Journal of Marketing Management
June 2017, Vol. 5, No. 1, pp. 12-20
ISSN: 2333-6080(Print), 2333-6099(Online)

Published by American Research Institute for Policy Development
DOI: 10.15640/jmm.v5n1a2
URL: https://doi.org/10.15640/jmm.v5n1a2

Effects of Last-Minute Bidding Behavior and Seller Reputation on Online Auctions

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Abstract:

The previous research findings about the effect of seller reputation on auction price are inconsistent. The purpose of this study is to investigate how this effect can be moderated by the last-minute bidding behavior. Multiple regression analysis is used to examine the moderator effect. Empirical results from eBay indicate that seller reputation has a significantly positive effect on auction price no matter whether the last-minute bidding behavior occurs or not. However, the occurrence of last-minute bidding would alleviate the impact of seller reputation on auction price. It indicates that, as seller reputation is increasing, the closing price is going up more quickly if the last-minute bidding behavior is controlled.

Keywords: Online auction; seller reputation; last-minute bidding, feedback system.

Introduction

Online auctions have experienced exponential growth since the mid 1990's and have become a popular commercial medium for conducting business transactions. Today, exceedingly large volumes of goods, services and financial instruments worth trillions of dollars are auctioned off annually in the global economy. In particular, eBay conducted $84 billion worth of auctions and achieved revenue of approximately $9.0 billion in 2016 (https://investors.ebayinc.com). The rapidly growing popularity of online auctions has fundamentally changed the buyer and seller behaviors, which has spawned considerable interest in studying the renewed dynamic pricing mechanism over the past two decades.

The problem of asymmetric information between bidders and sellers has been well observed in online auctions (Shiu and Sun, 2014; Huang et al., 2011). Bidders have to face more risks without physically checking the product quality. They also have less information about the seller's reliability, the product properties, the population size of potential bidders and other bidders' willingness to pay, which may result in the fraudulent transactions and market failure. Therefore, building trust between the trading partners is a critical issue in online transactions to give people the confidence to conduct transactions with strangers. Many auction websites create their own reputation mechanisms to alleviate such information uncertainty and reduce risks for online traders. eBay offers a self-enforcement feedback system to allow winning bidders to rate the seller's actions and post the comments on the transaction details. Potential bidders can use this information to form expectations about the seller's future behavior.

The issue of seller reputation is well documented in the existing online auction literature albeit the findings from some studies are conflicting. Lucking-Reiley et al. (2007) study the determinants of prices in coin auctions at eBay, and they find that seller's feedback ratings have measurable effect on the closing prices. Specifically, negative feedback ratings have more significant influence than positive feedback ratings do. Along the same line, Sun et al. (2016) investigate the Apple iPod auctions at Yahoo! Kimo, a leading online auction site in Taiwan, and find the significant effect of seller reputation on auction prices. Melnik and Alm (2005) examine U.S. silver Morgan dollar coins on eBay and support the strong significantly positive impact of seller reputation on a buyer's willingness to pay for heterogeneous goods with uncertain quality.

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Johnston (2003) also draws the same conclusion for homogeneous goods from eBay online auctions. Besides the transaction price, the current literature also indicates that seller reputation is an important factor for various auction outcomes. In studying eBay seller histories, Cabral and Hortaçsu (2010) estimate the effect of seller reputation on the sales rate. They find that the growth rate of sale drops substantially after a seller receives the first negative feedback. Cai et al. (2014) investigate the online auction at Eachnet, a Chinese auction site, and find that with a centralized feedback system, seller reputation is positively related to repeat business, trade expansion and market survival.

However, some researchers question the significant effects of seller reputation on the online auctions. Among them, Livingston (2005) investigates the eBay auctions of Taylor Made Firesole Irons for the golf club, and finds that sellers are significantly rewarded by the first few feedback reports, but marginal returns with additional feedback are severely decreasing. By conducting the empirical studies on eBay, Ba and Pavlou (2002) as well as Bajari and Hortacsu (2003) find that negative feedback has no significant influence on the closing price; however, Canals-Cerdá (2012) reports that negative feedback significant reduces the number of bidders, the probability of sale and the closing price, but the impact of additional positive feedback on auction outcomes is not statistically significant. In the meantime, Resnick and Zeckhauser (2000, 2002) suggest that neither positive nor positive feedbacks have impact on the final price. More recently, Huang et al. (2011) study the mobile phone auctions from Yahoo! auction sites and their empirical results show that seller reputation positively affects the success of online auctions, but it has on influence on the transaction price. Bockstedt and Goh (2011) analyze eBay auctions for identical products, and find that seller feedback score are less effective in differentiating sellers in competitive auction environments, as a result, online sellers need take a more strategic approach in their auction listings.

Overall, the impact of seller reputation on online auctions is not all that clear. It indicates that there is a need to better understand how issue of seller reputation has been influenced by the nature of bidder behavior (Pinker et al., 2003). Compared with traditional auctions, bidders may adopt different strategies to bid in online auctions. Auction theories suggest that in a traditional sealed-bid auction where bidders submit sealed bids without knowing the bid from any other bidder, the best bidding strategy is to simply submit the willingness to pay; in a traditional English auction where the bidding price continuous to go up until one bidder remains, the best strategy is to keep bidding until the price reaches the willingness to pay (McAfee and McMillan, 1987). It seems that, in traditional auctions, the timing of submitting a bid has no influence on the auction outcome.

Timing issue is an important decision made by bidders in online auctions. The popular phenomenon of last-minute bidding has been well observed in the most of auction websites with a hard close ending rule (e.g., eBay, TaoBao, and uBid), in which the auction ends exactly at a pre-determined time. The lase-minute bidding strategy is also called snipping where bidders wait until the final moments to participant in auctions. Roth and Ockenfels (2000) report that 18% of online auctions have bids in the last 60 seconds. Hayne et al. (2003) find that 75% of late biddings win the auctions. In studying the CPU auctions on eBay, Hou (2007) finds that 29% of winners enter the auctions at the last minute and, on average, winners submit their first bid after 87.2% of auction time has passed. Previous studies have suggested that there are several reasons to engage in the last-minute bidding strategy, such as to increase a chance of winning, to avoid a bidding war, and to avoid sharing valuable information with other bidders. This leads us two research questions: first, this study examines how the seller reputation affects the auction price; second, this study investigates how this effect can be moderated by the last-minute bidding behavior.

2 Literature Review and Hypotheses

2.1 Effect of seller reputation on price

The success of online auctions is to a large extent built on seller's integrity. Firstly, seller reputation is a proxy for product quality that cannot be physically inspected prior to the completion of the transaction. The standard auction format provides little information to differentiate products offered by various sellers. Sell reputation can facilitate the bidder's decision regarding which item to bid on. Secondly, seller reputation earned from the past performance can be used to predict the success of future transactions. In online auctions, the separation of payment and delivery increases the risk for potential buyers.

Thus, the importance of seller reputation has been highlighted because it indicates certain level of assurance that the seller will provide the product exactly as described on the website. Overall, online anonymous trade requires a certain degree of trust between sellers and bidders. Especially, bidders have more insufficient information about the transaction and pay the products before receiving them, as a result, bidders have to entail greater risk in online auctions. Then seller reputation becomes a norm-enforcing mechanism that discourages cheating, mitigate asymmetric information and build trust in anonymous marketplaces.

There is a considerable body of literature related to the influence of seller reputation on the auction price. Melnik and Alm (2002) point out that a buyer cannot directly examine the product during the online auction, so he has to rely on the reliability of the seller in deciding whether and how much to bid. As one of the important determinants of the willingness to pay, their empirical results show that seller reputation has a positive, statistically significant impact on the price. In addition, Brown and Morgan (2006) suggest that the reputation mechanism enables a form of trust to be built. By allowing buyers and sellers to leave feedbacks online, a reputable seller could signal his quality and win buyers' trust, then he will be awarded by more future sales or higher prices or both. Empirically, Houser and Wooders (2006) report that a 10% increase in positive feedback scores would lead to the rise of auction price by 0.17%; and a 10% increase in negative or neutral feedback scores would reduce the auction price by 0.24%.

Considering the importance of seller reputation on online auctions, I would expect that a seller with higher reputation would be more competitive in sales and receive more number of bids, as a result, it is more likely to obtain a higher closing price.

H1: Seller reputation is positively related to the auction price.

2.1 Moderating role of last-minute bidding

Auctions are designed to close in two ways. One of ending rules is called "hard close," in which the auction ends exactly at a pre-determined time. The other is called "soft close," (i.e., the "going, going, gone" auction) in which the auction will continue and pass the original deadline as long as any bid is received within the last few minutes (e.g., five minutes). Most of online auction websites use the hard-close ending rule.

Last-minute bidding refers to the bidder's behavior of submitting a bid as late as possible in a hard-close auction. There are several explanations why bidding in the last minutes or seconds is a common strategy in online auctions. Firstly, last-minute bidding is a way to avoid the potential bidding war. Submitting bids frequently at the early stage of auction will start a bidding war early, which results in the greater competition and increases the closing price. So bidders are motivated to engage in last-minute bidding in order to get a product at a lower price. Secondly, bidders are often uncertain about their competitors' valuations. Experienced bidders may want to bid late otherwise other bidders could potentially use the bidding information to revise their willingness to pay. So, last-minute bidding is an effective approach to avoid information discovery. Thirdly, bidding just before the end of auction could increase the chance of winning the auction with a lower price because it does not leave other bidders enough time to respond. Finally, last-minute bidding also could be a strategic response to a dishonest seller by preventing a shill bidder from pushing the auction price higher.

Some researchers suggest that last-minute bidding may hurt the auction outcomes. Stryszowska (2013) studies the equilibrium bidding behavior in simultaneous competing private-value online auctions, and shows that last-minute bidding leads to inefficient outcomes. Hou (2007) reports a significant negative effect of last-minute bidding on auction price in the computer CPUs auctions at eBay, which indicates that winners who enter auctions at the last minute pay a lower price than those who enter earlier. Glover and Raviv (2012) compare the revenue differences between hard-close auctions and soft-close auctions, and find that the selling price obtained from hard-close auctions is decreased by 13% - 20% over that from soft-close auctions because of the last-minute bidding behavior.

The previous findings about relationship between seller reputation and auction price are mixed. As suggested by Baron and Kenny (1986), moderators could be introduced when there are inconsistent relations between a predictor and an outcome across studies. In this paper, I would expect that last-minute bidding, as a moderator, will alleviate the impact of seller reputation on auction price. That is, seller reputation is positively related to auction price no matter whether last-minute bidding occurs or not; but, the relation will be weaker with last-minute bidding. Thus, the hypothesis is expressed as below:

H2: Last-minute bidding moderates the relationship between seller reputation and auction price such that it alleviates the impact of seller reputation on auction price.

3. Methodology

3.1 Data collection

EBay, as a dynamic self-regulating economy, provides the public data source which makes it possible to investigate a wide variety of auction activities. Two criteria are considered to select product category for this study. First, it should be in a highly competitive market with sufficient number of bidders and sellers (Hou, 2007). In such market, a seller is more likely to receive multiple bids in an auction, and a bidder can easily leave from the current auction and find other alternative auctions shortly. As a result, late bidding is more likely to occur. Second, homogeneous products are considered in this study in order to better control for their characteristics, which allows us to capture seller reputation (Melnik and Alm, 2005).

Data are manually collected from the electronic product (Canon EOS 6D) auctions on eBay during November and December in 2016 with the following rules. First, only single-item auctions with brand new products are considered. Second, auctions must have been successfully ended. The initial research sample includes 246 records. Among them, three records do not have feedback scores since their sellers set option to make their feedback private, and six records have newly registered sellers with zero feedback score. After deleting these 9 records, the modified sample size is 237.

3.2 Measures

Dependent variable

Auction Price. The closing price (in thousand dollars) is measured as the dependent variable. Shipping cost is excluded since it changes according to the national or international shipping options. Insurance is also excluded in this study. The average closing price in the data set is $1,148, with a maximum winning price of $1,299 and a minimum winning price of $987.

Independent variable

Seller reputation. Many auction websites have developed the public feedback systems where winners are voluntary to post comments based on their transaction experiences. This system quantifies the reputation measures and can be used to empirically examine the effect of the reputation on bidding outcomes (Zhang, 2006). eBay allows both buyer and seller to rate each other as positive (+1), neutral (0), or negative (-1). In this study, three items are used to measure seller's reputation: seller's positive feedback ratio, seller's feedback score, and the number of product photos in the auction.

The first item is positive feedback ratio, which is a percentage of the number of positive feedbacks over the number of total feedbacks. However, this item only measures seller's positive reputation, which cannot represent the seller's experience. Suppose, if a new seller has only one positive feedback, his positive feedback ratio will be 100%; on the contrary, if an experienced seller has 1000 feedbacks and all of them are positive, then his positive feedback ratio is also 100%. But, obviously, their reputations should be different. So, additional measures also should be considered to evaluate seller reputation. In this study, the range of seller's positive feedback ratio is between 75% and 100%.

The second item is the seller's feedback score, which is the difference between total positive feedbacks and total negative feedbacks (Ottaway et al., 2003). The advantage of this composite score is that it includes the information of seller's experience. In this study, 48.6% of feedback scores are below 100, 35.2% of feedback scores are between 100 and 1000, and 16.2% of feedback score are above 1000. As suggested by Melnik and Alm (2005), this score is modified to take a natural log form because the marginal effects are expected to decrease with reputation.

The third item is the number of product photos in an auction. Ottaway et al. (2003) propose that item pictures have influence on potential buyer's attitudes and trust, thus their willingness to bid. In this study, the range of number of pictures used in an auction is between 2 and 12.

The three-item standardized Cronbach alpha is 0.6123. Accordingly, these items were averaged to create a single reputation measure.

Moderator

Last-minute bidding. Frazier et al. (2004) suggests that, since moderators address "when" or "for who" a predictor is more strongly related to an outcome, moderators could be measured as categorical variables (e.g. level, gender). Thus, last-minute bidding is measured as a dummy variable in this study. If last-minute bidding occurs, its value is 1; otherwise, its value is 0. In this study, last-minute bidding has been observed in 32.4% of all auctions. In addition, at most 5 bids are found in the last minute of an auction.

Control variables

Reserve Price. A reserve price is the lowest price that an object can be sold for in an auction and its value is unknown to the bidders. In order to have a chance to win in an auction with a reserve price, the interested buyer must place a bid that is higher than or equal to it. It is included as a control variable to count for the probability that the existence of a reserve price could run away potential bidders (Standifird, 2001; Bajari and Hortacsu, 2003). It is measured as a dummy variable: if a reserve price is used in an auction, its value is 1; otherwise, its value is 0. In this study, 29.7% of sellers set a reserve price.

Length of Auction. A seller can decide the length of an auction as 3, 5, 7, or 10 days. Lucking-Reiley et al. (2007) report that, compared with auctions that end in a shorter period of time, the average price increases by 24% and 42% for 7-day auctions and 10-day auctions, respectively, on e-Bay. This may be attributed to the larger number of bidders who visit the auction site over a longer time period. But, on the other hand, some researchers find the effect of auction duration on the final price to be insignificant (Houser and Wooders, 2006). This may be attributable to the fact that a long duration creates difficulty for bidders to continually monitor the auction, especially when the support of artificial proxy agents is lacking. An alternative explanation is due to the late bidding phenomenon. Although a long duration may attract more bidders, a lot of bidding activities take a place at the end of the auction anyway. Since this issue is out of scope of this research, I control the effect of the length of auction on auction price. In this study, 29.7% of sellers set 3-day auction, 29.7% of sellers set 5-day auction, 37.8% of sellers set 7-day auction, and 2.8% of sellers set 10-day auction.

4. Analysis and Results

4.1 Summary statistics

A summary of the descriptive statistics and correlation is shown in Table 1.

Table 1: Descriptive statistics and correlations

Variable	Mean	Std. Deviation	Price	Last-minute Bidding	Reputation	Last-minute Bidding × Reputation	Reserve Price	Length of Auction
Price	1.1484	0.1158	-					
Last-minute Bidding	0.3243	0.4746	-0.5687*** (0.0002)	-				
Reputation	9.8652	3.5058	0.5950*** (0.0001)	-0.2355 (0.1605)	-			
Last-minute Bidding × Reputation	2.8182	4.6577	-0.2820* (0.0909)	0.8854*** (<.0001)	0.0785 (0.6440)	-		
Reserve Price	0.2973	0.4633	0.1261 (0.4572)	-0.1980 (0.2401)	-0.1411 (0.4050)	-0.2882 (0.0837)	-	
Length of Auction	5.2973	1.8389	0.0741 (0.6629)	-0.1772 (0.2940)	-0.0509 (0.7647)	-0.2977 (0.0735)	0.2520 (0.1324)	-

P-values are in parentheses

*** Correlation is significant at the 0.01 level (2-tailed) ** Correlation is significant at the 0.05 level (2-tailed)

* Correlation is significant at the 0.1 level (2-tailed)

Pearson correlation coefficient between auction price and seller reputation is 0.5950, which is significantly different from zero with a *p*-value of 0.0001. Also, auction price is significantly negative correlated with last-minute bidding with Pearson correlation coefficient of -0.5687 (*p*-value = 0.0002). However, the correlation between seller reputation and last-minute bidding is weaker with a value of -0.2355 (*p*-value = 0.1605).

4.2 Hypotheses analysis

Multiple regression analysis is used to examine the moderator effect. The regression equation is:

$$\text{Price} = \beta_0 + \beta_1 \text{Auction-length} + \beta_2 \text{Reserve-price} + \beta_3 \text{Seller-reputation} + \beta_4 \text{Last-minute-bidding} + \beta_5 \text{Seller-reputation} * \text{Last-minute-bidding} + \varepsilon$$

Where β's are regression parameters which measure the average effect on price of each factor, and ε is a random error term which captures the variation in price not explained by the factors included in the regression.

The results of the multiple regression analysis are given in Table 2. The various models start with the simplest specification in which only control variables are included, and then progressively add other factors to capture their influence on auction price. H1 tests the effect of seller reputation on auction price. As shown in Table 2, seller reputation has a significantly positive effect on price ($\beta = 0.0207$, $p < 0.01$). This finding is the same as the theoretical expectation described before. Overall, H1 is supported.

Table 2: Multiple regression analysis results of sell reputation and last-minute bidding on auction price

Variable	Model 1	Model 2	Model 3	Model 4
(Constant)	1.1248*** (0.0599)	0.9111*** (0.0664)	1.0088*** (0.0646)	1.0523*** (0.0632)
Reserve Price	0.0286 (0.0439)	0.0501 (0.0351)	0.0287 (0.0312)	0.0357 (0.0293)
Length of Auction	0.0028 (0.111)	0.0035 (0.0088)	-0.0003 (0.0077)	0.0050 (0.0076)
Reputation		0.0207*** (0.0045)	0.0169* (0.0041)	0.0097* (0.0049)
Last-minute Bidding			-0.1040* (0.0306)	-0.2764** (0.0787)
Reputation × Last-minute Bidding				0.019** (0.0081)
F	0.31			
R^2	0.0178	0.1019	0.2604	0.327
ΔF		7.08**	2.81**	0.22**
ΔR^2		0.0841	0.1585	0.0666

Shown are unstandardized beta weights. Standard errors are in parentheses
*** p<0.01
** p<0.05
* p<0.1

H2 tests whether the last-minute bidding behavior moderates the effect of seller reputation on auction price. The overall regression model (i.e., Model 4) is significant ($F = 10.42$, $p < 0.0001$). As it can be seen from Module 4 in Table 2, the last-minute bidding behavior is significant ($\beta = -0.2764$, $p < 0.05$), indicating that the occurrence of last-minute bidding would reduce the closing price. Since the magnitude of coefficient of last-minute bidding ($\beta = -0.2764$) is greater than that of seller reputation ($\beta = 0.0097$), which suggests that last-minute bidding has more influence on auction price than seller reputation.

In addition, the interaction term is significant (β = 0.019, p< 0.05), and the R^2 change associated with the interaction term (i.e., ΔR^2) is 0.0666. In other words, the interaction between seller reputation and last-minute bidding explains an additional 6.66% of the variance in the closing price.

Above results show that a significant moderator effect exists, then, it is important to examine its particular form. Notice that last-minute bidding is a dummy variable with two levels: with last-minute bidding and without last-minute bidding. The significant interaction term in Model 4 indicates that the slopes of seller reputation at two levels differ from each other, but, it does not show whether each of them differs from zero significantly. In other words, in order to test whether seller reputation is a significant factor on price when last-minute bidding occurs or not, two additional simple regression analyses should be conducted, and the results are shown at Table 3.

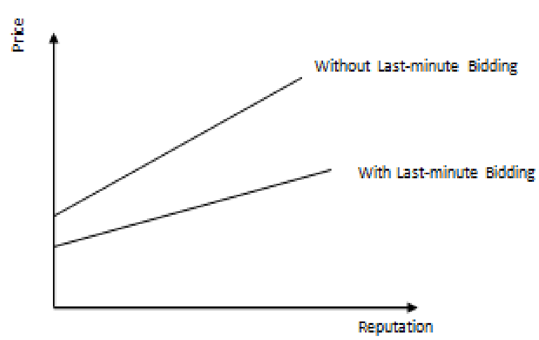
Table 3: Regression analysis results of seller reputation on auction price with / without last-minute bidding

Variable	Auction with Last-minute Bidding		Auction without Last-minute Bidding	
	Model 5	Model 6	Model 7	Model 8
(Constant)	1.0942*** (0.0479)	1.0113*** (0.0625)	1.3416*** (0.0602)	1.1388*** (0.0967)
Reserve Price	0.0411 (0.0330)	0.0464 (0.0313)	-0.0873 (0.0505)	-0.04163 (0.0448)
Length of Auction	0.0153* (0.0083)	0.0128 (0.008)	-0.0563*** (0.0124)	-0.0396** (0.0121)
Reputation		0.0091** (0.0047)		0.0131** (0.0054)
F	3.00*		2.87*	
R^2	0.2145	0.3318	0.2852	0.3762
ΔF		0.48**		0.42*
ΔR^2		0.1173		0.091

Shown are unstandardized beta weights. Standard errors are in parentheses
*** p<0.01
** p<0.05
* p<0.1

When last-minute bidding occurs (Model 6), seller reputation is significant (β = 0.0091, p< 0.05). On the other hand, without last-minute bidding (Model 8), seller reputation is also significant (β = 0.0131, p< 0.05), but its influence on auction price is greater since the coefficient of seller reputation in Model 8 is larger. It suggests that, as seller reputation is increasing, the closing price is increasing more quickly if no last-minute bidding occurs. A plot of regression equations for both cases is shown in Figure 1. Overall, H2 is supported.

Figure 1: Effect of price on reputation with and without last-minute bidding



5. Conclusions and Discussions

The purpose of this paper is to study the impact of both seller reputation and last-minute bidding on auction price. Empirical results indicate that seller reputation has a significantly positive effect on auction price; however this effect would be moderated by the last-minute bidding behavior, that is, the occurrence of last-minute bidding weakens the effect of seller reputation on auction price. Thus, it suggests that seller reputation matters when engaging in online auctions, and more importantly, seller reputation matters more if the last-minute bidding behavior is controlled.

Multiple regression analysis is used to explore the moderator effect. As suggested by Cohen (1992), the power to detect the true interaction effect should be examined in terms of its effect size, which is measured as ΔR^2 when the interaction term is added into the regression model. In this study, the effect size for interaction between seller reputation and last-minute bidding is $\Delta R^2 = 0.0666$, which is greater than the benchmark value of 0.002 (Cohen, 1992). In addition, as indicated in Model 4, the total effect size is $R^2 = 0.327$. Two additional regression analyses are also conducted for online auctions with or without last-minute bidding separately to further examine the significance of seller reputation on auction price.

Some limitations and future research directions should be mentioned here. First, in this study, seller reputation is measured based on three items: positive feedback ratio, feedback score and the number of product photos used in an auction. But, as observed by Resnick and Zeckhauser (2002), only 52.1% of buyers leave feedback on sellers. It would increase the random error and decrease the chance of obtaining true measures. In order to improve the reliability of seller reputation, more accurate measures on feedback should be considered in the future research.

Secondly, another potential limitation of this study is whether the theoretical model could be generalized to a variety of products at other auction websites. In this study, brand new digital camera is used to construct the empirical study. However, most of the items sold on eBay tend to be relatively heterogeneous in nature (Melnik and Alm, 2005), such as collectible coins, used products and others. So, buyer's willingness to bid largely depends on the specific characteristics of product and its uncertainty. Thus, another future research direction could focus on heterogeneous product auctions conducted at other auction websites.

Finally, from a practical perspective, this study shows the importance of the reputation system design on websites, also called online feedback mechanisms. eBay's feedback system is the best-studied online feedback mechanism to date, however, its feedback is overwhelmingly positive. For example, Resnick and Zeckhauser (2002) report that among feedback provided by buyers, 99.1% of them are positive, 0.6% of them are negative and the remaining 0.3% of feedbacks are neutral. So, one of the future research directions could be to investigate the effects of positive and negative feedbacks on the auction outcomes separately, and further to examine whether the last-minute bidding behavior moderate the difference between positive and negative reputation.

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