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# Charity auctions for the happy few☆

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## HIGHLIGHTS

- All-pay auctions, winner-pay auctions and lotteries are compared for fundraising activities.
- Recent literature determines that all-pay auctions raise more money for charity.
- Asymmetric participants and complete information can reverse this result.

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## ABSTRACT

Recent literature has shown that all-pay auctions raise more money for charity than either winner-pay auctions or lotteries. We demonstrate that first-price and second-price winner-pay auctions have a better revenue performance than first-price and second-price all-pay auctions when bidders are sufficiently asymmetric. Lotteries can also provide higher revenue than all-pay auctions. To prove this, we consider a framework with complete information. Complete information is helpful and may reflect events that occur, for instance, in a local service club (such as a voluntary organization) or at a show-business dinner.



## 1. Introduction

The recent literature of fundraising mechanisms is not conclusive about the relative performance of all-pay auctions, winner-pay auctions and lotteries. Theoretical results (Goeree et al., 2005; Engers and McManus, 2007) and experimental results (Schram and Onderstal, 2009) show, in a symmetric independent private values model, that all-pay auctions raise more money for charity than winner-pay auctions and lotteries. A field experiment by Carpenter et al. (2008) concludes in favor of winner-pay auctions instead of all-pay auctions.

We show that the asymmetry among bidders' values in a complete information framework can lead winner-pay auctions to raise more money for charity than all-pay auctions and lotteries. This invalidates the theoretical and experimental results of Goeree et al. (2005), Engers and McManus (2007) and Schram and Onderstal (2009), and might support the field experiment results of Carpenter et al. (2008). More precisely, our purpose is twofold. First, we would like to determine if the results found theoretically and confirmed in a lab experiment that all-pay auctions raise more money for charity than winner-pay auctions and lotteries are robust. Agents do not usually have the same preferences. Thus a way to test the robustness of results found in theoretical and experimental literature is to consider asymmetry either in the evaluation for the item sold or in altruism. Second, we would like to investigate if bidders' asymmetry could explain the results from the field experiment (Carpenter et al., 2008), which are that the winner-pay auctions can raise more money than the first-price all-pay auction. Indeed, Carpenter, Homes and Matthews' (2010) theoretical investigation of endogenous participation shows that participations cost do not provide a convincing explanation. Therefore, we compare five mechanisms: the first and second-price all-pay auctions, the first and second-price winner-pay auctions and the lotteries in a complete information framework.

Why are charity auctions interesting to analyze? Charity auctions have been held in the United States and in Europe for many years now.[1] At such auctions, an item (for example a key case of

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[1] Although historically more common in the United States, charity auctions have long been held in Europe, e.g. the *Hospices de Beaune wine auctions*, http://www.france.fr/en/celebrations-and-festivals/hospices-de-beaune-wine-auctions-ancestral-event.html.

zero value or an item donated by a luxury brand) is sold and the proceeds go to charity. Although many charity auctions are held on the Internet some are conducted among wealthy guests at charity dinners. These events may occur at local service clubs (such as the Rotary Club,[2] the Lions Club[3] and other (types of) voluntary organizations) or at show-business dinners. Potential bidders tend to be acquainted with each other in varying degrees. Beyond the item's value, the valuations of potential bidders vary with their interest in the voluntary organization (their altruism or philanthropy). Thus, potential bidders make a trade-off between giving money for fundraising and keeping it for some other personal use. Unlike non-charity auctions, though, here the amount paid is "never lost". Since the money raised is used to finance a charitable purpose, every participant in the charity auction may benefit from it, independently of the winner's identity. More specifically, the money raised by each potential bidder impacts the utility of all participants as they take advantage of an externality of the money raised for charity.

Under complete information, such auctions can be compared to those described in Ettinger (2010) who analyzes a general winner-pay auction framework with financial externalities.[4] These externalities are independent of the winner's identity and can be applied to charity auctions in which only the winner pays.[5] Moreover, he shows that there is no "revenue equivalence" with these externalities.[6] Maasland and Onderstal (2007) investigate winner-pay auctions with this kind of linear externalities in an independent private signals model. Their paper can also be applied to charities. They find similar qualitative predictions to Ettinger (2010): the second-price winner-pay auction outperforms[7] the first-price winner-pay auction. Goeree et al. (2005) analyze charity auctions in the symmetric independent private values model. They show that, given the externality, all-pay auctions raise more money for charity than both winner-pay auctions (second-price outperforms first-price) and lotteries. In particular, they determine that the optimal fundraising mechanism is the lowest-price all-pay auction with an entry fee and a reserve price. The lab experiment conducted by Schram and Onderstal (2009) shows results similar to Goeree et al. (2005), namely that the first-price all-pay auction leads to a higher revenue than winner-pay auctions and lotteries. Bos (2011) compares in a complete information framework the first-price all-pay auction and lotteries with asymmetric agents. In this paper, it is shown that the result of Goeree et al. (2005) can be reversed under complete information, which means that lotteries outperform all-pay auctions, if agents are asymmetric enough. Engers and McManus (2007) report findings similar to Goeree et al. (2005). Contrary to Goeree et al. (2005), a psychological effect comes into play: the winner benefits from a higher externality with her own bid, the others' bids having a lower effect on her. In their setting, as in Goeree et al. (2005), first-price all-pay auctions and second-price winner-pay auctions raise more money than first-price winner-pay auctions. Moreover, first-price all-pay auctions outperform each winner-pay auction only for a sufficiently high number of bidders.

Carpenter et al. (2008) report testing the predictions of Engers and McManus (2007) and Goeree et al. (2005) in a field experiment. Similar objects were sold in four American pre-schools through three different mechanisms which were the first-price all-pay auction and the first-price and second-price winner-pay auctions. They studied the determinants of the bidders' behavior and the revenue raised. Contrary to the theoretical predictions, first-price all-pay auctions did not produce higher revenues than winner-pay auctions. One main explanation for the gap between theory and the field experiment could be a non-participation effect (see Carpenter et al., 2010b), due to unfamiliarity with these mechanisms and their complexity: the participants did not know the all-pay design and few took part in second-price auctions on the Internet.

We consider a complete information framework to analyze the revenue performance of all-pay auctions, winner pay-auctions and lotteries. Complete information can help to provide analyses which are not available from the usual incomplete information.

First, complete information makes it easier to analyze asymmetries among bidders in a charity setting. In the current setting we are able to distinguish how altruism and asymmetry can independently affect bidding strategies and expected revenue.

Second, as recently pointed out by Damianov and Peeters (2012), complete information leads to a better understanding of the payment rule effects (through altruism) on bidding strategies and revenue raised. Damianov and Peeters (2012) distinguish three externalities attributable to the payment rule which can be analyzed separately in a complete information setting. In the second-price all-pay and winner-pay auctions, the highest bidder benefits from a positive externality: an increase in her bid raises her probability of winning without affecting her payment. A second positive externality is attributable to the bid of the second highest bidder. Any increase in her bid will raise the winner's payment by the same amount and so improve the second highest bidder's payoff. Finally, following Damianov and Peeters (2012) and Morgan (2000), the second-price all-pay auction leads to a negative externality due to the expected increase of revenue relative to the first-price all-pay auction.

Third, as Damianov and Peeters (2012) write, "the complete information model helps us further clarify the reasons for the superiority of auctions". While their setting features symmetric participants, their intuition to explain why all-pay auctions can outperform lotteries can still be applied here. Following Morgan (2000), they suggest that externalities are greater from auctions than lotteries.

We analyze first-price and second-price all-pay auctions for charity and compare this analysis to known results of winner-pay auctions and lotteries. In this framework, the externalities are such that every bidder derives as much advantage (obtains as much utility) from her own bid as from her rival's bid. Additionally, bidder $i$'s adjusted-value is the ratio of her valuation of the item sold and the fraction of her payment which she perceives as a cost given her altruism for the charitable cause. Bidders are then arranged in such a way that the adjusted-values and valuations are ranked in the same order. This ranking and its consequences are discussed.

The first-price all-pay auction equilibrium is characterized and the expected revenue computed. As in a case without externalities, there is no pure strategy Nash equilibrium and only the two bidders with the highest adjusted-values are active.

The equilibrium in the second-price all-pay auction is also characterized and the expected revenue computed. The results are then compared to those of Ettinger (2010) and Bos (2011) who analyze winner-pay auctions and lotteries with externalities that do not depend on the winner's identity and which could be applied to charity auctions.

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2 *The Rotary Club is a worldwide organization of business and professional leaders that provides humanitarian services, encourages high ethical standards in all vocations, and helps build goodwill and peace in the world.* There are about 32,000 clubs in 200 countries and geographical areas and 1000 clubs in France including in Paris, of course, but also small towns like Niort. http://www.rotary.org/.

3 http://www.lionsclubs.org/.

4 To the best of our knowledge, Ettinger (2010) is the only one to consider general externalities which could be non-linear.

5 Actually, Ettinger (2010) investigates a framework with two kinds of externalities. One is independent of the winner's identity and the other depends on the winner's identity.

6 The *revenue equivalence principle* (see Myerson, 1981) is one of the most famous and important results in auction theory. It determines that every auction mechanism, under some assumptions such as available information on the bidders' type and neutral-risk aversion, leads to the same expected revenue independently of the payment rule. For more details the textbook of Krishna (2009) makes for useful preliminary reading.

7 In the following, *outperform* means *generate higher revenue than*.