline mimics the traditional silent auction in which bidders observe all previous bids and are free to submit bids until some fixed deadline. The first treatment removes this deadline by extending the auction for 30 s every time a bid is submitted, and so eliminates the obvious rationale for sniping. In the second treatment, each bidder has her own "clock," an innovation that captures the dilemma a bidder confronts when she must leave the auction before others or when she wants to bid on several items with a common deadline. In short, the bidders in this treatment will want to telescope auction time, that is, to jump. Lastly, because the oral auction is the natural alternative for most charities, we also implemented an English button auction. The English auction will allow us to examine the potential opportunity costs of using the silent format.

Two final features of our experiment deserve mention. Participants were required to earn the endowments used to bid at the start of the experiment, which attenuated any house money effect. A wealth of demographic and behavioral data on participants was also collected, allowing us, perhaps for the first time, to ask whether traits like impatience and competitiveness affect bidding strategies above and beyond treatment effects.

We find, first of all, that consistent with our treatment design and conditional on participation, deliberative jumping is indeed "turned on" when bidders must confront their own time constraints, and that deliberative sniping is "turned off" in the absence of fixed deadlines. We also discern evidence of less deliberative or behavioral influences on both. Controlling for assignment into treatment, for example, bidders who are more impatient are both more likely to jump and less likely to snipe, while bidders who are more competitive are more likely to jump and bidders with more experience tend to snipe. Competitive bidders are also more likely to participate, but bidders with their own time constraints or no constraints are less likely to do so.

It is the revenue consequences of these behaviors that interest us most, and while the net effect varies over the distribution of outcomes, we are able to show, based on quantile methods, that jumping tends to increase revenue relative to the benchmark silent auction, with a more pronounced effect in high revenue auctions, but that sniping tends to reduce revenue, especially in otherwise low revenue auctions.

The question then becomes, how well does the standard silent auction do relative to the common alternative format available to most charities, the English, and how much of this difference can be attributed to differences in sniping and jumping behavior? Subject to caveats about variable treatment effects, we find that the standard silent auction generates significantly less revenue than an English button auction, but that the premium more or less vanishes when bidders do not have fixed time limits, and therefore snipe much less, or when each bidder has her own clock, and is incentivized to jump more. One of the practical lessons of this work, then, is that while the basic silent auction can be an expensive mechanism (in terms of lost revenue, at least) for charities to use, it isn't difficult to envision variations of this format that perform as well as the English alternative.

Section 2 reviews the literature on silent auctions and bidding strategies in ascending auctions; Section 3 describes the experimental design and presents some descriptive statistics; Section 4 examines individual bidding behavior while Section 5 considers the revenue implications. Section 6 discusses the practical implications of our experiment for fund-raising.

2. Jumping, sniping and their implications for revenue: what do we know?

Surprisingly, we know very little about the behavioral foundations and revenue implications of jumping and bidding in charity auctions; most of the research has been conducted in the non-charity context (Klemperer, 2004). For example, theoretical models predict jump-bidding when there is some cost to submitting and later revising a bid (e.g., Daniel and Hirschleifer, 1998; Easley and Tenorio, 2004; Rothkopf and Harstad, 1994), when bidders wish to signal strength and intimidate opponents via aggressive bidding behavior (Avery, 1998; Daniel and Hirschleifer, 1998), when bidders are impatient and wish to speed up the pace of the auction (Isaac et al., 2007) or when bidders wish to conceal information about the distribution of values from the auctioneer, particularly if the seller is suspected of phantom bidding (Kirkegaard, 2006). Plott and Salmon (2004) find empirical evidence that impatience may be the driving force behind jump-bidding in the third generation mobile phone services auction in the UK while Easley and Tenorio (2004) rely on data from Internet Yankee-type auctions to show that jump-bids are most likely to occur in more competitive auctions and to appear early in an auction, where the signaling value is the highest. Raviv (2008) in his investigation of jump-bids in sequential oral English auctions for autos in New Jersey, also finds evidence that the first offer is often the largest jump.

Isaac and Schnier (2005) is the only study of which we are aware that specifically analyzes jump-bidding in the silent charity auction environment; they focus on three naturally occurring auctions and six laboratory simulations. Unlike ascending auctions orchestrated by strategic auctioneers, silent auction participants have the opportunity to submit bids above the minimum increment (i.e., jump-bid) and Isaac and Schnier propose that it may be optimal to do so in the silent charity auction. In two of their three field auctions, over one-third of all bids were jump-bids while in the lab, 40–60% of all bids were above the minimum increment. The authors propose several justifications for jump-bidding as a rational bidding strategy: participants may jump-bid to increase the seller's revenue as a response to the public goods nature of the charity auction ("charitable" justification), to be seen in the presence of others as the bidder responsible for the charity's revenue ("see and be seen"), to speed up the pace of the auction or to obtain a geographic advantage in the room ("impatience") and/or to submit a final bid before the clock ends in order to make bids on other items that may be closing ("final seconds crowding"). Their lab and field results support all four justifications, but they conclude that jump-bids generally seem to be a "means by which impatient bidders can accelerate the pace of an auction and/or deal with end period effects". This conclusion helps motivate one of our treatments.

So what are the anticipated effects of jumping on revenue? To the extent that jumping is a strategy by which bidders signal high valuation and/or distract and intimidate others, jumping may dampen competition and thereby impair revenue (Banks et al., 2003; Easley and Tenorio, 2004; McCabe et al., 1991). Similarly if jumping is an attempt by bidders to manipulate information gathered by the seller as in Kirkegaard (2006), revenues may also decline. However, if impatient bidders overzealously bid more than necessary to win or to "telescope time" in a multi-unit auction, revenues may rise (Isaac et al., 2005, 2007). In fact, as Isaac et al. (2005, 2007) point out, prohibiting jump-bidding may even reduce revenue if frustrated bidders drop out early due to the slow pace of the bidding. To the extent that more competitive or risk tolerant bidders jump more often, their presence may enhance revenues as well. On net, empirical analysis suggests that jump-bidding appears to have a neutral or a slightly positive effect on revenues (e.g., Isaac et al., 2005, 2007; Plott and Salmon, 2004).

Sniping has also been studied extensively in the context of for-profit auctions. A common comparison in the literature is bid timing on eBay (where auctions have a "hard" end time or fixed deadline) with bid timing on Amazon (where auctions have a "soft-ending" since they are automatically extended until 10 min have passed without a bid). For example, Roth and Ockenfels (2003) and Ockenfels and Roth (2006) find that bids are more likely to occur late in the eBay auctions, but earlier in the Amazon auctions. Ariely et al. (2006) find similar results in the lab. Based on these findings, we included treatments with and without "hard" deadlines in order to titrate the amount of sniping in the lab.

Roth and Ockenfels (2003) and Ely and Hossain (2006) argue that sniping may be a rational strategy in auctions with a hard closing time if a sniper hopes to avoid a bidding war or outbid competitors whose bids are not successfully transmitted in the final seconds. They also suggest that sniping can be a rational strategy for bidders who want to gather information about others' values but who prefer not to reveal information about their own value for the item; this may be a particular useful strategy for experts bidding against naïve participants. In a similar vein, Cotton (2009) posits that sniping is a strategy employed by sophisticated bidders who want to avoid the "endowment effect" (the tendency to increase your valuation once the prize is yours or will be yours). By sniping, such bidders commit to submitting only one bid in the auction and are less susceptible to increasing their bids above their initial private value.

Elfenbein and McManus (2007) is one of very few studies to analyze sniping in charity auctions. In their comparison of eBay charity and non-charity auctions, they find significantly less last-minute bidding in auctions in which 100% of the proceeds are given to charity. Ku et al. (2005) find that there is a low frequency of sniping in online charity auctions and no evidence that fixed deadline auctions cause more sniping than soft-ending ones. These results suggest that some of the justifications for sniping may not apply in the case of charity auctions (e.g., Roth and Ockenfels (2003) suggest that sniping may be viewed as "tacit collusion" among bidders to explicitly lower seller revenue but this is unlikely in the charity context).

Unlike jumping, the impact of sniping on revenues is easier to predict. To the extent that sniping stifles competition, revenues will be depressed. If Roth and Ockenfels (2003), are right and sniping is a form of tacit collusion among bidders, then sniping may further impair seller revenues. Consistent with either prediction, Houser and Wooders (2005), Ariely et al. (2006), Duffy and Unver (2008), and Glover and Raviv (2007) find that revenue is significantly higher in soft-close auctions where sniping is attenuated. On the other hand, Gray and Reiley (2004) find no statistically significant differences in final price when a sniping strategy is pursued.

Since most of the studies rely on evidence from online auctions, very little is understood about the socioeconomic determinants of jumping and sniping; that is, are experienced people more prone to sniping? Do impatient bidders jump more? What are the behavioral foundations and revenue implications of these bidding strategies? Our experimental design allows us to answer these and other questions in the context of the silent charity auction.

3. Experimental design

This paper draws on data from a large scale laboratory experiment of charity auctions described in Carpenter et al. (2010a). Subjects were recruited via email, posters and newspaper ads and included students, faculty, staff and community members. Table 1 provides the descriptive statistics for the subjects. Slightly more than half (53%) of the subjects are male and 74% report white as their ethnicity. Less than 10% of the subject pool reported having participated in ten or more auctions (profit or non-profit). Not surprisingly, on average the sample pool appears to be risk neutral; the mean report was a 5 on a scale of 1–10 with 1 (10) being unwilling (willing) to take risks. The typical subject sees himself or herself as slightly competitive, reporting a mean of 6.13 on a scale of 1–10 (with 10 being most competitive). On average, subjects answered two out of three questions correctly on a quiz designed to test numeracy in the specific context of the auction. Thirty percent of the subjects are classified as "impatient" in the sense that in more than eight of the ten periods, they spent 5 s or less on the computer screen that provided a summary of the auction results or the screen that asked them to report the ease with which they could solve a puzzle of given difficulty. Lastly, despite predictions from rational choice theory about the irrelevance of sunk costs, roughly one-quarter of the subjects in this experiment considered sunk costs in their hypothetical decision-making. For the sake of brevity we continue by sketching the important aspects of the experiment and direct the reader to Carpenter et al. (2010a) which provides a detailed description of the procedures and the post-experimental survey.

In an ideal world, we would determine an exogenous source of variation in jumping and sniping to empirically identify the effect of these bidding behaviors on charity auction revenue. However, a truly exogenous source of variation may be hard to find. While this would be a limiting factor in many naturally occurring instances, the experimental lab allows us to innovate by constructing treatments that affect bidding as needed and, when combined with random assignment to treatment, these treatments can generate the requisite variation.

The details of our method for identifying the effects of deliberative bidding behaviors common to the silent auction is as follows. To

Table 1
Subject summary characteristics ($N = 199$).

Characteristic	Overall mean	Std. Dev.	Mean of active	Mean of inactive
Endowment	139.35	16.72	138.72	140.04
Private value	49.36	27.91	57.22	40.60
Expected participation	5.40	2.26	6.19	4.52
Experienced	0.08	0.26	0.08	0.08
Competitiveness	6.13	2.97	6.19	6.06
Risk tolerance	4.99	2.59	5.10	4.88
Numeracy	2.11	0.79	2.09	2.13
Impatient	0.30	0.46	0.30	0.29
Sunk cost sensitive	0.23	0.42	0.22	0.24
Male	0.53	0.50	0.54	0.51
White	0.74	0.44	0.74	0.73

begin, our Standard Silent acts as a baseline that mimics the traditional silent auction in which bidders openly observe all existing bids and may submit bids at any time until the close of the auction, a point that occurred sharply after 2 min had passed. In the first treatment (No Limit) we change the standard format to reduce deliberative sniping—every time a new bid was submitted the end time was extended by 30 s. In this treatment the auction lasted at least 2 min but ended only after 30 s had passed without a new, higher, bid. To encourage deliberative jumping we created a second treatment (Time Constraints) that captures the fact that some participants are unable to stay until the bitter end of an auction by randomly assigning different end times to auction participants. In this treatment bidders with short time allocations have an incentive to submit a jump just before they are forced to exit the auction. The minimum amount of time allocated was 20 s and the maximum was the full term, 2 min. Although individual allocations were private, it was common knowledge in this treatment that end times were randomly assigned. In a final condition we implemented an English button auction to replicate the incentive structure of the common alternative format, the "live" auction. The benefit of implementing a button auction (in which bidders watch a price clock ascend and click a button to drop out at their maximum willingness to pay) is that it can be run using the same computer technology as all the other experiments. In this sense, we control for the presentation of the auction but we do not account for the fact that the English auction might do even better (or worse) with a talented (or untalented) auctioneer.

Our identification strategy is predicated on the idea that each auction format/treatment turns only the targeted behavior "on" or "off" without affecting other revenue-relevant behaviors. While, at first blush, this assumption may seem as restrictive as those needed in other strategies (e.g., that the exclusion restrictions are met in an instrumental variable approach or that the modeled feedback is correct in a structural approach), another benefit of our approach is that we can directly test (in the next section) whether our interventions spill-over to the other behaviors. That said, we need not rule out the possibility that, for example, an innately more competitive bidder will jump more across formats, but focus on the revenue produced by the presence of deliberative jumping in some environments and not others.

We conducted five sessions per condition with ten subjects attending each 1.5 h session. There were ten periods in each session, providing fifty revenue observations per treatment and over five hundred bid observations per treatment, a result of the fact that subjects in the silent auctions could submit more than one bid per period.

In all formats, subjects were provided a comprehensive set of instructions and ample time to read and ask questions.[1] Prior to the start of the first period, subjects were asked to complete a short quiz designed to test basic numeracy and comprehension skills. At the conclusion of the quiz, participants were shown the answers to ensure proper understanding of the rules of the experiment. The experiment then proceeded in two phases. In phase one, subjects were asked to complete a series of word scrambles, similar in spirit to Gneezy et al. (2003) and Hoff and Pandey (2006). This endowment phase allowed us to partially attenuate the effects of unearned income (i.e., playing with house money). Subjects were paid a piece rate of one dollar (or 10 Experimental Monetary Units, EMUs) per correct response and the scramble difficulty, piece rate and time limits were calibrated to generate a mean endowment (which was replenished at the beginning of each round) of about 150 EMUs with low variance. In other words, we wanted participants to feel as if they had earned their endowments but we did not want to introduce the latitude for endowments to matter much. Table 1 indicates a mean endowment of 139 EMUs with a standard deviation of 17.

[1] Sample instructions appear at the end of Carpenter et al. (2010a).

Table 2
Participation and bidding overview.

Format	Participate	Jump	Snipe
Standard silent	0.559	0.143	0.045
Time constraints	0.502	0.184	0.050
No limit	0.526	0.156	0.004

Note: Frequencies by format.

Once the endowment phase concluded, the silent auctions with endogenous participation commenced. Each period, subjects were randomly assigned a private value in the interval [0,100] and then asked if they wished to participate in an auction for a fictitious good. Subjects who chose not to participate could solve another word scramble for a piece rate of 15 EMUs per correct answer. It is important to note that subjects were also told the level of scramble difficulty (on a scale of 1–5) at the time of the participation decision; this difficulty measure allows us to identify selection separately from bidding in the empirical analysis since puzzle difficulty likely affects the decision to participate but should not influence one's bid amount. The random sequence of puzzle difficulties was set at the beginning of the experiment, was common to all sessions, and the participants knew that the difficulty was the same for everyone in a given round.

For those who chose to enter, the environment was such that the auction winner earned a surplus of the difference between this participant's value and his or her bid.[2] In addition, to induce the incentives common to the theoretical models of charity auctions (e.g., Goeree et al., 2005 or Engers and McManus, 2006), all participants, regardless of whether they chose to bid in the auction or do the word scramble earned revenue proportional benefits. Specifically, a benefit equal to 10% of the final revenue was added to the payoff of every subject. On top of this, all bidders who ended up forfeiting their bids (in this case only the winner) earned an additional 5% on their bid amount as warm glow.[3] Hence, because participants can bid up to 115% of their value and still earn surplus, we should see overbidding in equilibrium, a result common to charity events.

The last two columns of Table 1 summarize auction-level data on revenue and bidder characteristics for both active and inactive participants. As one might expect, those people with higher values were more likely to enter the auction ($t=13.89$, $p<0.01$), perhaps as a result of "false concensus" bias based on the fact that everyone knows that they face the same outside option, we find that active bidders expected more competition in the auction than inactive puzzle solvers ($t=17.69$, $p<0.01$), and more risk tolerant participants tended to participate ($t=1.91$, $p=0.06$).

4. The behavior of individual bidders

At the individual level, we are first interested in whether our treatments induced the expected variation in jumping and sniping, controlling for possible participation effects. Given our comprehensive survey data, we also have the first opportunity to consider various behavioral determinants of these strategies, and the implications for current models.

An overview of our results is presented in Table 2. Jump-bidding is defined here as bidding at least 10 EMUs more than the previous bidder in a period, where the minimum bid increment is 0.10. The definition of sniping is to some extent mechanism-specific. In the

[2] However, participants were told that only one, randomly determined, round would be chosen on which to base the final payments. These payments averaged $24.85.

[3] The method we use to induce charitable preferences is consistent with the related theoretical literature on charity auctions (e.g., Goeree et al., 2005 or Engers and McManus, 2006); however there are other ways to induce these preferences. As one referee suggested, it might be the case that bidders simply attach an intended donation to their values.

Table 3
Probit models of individual behavior with selection.

	Participate	Jump	Jump (res)	Snipe
I(Time constraints)	−0.056**	0.083*	0.228***	0.006
	(0.027)	(0.048)	(0.076)	(0.008)
I(No limit)	−0.048**	−0.022	−0.023	−0.027***
	(0.019)	(0.038)	(0.040)	(0.011)
Endowment	−0.001	−0.001	−0.001	0.000
	(0.002)	(0.001)	(0.002)	(0.000)
Private value	0.007***	0.004***	0.003***	0.000***
	(0.001)	(0.001)	(0.001)	(0.000)
Expected participation	0.056***	0.009	0.010	0.001
	(0.008)	(0.007)	(0.006)	(0.001)
I(Experienced)	0.022	−0.046	−0.020	0.023*
	(0.083)	(0.047)	(0.054)	(0.013)
Competitiveness	0.012*	0.016**	0.017***	0.001
	(0.006)	(0.006)	(0.005)	(0.001)
Risk tolerance	0.002	0.005	−0.000	0.000
	(0.005)	(0.009)	(0.010)	(0.001)
Numeracy	−0.048*	0.004	0.007	−0.003
	(0.028)	(0.023)	(0.026)	(0.004)
I(Impatient)	0.014	0.090*	0.105*	−0.013**
	(0.040)	(0.050)	(0.056)	(0.006)
I(Sunk cost sensitive)	−0.092*	−0.009	−0.004	0.007
	(0.057)	(0.051)	(0.056)	(0.007)
Puzzle difficulty	0.154***	.	.	.
	(0.014)	.	.	.
Observations	1490	1490	1137	1490
rho	.	0.216	0.159	0.744
p-value on Wald χ^2	.	0.12	0.47	0.16

Marginal effects reported; (standard errors) clustered on session; white and male coefficients not listed; *$p<0.10$, **$p<0.05$, ***$p<0.01$.

Standard format, a bidder is said to snipe if her only bid occurs in the final 5 s of the auction. In the Time Constraints, sniping occurs if one's only bid is submitted in the final 5 s of that subject's allowed submission time. In the No Limit, it occurs if the subject's only bid occurs in the final 5 s whether or not the clock is reset.

Recall that for our manipulations to have their intended effect—that is, to facilitate identification—the bid data should evince two broad patterns. First, we should see more jumping in the Time Constraints treatment and less sniping in the No Limit treatment, relative to the Standard. Second, and also relative to the Standard, there should be no difference in sniping in the Time Constraints treatment and no difference in jumping in the No Limits treatment.

As planned, jumping does seem to be more prevalent in the Time Constraints treatment than the Standard ($t=1.75$, $p=0.08$), suggesting that jumping may indeed be used to "telescope" time. We also see significantly less sniping in the No Limit treatment than the Standard ($t=4.18$, $p<0.01$). In addition, there is little evidence of unwanted spillovers: compared to the Standard Silent, there is no more or less jumping in the No Limit treatment ($t=0.58$, $p=0.56$) or sniping in the Time Constraints treatment ($t=0.37$, $p=0.71$). Finally, while there do appear to be small differences in participation across formats, only that between the Standard Silent and the Time Constraints is significant at even the 10% level ($t=1.80$, $p=0.07$) when comparing summary frequencies.

Given our dual concerns that participation could reflect selection on unobservables (e.g., inequality or loss aversion, strategic sophistication) and also differ across formats, we estimated separate selection models for jumping and sniping and report the results in Table 3. Selection is estimated as a probit, with "puzzle difficulty" as an identifier and controls for endowments, private values, ethnicity and gender.[4]

[4] As one can see at the bottom of Table 3 we find substantial correlations among the errors at the two stages but limited evidence that bias is a problem. However, because the p-values for both jumping and sniping hover near the critical 10% level, we chose to be conservative and control for selection in each case.

The top of Table 3 confirms the effectiveness of our treatment manipulations. Using the entire sample we see that jumping is 8.3% ($p=0.08$) more common in the Time Constraints treatment and no more or less common in the No Limit treatment. Furthermore, because of how the treatment was implemented, this is in all likelihood a lower bound on the size of the effect. The random determination of time endowments meant that a number of participants didn't really feel time pressure because their times were close to the 120 s upper limit. In the third column we estimate the effect of time constraints on a restricted sample—those who had less than 100 s—and find the increase to be dramatic. In this sample, participants were 22.8% ($p<0.01$) more likely to jump and, again, they were no more or less likely to do so in the other treatment.

The results also confirm the effects of the No Limit treatment on sniping—bidders are 2.7% ($p=0.01$) less likely to snipe under these rules—and the absence of a sniping effect in the Time Constraints treatment.

There is, however, some evidence of participation effects in Table 3. First, participation is responsive to two behavioral factors: competitive bidders are more likely to submit a bid, while bidders who are sunk cost sensitive are less likely to do so. Second, and perhaps more important, it appears that both the Time Constraint and No Limit treatments discourage participation significantly. Subjects were 5.6% ($p=0.04$) less likely to participate when time constraints were imposed and they were 4.8% ($p=0.02$) less likely to participate when sniping was discouraged. To the extent that we can control for the number of active bidders in an auction in our revenue models, however, the direct and indirect effects of these behaviors can still be parsed out.

The bottom of Table 3 allows us to consider whether or not individual bidder characteristics influence behavior across auction formats, and provides a point of contact with some of the previous literature on jumping and sniping. Controlling for auction format, participation and other characteristics, for example, we find that impatient and competitive bidders are both much more likely to jump. Very competitive bidders, for example, those who reported themselves to be a "10" on our competitive index, are estimated to be 6.4($=4\times1.6$) percent more likely to jump than the mean bidder and the hypothesis that there is no difference can be rejected at better than the 5% level. To the extent that competitive bidders will attempt to intimidate their rivals more often that non-competitive bidders, this is consistent with the intimidation models of Avery (1998) and Daniel and Hirschleifer (1998). Likewise, a bidder who is classified as impatient is 9% more likely to jump, a difference that is significant at the 10% level.

Impatience and competitiveness aren't the only bidder characteristics that matter. High value bidders, for example, are also prone to jump-bid. To the extent that this reflects a desire to signal these values, the pattern is consistent with Isaac and Schnier (2005): a 10 EMU difference in private values is estimated to increase the likelihood that a bidder ever jumps by 4% ($p<0.01$).

Considering the fourth column of Table 3, there is some evidence, consistent with earlier research, that it is experienced bidders who were most tempted to snipe: subjects who were classified as experienced were 2.3% ($p=0.07$) more likely to do so, a large relative effect. Impatient bidders were also 1.3% ($p=0.04$) less likely to snipe. Both results paint a picture consistent with Roth and Ockenfels (2003) and Cotton (2009) in which experienced, patient bidders "quietly" gather information about others' values without any impulse to reveal information about their own values until the very end of the auction.

5. Silent revenue

Given the effectiveness of our treatments, we can use the variation generated by the experiment to estimate the effect of deliberative jumping and sniping on silent auction revenue. It is important to recognize from the outset, however, that while differences in mean

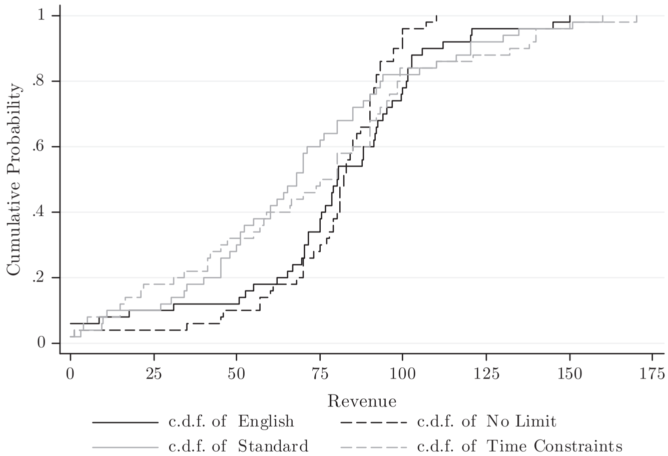

Fig. 1. Revenue cumulative distributions by format.

Table 4
Quantile revenue regressions (silents only).

	Q(25)	Q(50)	Q(75)
Time constraints	6.826	15.404**	23.541*
	(7.511)	(7.578)	(12.104)
No limit	21.813***	15.324***	7.694
	(4.580)	(5.241)	(9.792)
Mean endowment	−0.267	−0.407	−0.108
	(0.313)	(0.258)	(0.360)
Mean private value	0.846***	0.668***	0.768***
	(0.204)	(0.188)	(0.233)
Number of active bidders	7.720***	7.136***	7.618***
	(1.352)	(1.078)	(1.846)
Constant	−6.239	40.480	7.893
	(39.157)	(40.061)	(57.904)
Observations	147	147	147
Pseudo R^2	0.31	0.21	0.11

(bootstrapped standard errors);
*$p<0.10$, **$p<0.05$, ***$p<0.01$.

revenue (Standard—69.06 EMUs, Time Constraints—71.93 EMUs, No Limit—77.68 EMUs) do exist, there is strong evidence of heterogeneous treatment effects. A brief examination of Fig. 1, in which the cumulative distribution functions of revenue are plotted for each of the mechanisms, offers a clearer perspective. For revenues smaller than 75 EMUs, for example, the cdf for the No Limit format lies well below the cdfs for either the Standard or Time Constraints but for revenues more than 100 EMUs, it lies well above. Given this pattern, it is no surprise that the differences seem much smaller near the median, consistent with the absence of significant differences in means.

Because standard empirical methods can obscure the heterogeneous treatment differences seen in Fig. 1, we estimated a set of pooled quantile regressions with bootstrapped standard errors and report the results for the 25th, 50th and 75th quantiles in Table 4. Recalling from Table 3 the significant effect of our treatments on both bidding behavior and participation, in addition to controlling for one's endowment and private value, we also control for the number of active bidders in the auction so that we are confident that we are capturing the pure jumping and sniping effects of the conditions with our treatment indicators.

It comes as no surprise that higher private values lead to higher auction revenue and that this occurs across the revenue distribution. Table 4 also replicates our earlier field results in the sense that the number of active bidders also matters across the revenue spectrum. The surprise, perhaps, is that the effect is more or less constant: in both low and high revenue auctions, each additional active bidder increases revenue about 7 EMUs, an effect that is significant at better than the 1% level. This is an important reminder that practical mechanism design must consider possible participation effects. There is little reason to encourage each bidder to be more aggressive if, as a result, there is a sharp decrease in the number of bidders. We should also note that while it is hard to show that our participants focused more because endowments were earned, there is little evidence that the (smallish) variation in endowments had an effect on revenue.

Most importantly, the treatment indicators in Table 4 suggest that deliberative jumping and sniping both have significant effects on silent auction revenues. Combined with our results in Table 3, which showed that impatient and competitive bidders are “jumpers” to start with, the estimates of the Time Constraints treatment effect in Table 4 suggest that impatience and competitive spirits do indeed enhance auction revenue. Deliberative jumping produces more revenue across the distribution, but the effect is most pronounced in the upper half of the revenue distribution. At the 75th percentile, for example, the Time Constraints treatment is associated with an additional 23.54 EMUs of

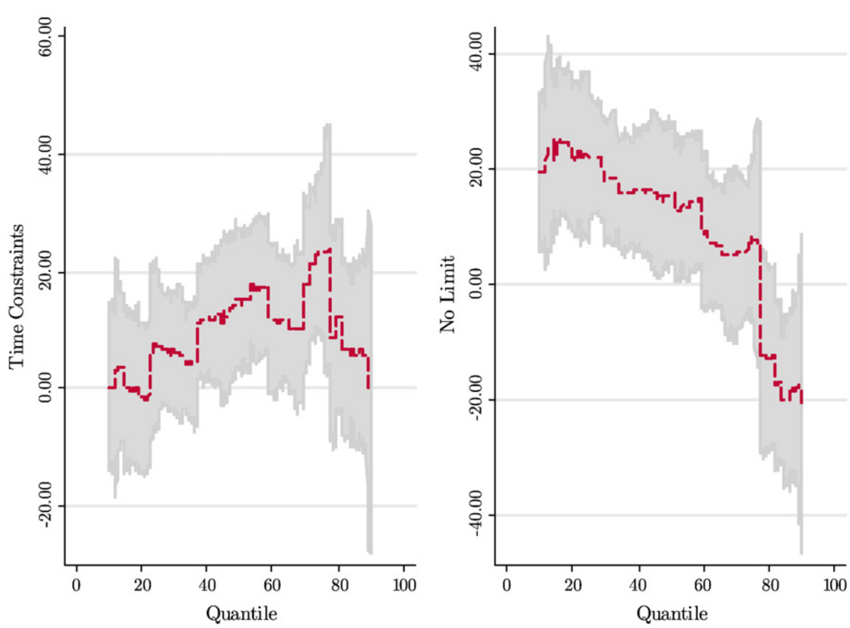

Fig. 2. The effects of encouraging jumping and removing sniping (compared to the basic silent format) by quantile.

Table 5
Quantile revenue regressions (compared to the English).

	Q(25)	Q(50)	Q(75)
Standard	−21.819***	−16.847***	−10.687
	(5.867)	(6.045)	(12.648)
Time constraints	−16.061*	0.114	11.013
	(8.330)	(4.799)	(9.898)
No limit	0.011	−3.587	−3.067
	(5.471)	(3.147)	(5.149)
Mean endowment	−0.090	−0.094	0.084
	(0.133)	(0.229)	(0.233)
Mean private value	0.869***	0.748***	0.666***
	(0.148)	(0.135)	(0.169)
Number of active bidders	7.011***	6.987***	6.540***
	(1.094)	(0.751)	(1.819)
Constant	−7.011	10.641	3.507
	(15.391)	(31.614)	(34.545)
Observations	195	195	195
Pseudo R^2	0.34	0.21	0.12

(bootstrapped standard errors);
*$p<0.10$, **$p<0.05$, ***$p<0.01$.

revenue, a substantial effect that is statistically significant at the 10% level.

Likewise, the reduction of deliberative sniping in the No Limit treatment has a large and significant effect on revenue, especially in otherwise low revenue auctions. At the 25th percentile, for example, the absence of deliberative sniping is associated with a 21.81 EMU increase in revenue, an estimate that is significant at better than the 1% level. In contrast, the effect at the 75th percentile is much smaller in size (7.69) and statistical significance. To the extent that low revenue auctions are also those in which high value bidders have been able to avoid wars of attrition, this heterogeneous treatment effect is consistent with both intuition and previous models.

Fig. 2 plots the estimated treatment effects and associated 95% confidence intervals by quantile and offers a useful summary of our results. Deliberative jumps have little or no effect in low revenue auctions—the effect is small in size and the confidence interval contains zero—and deliberative sniping exhibits no robust effect on high revenue auctions. In both intermediate and high revenue auctions, however, deliberative jumping adds significantly to revenue, as does the absence of deliberative sniping in otherwise low revenue auctions.

6. Discussion

Our results suggest that bidding behaviors like jumping and sniping are likely to significantly affect revenue in silent auctions. And while charities should be interested to learn whether jumping is, on balance, good or bad for revenue, or to confirm the conventional wisdom that sniping tends to reduce revenue, many have some latitude to choose another auction mechanism. For most, the natural alternative is a "live" or English auction. Of course, the problem with the English format is that it can require the charity to hire an auctioneer, it calls for the sustained attention of many of the potential donors at an event and it is not always as "scalable" in the sense that it can easily take more time to sell the same number of items. That said, if the standard silent auction does considerably worse at raising money, it might still pay to switch to the English format. The question, then, is whether the silent is worth it or not. With this in mind we also ran an English button auction to evaluate the opportunity cost of relying on the silent format.

Table 5 reports the results of our analysis. It is identical to Table 4 except that we have added the results of the English button auction and made it the baseline. That is, our point estimates now compare revenue performance relative to the English auction. As in Table 4, we control for the mean endowment, private value and number of active bidders to assess the difference in revenues between the English auction and its silent competitors.

The results of this analysis are also interesting for fundraisers. Because it limits jump-bidding and allows sniping, the standard silent mechanism used by many, if not most, charities does significantly worse than the English alternative. While the effect tends to be somewhat smaller in otherwise high revenue auctions, the standard silent format is estimated to produce 21.82 fewer EMUs at the 25th quantile and 16.85 fewer EMUs at the median, with both effects statistically significant at better than the 1% level. To appreciate the size of these effects, it is perhaps useful to remember that mean private value was just 49.36 EMUs.

This does not mean, however, that silent formats should be abandoned altogether. With the exception of low revenue auctions, the deliberative jumping associated with the Time Constraints treatment resulted in revenues that were indistinguishable from the English. If it is the case that enforcing a common end time for all of the items under auction encourages jump-bidding, then this convenience might actually work to the charity's advantage, a result that, if future research finds robust, would surprise some auction organizers.

At some events, participants may be less pressed for time. In these settings because the No Limit estimates are never significantly different from zero in Table 5, we conclude that the removal of hard deadlines might eliminate deliberative sniping and produce revenues that also match those available under the English. In short, the bad news is that we find the standard silent auction does worse than its somewhat less convenient alternative, the English, but the good news is that simple and inexpensive "fixes" discernible by the extent to which time is a constraint are available that would remove the difference.

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