Auction Characteristics, Seller Reputation, and Closing Prices: Evidence from eBay Sales of the iPhone

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Abstract

We analyze auctions from eBay to determine whether seller reputation, auction timing, and auction aesthetics influence closing prices. Using a large sample of Apple iPhone auctions, we find that closing prices are influenced by the level of seller reputation and sellers with no reputation at stake suffer a substantial loss in closing prices. Moreover, during the sample period investigated there were small arbitrage opportunities in deciding when the auction would end, and in certain aesthetics of the auction, such as using bold fonts and including pictures of the product for sale. These arbitrage opportunities were somewhat reduced when *eBay* increased the prices it charged for these aesthetic upgrades six months after the sample period investigated.

JEL Classifications: L14, D44, D8

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1. Introduction

On-line commerce was estimated at approximately $136 billion in 2007 (U.S. Census Bureau, 2007), of which approximately $59.35 billion occurred at the on-line auction site *eBay* (Internet Retailer, 2008). The success of *eBay* has stimulated a growing interest in academia and transaction data from *eBay* auctions have been used to empirically test auction theory and to analyze the dynamics of internet commerce. This paper contributes to the latter stream of literature by investigating how various auction characteristics and seller reputation influence the final sales price of 8 gigabyte Apple iPhones.

Using data obtained from the online retailer for October-November 2007 and describing approximately 25,000 different auctions, we investigate two interrelated questions. First, what auction characteristics influence the probability that an auction will successfully close. Second, given that an auction has closed, what are the hedonic values of the various characteristics of the auction. The investigation is of interest because on-line auction sites such as *eBay* and *Amazon* charge a variety of prices to those who choose to sell items on their site. Investigation of whether, for a rather popular item such as the Apple iPhone, the online auction sites extract all the surplus created by various aesthetic aspects of auctions is of interest. Specific to our investigation, *eBay* increased the prices it charged to on-line sellers. The evidence provided herein suggests that, at least in the area of the iPhone, the increased prices did not extract all the additional revenue the aesthetic attributes provided iPhone sellers.

This study also contributes to the literature focusing on seller reputation. We find that a greater seller reputation is correlated with average closing price and having no reputation at stake lowers average closing price by approximately one sixth of a standard deviation (in the sample investigated herein). We also find that in the niche market of Apple iPhones there were arbitrage

opportunities for sellers. Auctions that had an odd starting price, ended during the week, auctions that ended before four pm Eastern time, and auctions that were won by non-U.S. buyers, auctions that had a sub-title (ostensibly offering more information to potential bidders), had bold text in search results, had a gallery picture (perhaps offering more credibility to potential bidders), or had the "highlight" feature all enjoyed statistically significant and economically meaningful increases in closing prices than otherwise similar auctions.

2. Auction characteristics, seller reputation and closing prices

Much of the research of online auction markets is devoted to understanding the impact of *eBay*'s buyer-seller reputation system on the final sales price of a given auction. Lucking-Reiley, Bryan, Prasad and Reeves (2004) show that seller feedback scores do, in fact, have a measurable impact on the closing prices of the auctions of pennies. Moreover, they find that negative seller feedback has a negative and statistically significant impact on closing prices whereas positive seller feedback was not statistically significant.

Bajari and Hartacsu (2003) also study the effect of *eBay*'s reputation system on closing prices of coin auctions. While Lucking-Reiley, Bryan, Prasad and Reeves (2004) find negative seller feedback to reduce closing prices, Bajari and Hartacsu (2003) find that negative seller feedback has no significant impact on closing prices. Furthermore, Bajari and Hartacsu find low negative seller feedback to significantly increase bidder entry, and they find an increase in the number of bidders to positively influence final sales price. Contrary to Lucking-Reiley, et al., Bajari and Hartacsu found that the overall reputation of the seller increases revenues. Bajari and Hartacsu also note that bidder experience has no impact on an auction's final sales price.

It appears that Lucking-Reiley, et al. (2004) and Bajari and Hartacsu (2003) are telling a similar story. Risk-averse buyers may doubt that a seller with poor feedback will follow through with the transaction, or that the item for sale will not match the seller's description. Thus auctions with negative seller feedback earn some proportion between zero and one of auctions with positive seller feedback. This line of reasoning is intuitive and appears relatively consistent across multiple data sets.

David Eaton (2005) analyses the effect of negative seller feedback on final sales price by examining high-end guitars (specifically, four models of Paul Reed Smith guitars) sold on *eBay*. He controls for negative seller feedback by creating a dummy variable that indicates whether a seller has any negative feedback. The interactions between the negative feedback dummy variable and whether a seller will accept credit cards and whether the seller utilizes escrow generally correlate with lower closing prices. However, the interaction between negative feedback with whether an auction included pictures generally correlated with higher closing prices. Eaton's results suggest that, in the presence of negative feedback, aspects of an auction that increase a buyer's confidence about the seller's veracity or the auction's authenticity seem to have a positive impact on closing prices. In the case of providing pictures of the article for sale, prospective buyers can "inspect" the product before placing a bid and thus the perceived risk in the auction falls.

3. The Empirical Strategy and Data

The Empirical Strategy

The empirical strategy to investigate various characteristics of Apple iPhone auctions is comprised of two stages. In the first stage, the probability that an auction successfully closes, that

is, the auction ends with a price acceptable to the seller, is analyzed with a probit model. In this stage some characteristics of the auction that are known only to the seller are included in the analysis. In the second stage, the impact of auction characteristics on closing price is investigated using a standard ordinary least squares estimator. In the second stage, information known to the bidders is included in the analysis.

One complication is that only successfully closed auctions contribute to estimating the impact of auction characteristics on closing prices. This leads to a potential sample selection problem that can introduce bias to ordinary least squares applied to the selected sample. To accommodate this possibility, the sample selection model outlined by Heckman (1979) is utilized where both the selection model and the outcome equation are estimated simultaneously.

The first step of the analysis is to test whether there are systematic relationships between auction characteristics, some of which are only known to the seller, and the probability of a successful auction. If there is no systematic relationship then concerns about sample selection in the estimation of the price equation are somewhat mitigated. The probability of a successful auction is estimated using a probit model of the following general form:

$CLOSE_i = f(M_i, T_i, A_i; \alpha) + v,$

where dependent variable is a dummy variable describing whether the auction was successful (CLOSE), the α's are parameters to be estimated and v is a Normally distributed error term.

The explanatory variables are divided into three groups. The vector M_i, includes the reserve price specified by the seller but not known to bidders (*MINBID*), the number of bids the auction received at the time the auction period ended (*NUMBIDS*), and the number of competing

iPhone auctions that closed on the same calendar day (*COMPS*).[1] It is anticipated that the higher is *MINBID* the lower the probability that an auction successfully closes, the more bids an auction receives the greater the probability that an auction successfully closes, and the more competing auctions the lower the probability that an auction successfully closes.

The vector T_i includes the number of days the auction is scheduled to be open (*DAYS*) and a dummy variable that takes a value of one if the auction ended on Saturday or Sunday (*WEEKEND).* The impact of *DAYS* on the odds of closing is ambiguous. Auctions that are open longer might have an increased probability of closing successfully as more potential bidders can see that the auction exists. On the other hand, however, longer auctions might reduce the odds of success if potential bidders consider auctions that are open longer to be less desirable for bidding. It is anticipated that auctions that end on the weekend have a lower probability of closing successfully if there are fewer people bidding on *eBay* auctions during this time.[2] It is possible that auctions that end very early in the morning might have later in the evening would command a lower closing price On the one hand, if the auction closes later in the day there are that many more opportunities for potential bidders to view the auction, thereby increasing the probability of an auction closing successfully. On the other hand, however, if individuals do not use their home computers for *eBay* auctions then later closing auctions might suffer a reduction in the probability of success.

The vector A_i contains a dummy variable that takes a value of one if the title or subtitle of the auction contains two sequential exclamation points (*EXCLAMATION)*, a dummy variable

[1] Sellers have the option of setting a secret reserve price that grants them the right to deny the sale of their item to the high bidder if the final sales price fails to reach their secret reserve amount. Bidders are made aware of the existence but not the value of a reserve price if it exists.

[2] Other specifications included dummy variables for day of week ending and hour of the day ending. In either case the dummy variables were generally insignificant, although the Saturday and Sunday dummy variables were both negative, with the former being statistically significant; thus the motivation for including the WEEKEND dummy variable.

that takes a value of one if the seller added the aesthetic of bold font (*BOLD*), a dummy variable that takes a value of one if the seller added the aesthetic of providing a picture of the iPhone being auctioned (*GALLERY*), a dummy variable that takes a value of one if the seller added the aesthetic of being highlighted on lists of multiple auctions (*HIGHLIGHT*), and a dummy variable if the seller purchased the aesthetic of being featured near the top of search result pages (*FEATURED)*. The auctions under investigation herein occurred immediately after the 8 gigabyte Apple iPhone had been released. It is conceivable that potential and actual bidders might have considered sellers who include multiple exclamation points in their title or subtitle to be less honest than other sellers who chose not to draw attention in such a manner. If this is the case then the variable *EXCLAMATION* would have an inverse relationship with the odds of a successful auction. The various aesthetics that can be purchased by sellers are expected to have positive impacts on the odds of a successful auction; otherwise it would seem unlikely that *eBay* could continue to charge for such extras.

The second step in the analysis investigates how various auction characteristics influence the closing price of a successful auction in the context of a hedonic model. Hedonic models estimate the value of various attributes of a composite good, e.g., a house or an automobile (see Rosen, 1974). In this case, the composite good is an auction comprised of a homogeneous underlying product, the Apple iPhone, and the various attributes of the auction, some of which are at the discretion of the seller. The hedonic model is specified as:

$$PRICE_i = f(R_i, S_i, T2_i, A2_i; \beta) + \varepsilon,$$

where the dependent variable is the closing price in dollars (*PRICE*), the β's are parameters to be estimated, and ε is a zero-mean error term.

The explanatory variables in the hedonic model are divided into four groups. The vector R_i includes variables thought to influence the closing price, including a dummy variable that takes a value of one if the initial asking price did not end with two zeroes (*ODDPRICE)*, a dummy variable that takes a value of one if the seller specified a reserve price, although the reserve price is not announced to potential and actual bidders (*RESERVE)*, the number competing iPhone auctions that closed on the same calendar day (*COMPS)*, and a dummy variable that takes a value of one if the auction advertises free shipping (*FREESHIPPING)*, and a dummy variable that takes a value of one if the auction winner is located in the United States (*USBUYER).*

It is anticipated that an odd initial price might increase the closing price if individuals are more likely to outbid an odd price.[3] It is anticipated that posting a reserve price is likely to increase the closing price, assuming the auction is successful. The impact of the number of competing auctions on closing price is ambiguous. It is anticipated that "free shipping" would increase the closing price of the auction but approximately but only by the anticipated cost of shipping. As the Apple iPhone was first released in the United States and was available in the United States from other sources than *eBay* it is anticipated that a U.S. bidder would be willing to pay less for an iPhone, *ceteris paribus.*

The vector S_i contains variables that describe the seller's reputation including the seller's overall reputation score (*TOTALFEEDBACK*) and a dummy variable that takes a value of one if the seller has no reputation at stake (*ZEROFEEDBACK*). It is anticipated that a higher seller reputation would correlate with a higher closing price and that sellers without any feedback

[3] When sellers implement a secret reserve price they usually set a low minimum initial bid in an attempt attract more bidders without the risk of being obligated to sell their item below their threshold amount. This is not a costless option on the part of the seller as *eBay* charges a premium for this option.

suffer a reduction in closing prices, *ceteris paribus.* The intuition is relatively straightforward. The seller reputation system used by *eBay* allows past buyers to rate their experience with a particular seller; the better the experience and the more transactions undertaken, the greater the reputation of the seller at the time the auction is posted. New sellers start with a zero reputation and must both complete transactions and do so to the satisfaction of their customers to earn a reputation. If potential and actual bidders associate a higher reputation on past transactions as a reasonable predictor of satisfaction if they win the auction, then a higher reputation would be expected to correlate with a higher closing price, all else equal. It is also possible that those sellers with no reputation at stake are considered highly uncertain in terms of customer satisfaction and might be expected to suffer a noticeable reduction in their closing prices.

The vector $T2_i$ contains variables that describe the timing of the auction including the number of days the auction was open (*DAYS*), a dummy variable that takes a value of one if the auction closed after four in the afternoon Eastern time (*AFTERFOUR*), and six dummy variables that take a value of one for the various days of the week on which the auction ends (*MONDAY, TUESDAY, WEDNESDAY, THURSDAY, FRIDAY, SATURDAY*).[4]

It is possible that auctions that are open for longer yield higher closing prices as there are more opportunities for high value bidders to see the auction. On the other hand, auctions that have been open longer might carry a stigma which might reduce the number of people who bid on the auction. Furthermore, it is not immediately clear what is the best time of the day for an auction to end. On the one hand an auction that ends later in the day might generate more bids and might be expected to generate a higher closing price. However, if people are distracted from bidding on *eBay* auctions by after work activities, it is possible that auctions that close later in the day command lower prices.

[4] Sunday is the reference day.

The vector $A2_i$ auction characteristics such as the length of the auction's title (TITLELEN), the length of the auction's sub-title (SUBTITLE), a dummy variable for whether the seller purchased bold font (BOLD), whether the seller purchased a picture (GALLERY), whether the seller paid to be highlighted (HIGHLIGHT), and a dummy variable that takes a value of one if the seller purchased the right to be featured (FEATURED). It is anticipated that longer titles and subtitles convey more information to potential and actual bidders and increasing the closing price. Moreover, adding an aesthetic attribute to a standard auction, such as bolding the font of the title or including a picture, increased the cost of listing an auction during the sample period. Thus, the parameters on these attributes are of particular interest. If, on average, the benefits of adding a bold title exceeded the costs, this would represent an arbitrage opportunity for the seller. Furthermore, it would suggest that *eBay* might consider re-pricing these attributes, a possibility we discuss below.

Data

Information describing 25,591 posted auctions during June, July, and August of 2007 were purchased from eBay. The data were delivered "raw" in the sense that they had not been screened or otherwise filtered. This period coincides with the three months immediately following the release of the 8GB iPhone; this period of time was characterized by an active secondary market for Apple iPhones because of their limited distribution and availability. The data were purchased from the auction site *eBay* and contain a multitude of variables. Thus we are limited in our analysis by the data which *eBay* collects on the auctions posted on its site, and we stress that the data might have been gathered for completely different purposes than for what we use them.

A second point is that several of the variables collected by *eBay* are not directly observable from the website either during or after an auction ends. For example, bidders are not able to see the reserve price chosen by the seller, if a reserve price has been posted. While bidders are informed whether a bid exceeds or fails to exceed the reserve price, the actual price is not known.

A third point is that the data contains several auctions with questionable data. For instance, there are several observations in which the closing price was less than a dollar and greater than $50,000; these observations were considered noisy and were withdrawn from the sample analyzed. Furthermore, there were other auctions that had questionable values in the number of bids, the minimum bid required, and so forth. Finally, we threw out any auctions that listed the iPhone as being "unlocked" in either the auction's title or subtitle. Unlocked phones can be activated by any GSM cellular provider whereas locked phones are limited to the New AT&T / Cingular Wireless network. All else equal, unlocked phones are generally considered to be more valuable than locked phones. Thus, to ensure the greatest amount of homogeneity in the dimension of the underlying product being auctioned, and therefore to draw the greatest contrast across auctions, we excluded unlocked phones. Further, any auctions that had a fixed-price (buy-it-now) option and all Dutch style auctions were excluded from the sample.

The descriptive statistics of the sample are reported in Table 1. Table 1a provides information concerning the full sample of auctions used to determine whether there are systematic relationships between auction characteristics and whether an auction ends successfully. Just under 43% of all Apple iPhone auctions listed on eBay during the time period investigated closed successfully. The average minimum bid required by the seller was just over $466, although this information was not known to potential and actual bidders. The average

auction received six bids, although the most active auction received 130 bids. During the time period under investigation the average auction faced 547 competing auctions for the same product, consistent with the anecdotal evidence that that both supply and demand side influences created an active secondary market for the iPhone. Approximately 10% of all auctions offered free shipping. The average auction was open for just under two full days, again supporting the anecdotal claims of an active secondary market for the iPhone during the period under investigation. Approximately twenty-five percent of all auctions contained two or more sequential exclamation points in the title or subtitle of the auction. Approximately 22% of all auctions included bold font, 50% of all auctions included a picture, 7.% were "highlighted" and less than 1% elected to be "featured" in search results.

Table 1b reports the descriptive statistics for the 10,286 successful auctions in the sample. Among these auctions the average closing price was $624, approximately 40% had an opening price that did not end in "double zero," and approximately 10% had a reserve price specified by the sellers. Successful auctions faced 472 competing auctions that closed on the same day, 85% were won by a buyer in the United States, and approximately 10% indicated free shipping. The average total seller feedback was 440 points, with a minimum of zero and a maximum of 1262. Less than 2% of all successful auctions were posted by a seller with zero reputation points. Approximately 48% of all successful auctions closed after four pm Eastern time, and the average auction was open for just over two days. The distribution of auctions across the days of the week shows that 21.5% ended on Sunday, approximately 19% ended on Saturday, with the least popular closing days being Thursday (10.7%) and Friday (10.1%). Among successful auctions, the average title length was 45 characters, the average sub-title length was 19 characters, 25%

had bold font, 55% had a picture, 8% were “highlighted” and less than one percent were “featured.”

It is clear from Table 1a and Table 1b that there are some differences between the overall sample of iPhone auctions and the sub-sample of successful auctions, suggesting that our empirical strategy of investigating both what influences the odds of a successful auction and what influences the final price, controlling for sample selection, is justified.

4. Empirical Results and Discussion

Table 2 reports the empirical results investigating systematic relationships between auction characteristics and the probability of a successful auction. In the table several specifications are reported: the first columns include sub-groups of explanatory variables whereas the last two columns include all covariates. It should be noted that the results in Table 2, other than the final column, are estimated parameters rather than the estimated marginal impact on the probability of a successful auction. A positive parameter estimate indicates that an increase in the covariate corresponds with an increase in the probability of a successful auction, and vice-versa; the final column reports the marginal impact of the covariates holding other variables at their sample mean values.

Columns one through three include sub-samples of covariates for edification purposes. Focusing on Column 4, which includes all covariates, the results follow intuition rather well. A higher minimum bid reduces the probability of a successful auction, the more bids an auction obtains the greater the probability of a successful auction. The more competing auctions on a given day the lower the odds any particular auction will close successfully. Interestingly,

offering free shipping does not have a statistically significant relationship with the odds of having a successful auction.

Auctions that are open longer tend to be less successful, which is different than the unconditional results reported in Column 2. This suggests that significant omitted variable bias is introduced to the parsimonious models justifying Auctions that contained two or more sequential exclamation points in the title or sub-title of the auction failed to close approximately six percent less often than auctions that did not contain such characters. Perhaps potential and actual bidders viewed the multiple exclamation points as a negative signal about the seller, all else equal. The auctions investigated herein were all of a homogeneous, new, and highly demanded product. Sellers likely didn't need to include such syntax in their auction titles as it would not draw attention to any differentiation in the underlying product being auctioned. Auctions that included bold font and a picture generally had a higher probability of being successful. Being "highlighted" in search results had a positive but weakly significant relationship with the odds of being successful. Being "featured" in search results had no statistically meaningful relationship with the odds of being successful.

The final two columns in Table 2 report results for a parsimonious model in which four covariates that were insignificant in the full model, *FREESHIPPING*, *DAYS*, *HIGHLIGHTED* and *FEATURED*, have been removed. The remaining results in Column (5) are essentially unchanged from those in Column (4). In Column (6) the marginal impacts of each covariate on the probability of a successful auction are reported, evaluated at the sample mean for each covariate. For dichotomous variables the marginal probability is calculated as the difference in the probability of success when the dummy variable is zero, all other variables evaluated at their means, and when the dummy variable is one.

As can be seen in Column (6), the odds of a successful auction increases by approximately 2% for each bid received over the sample average of six. For every fifty competing auctions the odds that an auction will be successful falls by one percent. Including exclamation points in the title or sub-title reduces the odds of a successful auction by almost two percent. If an auction has bold text the odds of closing successful increase by approximately six percent and including a picture in the auction increased the odds of a successful auction by approximately nine percent. The positive marginal impacts of these various aesthetics suggest that *eBay* was justified in charging for these additional auction characteristics, at least in the auctions of Apple iPhones.

Given the systematic relationships between various auction characteristics and the probability of a successful auction, investigating the relationships between auction characteristics and closing prices using only successful auctions might introduce selection bias. To accommodate potential selection bias, a selection equation and the hedonic model are estimated simultaneously as described in Heckman (1979). The selection equation is specified as in Column (5) in Table 2.

Table 3 reports the results of estimating the hedonic model relating auction characteristics to closing prices. Each specification controls for sample selection bias and the likelihood ratio test indicates rejection of the null hypothesis that the selection equation and the hedonic equations are independent, i.e. there is no sample selection problem, at the one percent significance level. Models (1) through (4) in Table 3 include sub-groups of the full array of explanatory variables and are provided for edification purposes; the discussion will focus on the full specification reported in Column (5).

Auctions that have an odd opening price correspond have closing prices that are $13.23 higher, on average, than auctions in which the opening price was even. Why might this be the case? Perhaps having an odd price, such as $0.99, encourages higher first bids thereby pushing up the closing price; more finely recorded bid-by-bid data would be required to test this hypothesis. The lack of an influence of a reserve price differs from Katkar and Lucking-Reiley (2007), who find that a reserve price significantly reduces the final price of Pokémon trading card auctions, but is consistent with Lucking-Reiley, Bryan, Prasad, and Reeves (2004), who find a reserve price is not statistically related to the final auction prices of pennies.

For every competing auction closing on the same day, the average closing price increased by approximately eight cents. This increase in price might seem counterintuitive but is consistent with demand-side (upward) pressure on price being greater than the supply-side (downward) pressure on price; recall that an increase in the number of competing auctions reduces the probability that any particular auction will close successful. Auctions that offered free shipping had closing prices $13.63 higher on average, which might approximate the actual shipping costs to most locations in the United States. Auctions that were won by U.S. buyers had closing prices approximately $28 lower on average. This would be consistent with individuals outside the United States being willing to pay more for the Apple iPhone because the release pattern of the Apple iPhone. The phone debuted in the United States in June of 2007 but was not available in the United Kingdom, France, and Germany until November 2007; Apple released the iPhone in more countries over the following year.

Seller reputation, as reflected in their aggregate feedback score, is positively related to closing price. Furthermore, auctions posted by sellers who have yet to establish a positive

reputation end with substantially lower average ending prices. Having no feedback lowers closing prices by approximately $14, or about one sixth of a standard deviation.

The longer an Apple iPhone auction stayed open during the sample period had no discernable impact on the closing price of the auction. While this differs from Lucking-Reiley, et al. (2004), it is likely because of the high number of Apple iPhone auctions listed, the median length of an auction was one calendar day, and the average length of an auction was approximately two days. Auctions that closed after four pm Eastern Time had closing prices that were lower by approximately $12.30, on average. Among te successfully closed auctions, 41.83% of the final bids were offered between eight am and five pm Eastern time, slightly more than would be expected if bids were uniformly distributed across all twenty four hours. Auctions that closed on Monday through Friday had closing prices between $34 and $41 more than on Sunday; auctions that closed on Saturday received the smallest boost in closing price relative to Sunday.

The results suggest that longer titles tended to command higher closing prices, consistent with the idea that consumers are willing to pay more if they have more information. The marginal impact of longer sub-titles is also positive and statistically significantly related to closing price but at a lower impact than the title. Purchasing bold font increased closing prices by $4.38, on average, having a picture increased closing prices by $5.86 on average, and purchasing the “highlight” feature increased closing price by $7.45 on average; purchasing a “featured” status on *eBay* had no discernable impact on closing prices of the auctions investigated here. These results suggest that *eBay* was and is justified in charging sellers for these additional auction characteristics.

Having determined that several auction characteristics for which eBay charged led to higher closing prices of Apple iPhone auctions leads to the obvious question of whether those sellers who purchased these additional characteristics earned a net surplus or not. In 2007, *eBay* charged sellers $1 for bold text in search results (*eBay*, 2007). The results presented in Table 3 suggest that, once controlling for selection bias, the average auction with this feature fetched a closing price that was $4.38 higher on average. Thus, in this characteristic *eBay* was not able to extract the average seller's entire surplus. A sub-title cost $0.50 at the time but the average sub-title (evaluated at the average length of 19 characters) yielded an average closing price that was $6.65 than auctions without a sub-title. A gallery picture cost $0.35 at the time but yielded an average closing price that was $5.86 greater than otherwise similar auctions that did not have this extra characteristic. In the case of the "highlight" feature, *eBay* charged $5.00 for this feature during the sample period and yet the benefit to the average iPhone auction during the sample period was $7.45, suggesting that in this dimension *eBay* was able to extract a greater percentage of the average seller's surplus.

In two areas it seems the price for an *eBay* 'upgrade" was not justified in the Apple iPhone auctions investigated herein: having a reserve price and purchasing the "featured" upgrade. A reserve price cost $2.00 for a reserve price between $50.00 and $199.99 and cost 1% of the reserve price, up to $50, for prices $200 and greater. In the sample investigated, having a reserve price did not statistically increase the average closing price and the parameter estimate is considerably lower than the expected cost of the reserve price.[5] In the case of the "featured" upgrade, for which *eBay* charged $19.95, there was no statistically significant relationship between having the "featured" upgrade and closing price. It is likely that the sheer frenzy of the Apple iPhone market immediately after the iPhone's release in the summer of 2007 contributed

[5] It is noted that *eBay* refunded the reserve price fee if the auction closed successfully.

to the lack of value for these two upgrades among the auctions analyzed here. It is entirely possible that in areas with fewer auctions and/or fewer buyers, that these upgrades provide more than their cost in terms of higher closing prices.

5. Conclusions

This paper presents an empirical analysis of how auction characteristics and seller reputation impact the closing prices of auctions selling Apple iPhones on *eBay* during June, July, and August of 2007, immediately after the release of the iPhone in the United States. We estimate a probit model that investigates whether there are systematic relationships between auction characteristics and the odds that an auction closes successfully and an hedonic model that relates auction characteristics to closing prices. The hedonic model controls for potential sample selection problems, using the first-stage analysis as a guide to how to specify the selection model.

Our analysis offers three contributions to the literature focusing on *eBay* auctions, although like most other papers we focus on a specific, homogeneous product. First, in the case of a highly active auction market, not all of the "upgrades" *eBay* offers provide a net benefit to sellers; in this sample this is true in the case of setting a reserve price and purchasing "featured" status. Second, we show that if studies focus only on closed auctions there is a potential for sample selection bias that invalidates the external validity of the results; that is, the results are conditional upon the auction successfully closing but successful closing is itself related to auction characteristics that also influence closing price. Finally, the sample shows that having a higher seller reputation is positively correlated with closing price and having no reputation lowers closing price.

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Table 1a: Descriptive Statistics
(All Apple iPhone Auctions: N=24,075)

Variable	Description	Mean	Std. Dev.	Min	Max
SUCCESS	Auction was successful	0.427	0.494	1	0
MINBID	Minimum bid required by seller	466.373	314.27	0.01	1000
BIDS	Number of bids auction received	6.052	10.068	0	130
COMPS	Number of iPhone auctions that closed on the same day	547.352	448.023	0	1262
FREESHIPPING	Seller specifies free shipping (1=Yes)	0.105	0.306	1	0
DAYS	Number of days auction was open	1.908	1.907	0	60
WEEKEND	Auction ended on Saturday or Sunday (1=Yes)	0.440	0.496	1	0
EXCLAMATION	Title or subtitle contained two or more sequential exclamation points (1=Yes)	0.260	0.438	1	0
BOLD	Auction included bold font in search results (1=Yes)	0.221	0.415	1	0
GALLERY	Auction included a picture (1=Yes)	0.495	0.499	1	0
HIGHLIGHT	Auction was “highlighted” in search results (1=Yes)	0.074	0.263	1	0
FEATURED	Auction was “featured” in search results (1=Yes)	0.002	0.046	1	0

Notes: The data describe *eBay* auctions of 8 gigabyte Apple iPhone from June, July, and August of 2007. COMPS and EXCLAMATION are determined by authors’ calculations.

Table 1b: Descriptive Statistics
(Successfully Closed Apple iPhone Auctions: N=10,286)

Variable	Description	Mean	Std. Dev.	Min	Max
ENDPRICE	Final auction price in dollars	624.655	90.589	99.99	799.99
ODDPRICE	Seller chooses odd opening price	0.404	0.491	0	1
RESERVE	Seller specifies reserve price (1=Yes)	0.102	0.302	0	1
COMPS	Number of other iPhone auctions that closed on same day	471.73	430.483	1	1262
FREESHIPPING	Seller specified free shipping (1=Yes)	0.097	0.296	0	1
USBUYER	Auction winner was located in United States (1=Yes)	0.847	0.359	0	1
TOTALFEEDBACK	Total seller feedback	440.487	1413.046	0	25859
ZEROFEEDBACK	Seller has no feedback (1=Yes)	0.017	0.132	0	1
AFTERFOUR	Auction closed after four pm Eastern time	0.486	0.499	0	1
MONDAY	Auction closed on Monday (1=Yes)	0.144	0.351	0	1
TUESDAY	Auction closed on Tuesday (1=Yes)	0.129	0.335	0	1
WEDNESDAY	Auction closed on Wednesday (1=Yes)	0.119	0.315	0	1
THURSDAY	Auction closed on Thursday (1=Yes)	0.101	0.309	0	1
FRIDAY	Auction closed on Friday (1=Yes)	0.101	0.302	0	1
SATURDAY	Auction closed on Saturday (1=Yes)	0.189	0.391	0	1
DAYS	Length of auction in Days	2.019	1.956	0	60
TITLELEN	Length of auction title (in characters)	44.884	11.639	0	55
SUBTITLELEN	Length of auction subtitle (in characters)	19.102	23.181	0	55
BOLD	Auction included bold font in search results (1=Yes)	0.246	0.431	0	1
GALLERY	Auction included a picture (1=Yes)	0.548	0.497	0	1
HIGHLIGHT	Auction was highlighted in search results (1=Yes)	0.079	0.079	0	1
FEATURED	Auction was featured in search results (1=Yes)	0.002	0.044	0	1

Notes: Data describe successfully closed 8 gigabyte Apple iPhone auctions on *eBay* from June, July, and August 2007. An auction is considered successful if the closing price was accepted by the seller. COMPS and AFTERFOUR determined by authors' calculation.

Table 2: Influences on the Probability of a Successful Apple iPhone Auction

	(1)	(2)	(3)	(4)	(5)	(6)
MINBID	-0.0003**			-0.0003**	-0.0003**	-0.0001**
	(0.0001)			(0.0001)	(0.0001)	(0.0000)
BIDS	0.0585**			0.0604**	0.0604**	0.0237**
	(0.0027)			(0.0029)	(0.0029)	(0.0011)
COMPS	-0.0004**			-0.0005**	-0.0005**	-0.0002**
	(0.0000)			(0.0000)	(0.0000)	(0.0000)
FREESHIPPING	-0.0295			-0.0280		
	(0.0292)			(0.0294)		
WEEKEND		-0.1399**		0.0001		
		(0.0167)		(0.0218)		
DAYS		0.0269**		-0.0477**	-0.0477**	-0.0187**
		(0.0044)		(0.0071)	(0.0071)	(0.0028)
EXCLAMATION			-0.0226	-0.0461*	-0.0462*	-0.0181*
			(0.0203)	(0.0224)	(0.0224)	(0.0088)
BOLD			0.1679**	0.1327**	0.1427**	0.0563**
			(0.0206)	(0.0228)	(0.0218)	(0.0086)
GALLERY			0.2384**	0.2295**	0.2277**	0.0892**
			(0.0164)	(0.0179)	(0.0179)	(0.0070)
HIGHLIGHT			0.0279	0.0585		
			(0.0325)	(0.0357)		
FEATURED			-0.0923	0.0153		
			(0.1783)	(0.1885)		
CONSTANT	-0.1370**	-0.1740**	-0.3376**	-0.1726**	-0.1738**	
	(0.0373)	(0.0146)	(0.0131)	(0.0381)	(0.0381)	
Pseudo R^2	0.177	0.004	0.008	0.186	0.186	
Observations	24075	24075	24075	24075	24075	24075

Notes: All specifications use probit estimator. The final column reports marginal impacts evaluated at sample mean using the specification in column 5. Robust standard errors in parentheses. * significant at 5%; ** significant at 1%

Table 3: Influences on the Closing Price of a Successful Apple iPhone Auction

	(1)	(2)	(3)	(4)	(5)	(6)
ODDPRICE	13.2335**				7.9053**	8.0026**
	(1.8674)				(1.8303)	(1.829)
RESERVE	0.9493				0.7802	
	(2.7902)				(2.7028)	
COMPS	0.0667**				0.0820**	0.0806**
	(0.0020)				(0.0025)	(0.002)
FREESHIPPING	13.6343**				8.5415**	8.5746**
	(2.8331)				(2.7472)	(2.747)
USBUYER	-28.1641**				-23.8558**	-23.8748**
	(2.3424)				(2.2746)	(2.274)
TOTALFEEDBACK		0.0014*			0.0014*	0.0014*
		(0.0006)			(0.0006)	(0.0006)
ZEROFEEDBACK		-39.9603**			-13.9334*	-13.1496*
		(6.6823)			(6.1399)	(6.118)
DAYS			-4.7536**		0.7433	
			(0.4599)		(0.4467)	
AFTERFOUR			-6.4277**		-12.2909**	-12.1965**
			(1.8178)		(1.6745)	(1.674)
MONDAY			3.9174		34.6814**	34.5261**
			(3.0124)		(2.8683)	(2.865)
TUESDAY			2.7844		38.5814**	38.2245**
			(3.1132)		(3.0011)	(2.993)
WEDNESDAY			-6.6468*		41.8314**	41.3571**
			(3.2607)		(3.2358)	(3.221)
THURSDAY			-11.5721**		35.4889**	35.1099**
			(3.3064)		(3.2693)	(3.259)
FRIDAY			-13.1842**		35.9068**	35.3953**
			(3.3697)		(3.3470)	(3.332)
SATURDAY			-1.7033		11.3624**	11.1025**
			(2.8232)		(2.5973)	(2.592)
TITLELEN				1.5273**	1.0997**	1.0983*
				(0.0749)	(0.0728)	(0.072)
SUBTITLELEN				0.4640**	0.3565**	0.3547**
				(0.0392)	(0.0370)	(0.037)

Table 3 (cont.): Impacts on Closing Price

BOLD				9.1631**	4.3851*	4.4302*
				(2.1588)	(2.0179)	(2.017)
GALLERY				10.7185**	5.8607**	5.8563**
				(1.8122)	(1.6936)	(1.692)
HIGHLIGHT				12.3332**	7.4505*	7.5972*
				(3.3801)	(3.1504)	(3.149)
FEATURED				12.2647	2.7007	
				(19.4849)	(18.3066)	
Constant	601.1335**	608.7177**	627.8761**	519.2607**	512.2042**	514.793**
	(2.9573)	(1.8208)	(2.8406)	(3.9398)	(5.0883)	(4.832)
H_0: No Sample Selection Problem (LR Test)	9.65**	78.57**	35.91**	138.84**	8.60**	8.10**
Observations	24075	24075	24075	24075	24075	24075

Notes: All models control for sample selection using simultaneous estimation of the selection and outcome equations. Selection equation is specified as in the last column in Table 2. Likelihood Ratio tests have one degree of freedom and test for independence of the selection and outcome equations, i.e., no selection bias. Robust standard errors in parentheses. * significant at 5%; ** significant at 1%