A BUSINESS MODEL FOR BUY- TO- PARTICIPATE PRICING IN E-COMMERCE

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Abstract

This paper is the first to analytically and empirically analyse entertainment-shopping reveal auctions, the new exciting fast-paced business-to-consumer online auctions that were recently introduced on the internet and are attracting significant interest from consumers and start-ups. Reveal auctions are becoming popular because of their ability to provide incredible bargains. But bidders can privately observe the price only by paying a fee, and every time a bidder does so, the price falls by a predetermined amount. The theoretical model suggests revenue equivalence between different price increments. But the empirical results refute the theoretical predictions.

Introduction

The business model “auction“ is a form of participative price finding (Reiner,J. et al 2014). . This means that the price of a product is not simply determined by its seller, but the buyer can actually actively influence it. This is done on the basis of potential buyer´s bid, which reflects his individual willingness to pay a certain price. The relatively low costs of building internet websites and new ideas and start-up online dealerships lead to a large number of different auction forms. . Auction-based business models are found, for instance, in the area of the so-called “reverse auction,“ which is also called “commercial reverse auction”. It is different auction form derived from the classic auction, in which not the potential buyers but the sellers of a service compete to get the job. The touristic service company Priceline, founded in 1997, is a famous example for a company who uses the model of “reverse auction” with great success. Next to well-known companies new start-ups have emerged within the last years that have further developed regular auctions into the business model of “entertainment shopping auctions” thanks to their intrinsic fun components (Toennesmann 2014.) It is a new trend of e-commerce, where the mere sale of a product is enriched by entaining elements, which cause the consumers to interact with one another (Moss,2007.)

A business model is often depicted as an overarching concept that takes notice of the different components a business is constituted of and puts them together as a whole (Wehmeier 2014; McGrath 2010;Morris et al 2005;Osterwalder,Pigneur 2010). To describe a business model one can employ a concept that consists of four central dimensions: Who, What, How, Why. Who: Every business model serves a certain customer group. It should answer the question: “Who is the customer?”What: What is of value to the customer? The value proposition can be defined as an “overall view of a company´s bundle of products and services that are of value to the customer”(Osterwalder 2004,43). How: To master the processes and activities of building and distributing the value processes plus their orchestration in the focal firm´s internal value chain. Why: This dimension explains why the business model is financially viable. The advantage of auctions, when seen as a businessmodel is that a the buyer never has to pay more than he can afford or wants to pay (What.) The buyer benefits from this model, because it allows him to reach a better market allocation of his performance (Why.)

Pay-per-bid auctions are implemented as either increasing (ascending) or decreasing (descending) auctions. They involve bidding costs (Reiner,J.et al 2014) and are therefore different form well-known auction sites, such as ebay. Ascending auctions are related to English auctions as the price incrementally increases bid by bid (Milgram 1989). In contrast to English auctions, bidding is associated with additional tangible costs per bid. Each bid increases the price and the bidder must pay for each bid. Descending auctions have similarities to Dutch auctions: This type of auction begins with a high asking price (e.g. recommended retail price) which is lowered after a predetermined period of time until a participant is willing to accept the auctioneers price. The initial price is much higher than the item´s value usually is and no seller expects to get that price for the item. Because bidders must know the amount of the bids, bids are not scaled as they are in some kinds of auctions. To see the actual price, the bidders must pay the auctioneer a small fee every time they "move". The price is lowered in increments until a bidder chooses to accept the current price. He is the winner and pays that exact price for the item. The speed of the decreases in prices is not set by the auctioneer, but by the participants of the auctions. When many bidders participate, prices decrease quickly, but when only a few bidders participate, prices might stay high for a while. These mechanisms enrich traditional auction formats with some original elements and have had a noticeable success on the Internet as well as attention from the media. Weekly journals , popular magazins and online blogs are full of emotional discussions about this emerging type of online auction. Although some commentators are enthusiastic about the attractive deals and the fun offered in entertainment shopping auctions, others strongly warn consumers against participating in them. Such commentators point to potentially huge losses that might occur because of high bidding costs. However, all commentators have based their conclusions from a fairly limited number of observations, some of them are quite anecdotal.

Price reveal auctions

Yet, although pay-per bid auctions are quite popular, very few people know how they actually work. Although one can find literature about certain types of auctions (Fay 2004; Jap 2005; Milgram 2004) , there is only little research on fee-based bidding auctions, especially about descending auctions. None of these studies (Eichberger,Vinogradov 2008; Gallice 2009; Rapaport et al 2009;Houba et al 2011;Östling et al 2011;Platt et al 2010) have examined the effects of costs per bid, which are likely to vary , because they occur more than once and are similar across bidders. As a consequence, little is known about how auctioneers can profit from these kinds of auctions, and how these auctions affect consumer surplus. In this study we aim to address the need for a theoretical basis and an empirical analysis of such auctions to more objectively discuss the benefits and perils. Specifically, the goal of this paper is twofold. First we will outline descending pay per bid auctions as a format of price reveal auctions and develop an analytical model that allows us to determine critical economic differences for auctioneers and consumers. Second, we analyse the results of descending auctions, to investigate if, when and how often descending auctions are profitable for the auctioneer as well as when bidders realize savings and how much they save. We will show that in a perfect Bayesian equilibria an agent's optimal strategy is to observe the hidden price if he believes that it is smaller than his private valuation net of the bidding fee. This result derives from the fact that the price decreases endogenously rather than exogenously. Furthermore the bidding behavior of price reveal auctions is more similar to second price auctions rather than first price auctions (Krishna 2002). Differences between the two specifications subsist in the possible equilibrium outcomes and profitability (Gallice 2012).

Economic Analysis of Price Reveal Auctions

Model Assumptions

Equilibrium behavior and the profitability of price reveal auctions' mechanisms do not change even if the bidders are risk lovers or risk neutral. Risk attitudes do not modify the optimal bidding strategy, so we assume risk-neutrality in the model. Each bidder values the product to be auctioned off. So the common valuation of products results from the willingness-to-pay price, which is a proxy of the recommended retail price. This assumption is reasonable, because the items that are offered are brand new products that are available at other shopping websites or retailers. It works well for cash or vouchers because the current retail price is equal to the amount of cash or the monetary value of the voucher. In his theoretical model (Augenblick 2012) shows that the independent private valuations of bidders converge to the full information common valuation case as the differences in valuation decrease.

The model

In price reveal auctions there are n+1 risk-neutral players: a seller s and a finite set N={1,….n} of potential bidders. The seller´s valuation for the item to be auctioned off is given by $\boldsymbol{\omega_s}=\boldsymbol{\omega_r}$ where $\boldsymbol{\omega_r}$ is the publicly known recommended retail price. Each buyer has an independently and identically distributed valuation $\boldsymbol{\omega_i}$ for the product that is for sale. $\boldsymbol{\omega_i}$ is on the interval$[0,\acute{\omega}]$ according to the cumulative distribution function **F**, which is strictly increasing and continuously differentiable with density ***f*** and such that $\acute{\boldsymbol{\omega}} \geq \omega_r$. Every descending pay-per-bid auction begins at a price that the auctioneer sets. It is usually equal to ω_r. Time is discrete and goes from **t**=0 to **t**=T. At **t**=0 the seller sets the initial price $\mathbf{p_s} \in [0,\acute{\omega}]$.The price $\mathbf{p_s}$ and the recommended price $\mathbf{p_w}$ for any **t**ϵ{1,…T} is not publicly observable, i.e. is unknown to potential buyers. Only the current bidder can view this price. At any period **t**ϵ{1,…T} each player iϵN plays $\alpha_{i,t}\epsilon\{\emptyset,\delta+\}$. $\alpha_{i,}t=\emptyset$ indicates that bidder i remains inactive. $\delta+:[0,\acute{\omega}]\rightarrow\{0,1\}$ indicates that I observes $p_w\epsilon[0,\acute{\omega}]$ and then decides to buy the item ($\delta(p_w)=1$) or not($\delta(p_w)=0$). The bidder has to pay costs c>0 whenever he observes p_w if multiple bidders simultaneously play $\alpha_{i,t}=\delta+$ auctioneers randomly selects a single bidder whom he discloses p_w and charges c. If the bidder decides to buy, then he pays the auction price and the auction ends, otherwise the auction continues. Each bid decreases the auction price from p_{t-1} to $p_t=p_{t-1}-\Delta$ with $\Delta\epsilon(0,c)$. The bidding costs are greater than the price decrement, c>Δ. In actual descending auctions the relation Δ=0,5 usually holds. If Δ>c than the agent could drive p_t down to zero by planning p_s/Δ times action $\alpha_{i,t}=\delta+$ with $\delta(p_t)=0$ for any $p_t>0$.The costs of this strategy are c/Δ x p_s and would thus ensure profits as far as c/Δ x $p_s<\omega_i$. The auction ends at $t_e\epsilon\{1,\ldots,T\}$ where $t_e=T$ if $\alpha_{i,t}=\emptyset$ or $\alpha_{i,t}=\delta+$ with $\delta(p_t)=0$ for any I and any t while $t_e=t'$ as soon as bidders play $\alpha_{i,t'}=\delta+$ with $\delta(p_{t'})=1$ at period t'ϵ{1,…T}.If $\varepsilon_{i,t0}$ is the number of times i observes the price, bidders payoffs thus take the following form:

$$\eta_{i,t_e} = \begin{cases} \omega_i - \mathrm{P}_{t_e} - C \in_{t_e} & if\ i\ buys\ the\ good \\ -C \in_{i,t_e} \quad for\ i\ \in \mathbb{N} & otherwise \end{cases}$$

$$\eta_{s,t_e} = \begin{cases} p_{t_e} - \omega_s + c\sum_{i\epsilon \mathrm{N}} \varepsilon_{i,t_e} & \textit{if there exists an i that buys the good} \\ c\sum_{i\epsilon \mathrm{N}} \epsilon_{i,t_e} & \textit{otherwise} \end{cases}$$

Potential buyers accumulate sunk costs c every time they observe the price. Therefore, an agent would ideally observe p_t only once, discovers if the price reaches his willingness –to- pay price $\lambda(\omega_i)$ and buys. $\lambda(\omega_i)=b(\omega_i)-c+\Delta$ where $b(\omega_i)$ is the bidding function that will be identified in equilibrium. When the highest valuation of a bidder is below the starting price or $\lambda(\omega_i)>b(\omega_i)$, no bidder will adjust his willingness to pay and place a bid. In other words: If the starting price is excessively high,i.e. $\omega_i<p_s-\Delta+c$ then no bidder is keen on seeing the price, and the item will not be sold in equilibrium. If the starting price is too low, i.e. $\lambda(\omega_i)<b(\omega_i)$ all bidders will want to see the price; the first bidder will be the buyer. The highest starting price that attracts rational bidders is $\lambda(\omega_i)=b(\omega_i)$. For example: The bidder i with valuation ω_i is willing to invest up to $b(\omega_i)=100$, with $c=2;\Delta=1$. He will observe the price, when he assumes that $p_{t-1}\leq\lambda(\omega_i)$ is $\lambda(\omega_i)=99$. In fact, if his assumption is correct, the bidder discovers the price $p_t\leq 98$, buys the item, and bears the total cost of $\omega_t+2\leq 100=b(\omega_i)$. Let $\gamma_{i,t}(+)$ indicate the bidder´s assessment about the probability of the event's (+) realization at time t. A bidder must thus abstain from observing whenever $\gamma_{i,t}(p_{t-1}\leq\lambda(\omega_i))\leq\tilde{y}_{i,t}$ where $\tilde{y}$ is a threshold that will be defined shortly. In all other cases the agent observes the price und compares p_t with $\lambda(\omega_i)-\Delta=b(\omega_i)-c$. Bidders should then play according to the following rule:

$$\alpha_{i,t} = \begin{cases} \emptyset & if\,\gamma_{i,t}\big(p_{t-1} \leq \lambda(\omega_i)\big) \leq \tilde{y}_{i,t} \\ \delta(p_t) = 0 & if\,\gamma_{i,t}\big(p_{t-1} \leq \lambda(\omega_i)\big) > \tilde{y}_{i,t}\ and\ p_t > b(\omega_i) - c \\ \delta(p_t) = 0 & if\,\gamma_{i,t}\big(p_{t-1} \leq \lambda(\omega_i)\big) > \tilde{y}_{i,t}\ and\ p_t \leq b(\omega_i) - c \end{cases}$$

At the threshold of bidders`beliefs $\tilde{y}_{i,t}$, let $\Gamma_{i,t}(+)$denote the expectation operator and consider the following condition:

$\tilde{y}_{i,t}(\omega_i - \Gamma_{i,t}(p_t) - c) - (1 - \tilde{y}_{i,t})c = 0$

Under the assumption of risk neutrality, we find indifferences between the expected payoff associated with the decision to observe the price. In sum:

$$\tilde{y}_{i,t} = \begin{cases} \dfrac{c}{\omega i - \Gamma_{i,t(pt)}} & if\ \omega_i - c \geq \Gamma_{i,t}(\mathrm{p}_t) \\ 1 & otherwise \end{cases}$$

Based on this model Galice (2009) derives two propositions:

1. If the number of participants is common knowledge, then descendent auctions raise profits that are only marginally higher than those from a normal market transaction.

2. If the number of participants is uncertain, a descendent auction can trigger multiple entry even on the equilibrium path.

Empirical Study of Price Reveal Auctions

We saw that in theory the starting price in pay-per-bid auctions usually corresponds with the publicly known retail price $\omega_{r,}$ because the bidding costs ω_r are slightly above the maximum starting price. An explanation that bidders still observe the price, could be the entertainment character of shopping auctions and their curiosity. Especially if the difference c-Δ is smaller than the utilities it is logic to place a bid. Even if all bidders are rational, but assume that some bidders are curious, it is rational to play the game, because a curious bidder might have placed bids. Most websites of descending auctions display the results of past auctions. In fact most items are sold clearly below their starting price. As a matter of fact there must be curious bidders. In the data set (1.460 completed auctions) the following conditions are valid: c=0,49; Δ=0,40; which means that the starting price in practice is ω_r-0,09. Another divergence to theoretical findings is, that in equilibrium there are no bids in the descending auctions. This statement clearly contradicts the empirical results in which we observe active participation.

Product Category	Products per Category	N	Actual revenue	Standard Deviation	Δ-%
Video Game Console	Nintendo DS, Nintendo Wii, PSP, PS3,Xbox 360	126	1.12	0.10	12%
Software	Programs, PC games, Video games	69	1.16	0.09	16%
Computer Accessories	USB,Computer bags, Keyboards	208	1.18	0.19	18%
Jewelry	Watches, Bracelets	18	1.09	0.10	9%
Computer Hardware	Desktop, Notebook,Printer,Monitors	101	1.07	0.09	7%
Home Appliances	Coffee machine, Washer, Dental care, Shaver	105	1.13	0.12	13%
Small Electronic Goods	Mobile, Telephones, Digital frame, Radio	142	1.17	0.15	17%
Perfume	Hugo Boss, Lagerfeld	14	1.24	0.37	24%
Toys	Lego, Board games	64	1.18	0.19	18%
Fast-Moving Electronic Appliances	Mp3, Digital camera	196	1.12	0.09	12%
GPS	Falk, Navignon, TomTom	26	1.08	0.08	8%
DVD	Blockbuster, TV series	81	1.18	0.09	18%
TV+Audio-visual	Samsung,LG,Philips	40	1.08	0.11	8%
Housewares	Fondue pots	16	1.13	0.08	13%
Vouchers	Free bids, 100€ voucher	161	1.34	0.39	34%
Others	Bags, Magazine subscription	93	1.18	0.17	18%
TOTAL		1460	1.17	0.19	17%

Tab.1:Data Set of the Means of Actual Revenues from Descending Auctions

Table 1 (Kim et al 2014) gives an overview of the auctioned products. The difference between the actual revenues and the expected revenues is significantly different from zero because of the fluctuations in the willingness-to-pay prices respectively the recommended prices over time. Amazingly the variance respective standard deviation is also different in the voucher segment. Thus it seems that bidders may not decide to auction an item when the willingness-to-pay price is lower than the auction price. Furthermore such bidders wait for the price to decrease further. This is what we can conclude when looking at the behavior seen in the provided information on the website regarding final prices. Knowing the bidder's behavior, namely that they do not directly buy when the price is below their own willingness-to–pay price may cause them to wait or to place multiple bids. Table 1 also shows that actual revenues of an auctioneer of descending pay-per-bid auctions are significantly higher than the expected revenues (recommended retail price) in all segments. A linear regression analysis with the difference in standardized revenue (actual revenue –expected revenue/recommended retail price) as the dependent variable can explain this fact.

Variable	**Parameter Value**	
Number of Bidders per Auction	0.002	***
Recommended Retail Price	-0.085	***
Hedonic Category	-0.022	**
Utilitarian Category	0.006	n.s.
Hedonic&Utilitarian Category Constant[a]	0.483	***

***=p<0,01;**=p<0,05;n.s.=not significant; a:reference category;adj.R^2=0.186 N=1460;Stand.rev.is defined as revenue/RRP;RRP:recommended Retail Price

Tab.2:Drivers of Differences between Actual and Expected Standardized Revenues per Auction in Descending Auctions

In Table 2 the products are classified according to the method of Strahilevitz and Myers (1998), as utilitarian (practical), hedonic (frivolous), both utilitarian and hedonic, or neither nor. The hedonic category of items (game consoles, mp3 players, video games etc) negatively affects revenue per auction. It is possible, that there is a trade-off between ownership and savings. If a bidder wants to get the ownership he will buy earlier and thus the actual revenue converges with the expected auctioneer revenue. If a bidder wants to obtain large discounts, he will wait to give up bids. Bidders for hedonistic goods most likely fear that other competitors could snatch away the products they want. So they buy them in an early stage of the auction. As the costs of a bid are higher than the decrement this situation is not desirable for auctioneers.

Summary

Descending pay-per bid auctions are a new form of selling mechanisms via the internet. They have attracted significant interest from consumers and start-ups. Apart from their commercial use which is fading away (Eichstadt 2008) and thanks to their intrinsic “fun” component, these auctions have changed to entertainment shopping auctions, that also find applications in charities and fund-raising activities, i.e. for events in which the money sits laxly. With the empirical analysis of this auction model we have shown that a major difference between descending formats lies in the introduction of a bidding fee for every single bid and the transformation of only part of the bidding fee into a decrement of the final price. As a result an auctioneer cannot suffer any loss in a descending auction. Because of the accrual of players’ bidding fees, multiple entry enhances the expected profitability. Motivated by this business model hundreds of start-ups emerged using this mechanism. In the short run these websites may have exploited people’s enthusiasm and naivety, and have managed to be profitable and flourish. But in the long run the lack of handling-knowledge placed many of them at risk with the consequence of becoming bankrupt. Furthermore, the theoretical analysis showed that if agents were fully rational, a price reveal auction should attract zero bids and thus lead to zero profits for the seller. Contrary to this prediction, data about actual price reveal auctions show that players submit enough bids to make the mechanism profitable. We interpret this inconsistency as evidence of the bidders´ limited rationality, and we claim that this naivety is the only possible source of profits for the seller. Additional differences between actual and expected revenues could be explained by the number of bidders and the characteristic of the category. A descending auctioneer should sell the category of utilitarian products rather than hedonic products to generate greater revenues. Such an auctioneer could make a greater effort to enhance traffic because auctions with utilitarian products end later, leading to higher revenue per auction. Finally, auctioneers who are risk-averse should choose the descending format because the method offers potential for a much wider range of revenues than ascending auctions.

Future Research

Another fundamental question, which we have not even addressed in this paper, would be to determine for how long we can see a difference between actual and expected revenues. How long does it take to capture the bidders' learning process, and how does learning influence the bidders' behavior . More interesting future research could involve indentifying bidders' strategies in finding the ideal entry and exit points to an auction. Overall, entertainment shopping auctions and an in-depth analysis of behavioral aspects are a promising field for future research.

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