Presidential Memorabilia on eBay: Value, Minimum Bid, and Popularity

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ABSTRACT. The paper develops a simple theoretical framework for empirical investigation of the final price, number of bids, and whether an item sold for eBay auction data collected in 2009-2010 for presidential memorabilia items. The explanatory variables include the eBay auction variables minimum bid, seller feedback, shipping and handling, and the buy-it-now feature, as well as some political variables and a measure of popularity. One contribution of the paper is the introduction of the popularity measure to the empirical analysis. The second contribution to the literature is a very simple theoretical model that distinguishes between a "seller" and a "dealer" to make a prediction about the effect of the minimum bid on the final price. The major empirical results are that (1) the coefficient on the minimum bid in the final price regressions is between zero and one as the theory predicts, and (2) the popularity variable has an effect on the final price but only via its effect on bids. (D44, L8)

I. Introduction

The paper develops a simple theoretical framework for an empirical investigation of the final price, number of bids, and whether an item sold for eBay auction data collected in 2009-2010 for presidential memorabilia items. The explanatory variables include the eBay auction variables minimum bid,[1] seller feedback, shipping and handling, and the buy-it-now feature, as well as some political variables and a measure of popularity. The paper contributes to the literature in two ways.

First, it introduces a very simple theory that distinguishes between a "seller," a "dealer," and a "collector." As detailed later, there is a considerable literature that conflates these agents, especially sellers and dealers. We imagine them to have separate roles in any given auction. A dealer is someone with sufficient knowledge of a given market that he or she will buy an item on eBay for resale to a collector in a non-eBay transaction if the numbers make sense. The dealer knows, for example, that collector X will pay $1000 for a button from George Washington's greatcoat but doesn't have any to sell. The seller on the other hand, has

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a button to sell, knows it should bring $1000 but is selling it on eBay precisely because he or she doesn't know the identity of collector X. Collector X will always pay $1000 for a button, but only sometimes bothers to take the time to monitor eBay auctions. The probability that the collector will do so for a given auction is exogenous. The paper characterizes the expected final price of one such auction with two or more collectors; the primary theoretical prediction is that the minimum bid coefficient in the final price regressions should be between zero and one.

The second contribution of the paper to the literature is empirical, derived from the fact that our data is for presidential memorabilia items. A particular collector may have a special interest in a given president, Washington, for example. In any given auction the collector may view himself or herself as competing for the item with other collectors of the same president's memorabilia. A collector interested in Washington can calculate the proportion of Washington items listed on eBay that actually sell from information readily available on the site. The empirical analysis includes this measure, for shorthand called the president's "popularity" on eBay.

One major empirical result of the paper is that the coefficient on the minimum bid in the final price regressions is between zero and one as the theory predicts. A second result is that the popularity variable has an effect on the final price but only via its effect on bids.

There is beginning to be a significant literature on eBay auction of items that the theory of the present paper might be applied to, namely items where it might plausibly be supposed that there are dealers who have good knowledge of their value. Several papers in the literature have dealers, although their definition is not consistent between papers and our definition is not found. But in all cases, the very possibility of a dealer changes the relationship between minimum bid and final price.

Melnik, Xu, and Alm (2009) focus on the seller's choice of the minimum bid for eBay auctions of coins. Empirically, they use final price and book price to test various propositions about the minimum bid. The present paper, on the other hand, uses the minimum bid as one explanatory variable for the final price—the emphasis being on the explanation of the latter. Their theory assumes the seller has to realize a certain dollar return on the item (its "internal value") or he or she will not sell. The theory of the present paper assumes that it is a dealer, not the original seller, that must realize a certain dollar return on the

transaction or she or he will not bid. In both papers the objective of the seller is to maximize expected final price. While one of their results is that the optimal minimum bid is below the seller's internal value, in general their minimum bid is simply positively related to the item's value—they do not get the discontinuous relationship between minimum bid and value of the present paper.

Bajari and Hortacsu (2003), also considering coin auctions on eBay, argue that the minimum bid ought to be set at book value, a factor that is not considered in the present paper. They also argue that the observed practice of setting the minimum bid at significantly less than the book value "… [is] consistent with profit-maximizing behavior" (Bajari and Hortacsu, 2003, 330-331), "significantly" being 10-20% less than book value (347) . They assume that the seller is also a dealer in a brick and mortar store and has a "residual value" of the item (similar to the internal value of Melnik, Xu, and Alm (2009)) which is below book value, and that the minimum bid is set to recover this lower residual value (not set below it as Melnik, Xu, and Alm (2009) would later argue). In any event, they do not get the relationship between minimum bid and value of the present paper either.

Somewhat further afield from the present paper is the work of Friesner, Hickman, and McPherson (2009), also on eBay auctions of coins, that considers the relationship of seller, dealer, and collector—but in their setup the "dealer" is an agent who does not operate on eBay. As in the model of the present paper the collector can buy from that dealer off-eBay, but the seller (only) sells to the dealer off-eBay as well. In the model of the present paper the dealer buys on eBay and sells off-eBay. Empirically, their dealer behavior is tested introducing "dealer bid and ask prices" drawn from a guide, and the focus is on the number of auctions resulting in a sale.

Lucking-Reiley, Bryan, Prasad, and Reeves (2007) in an eBay-coin auction paper that disregards the possibilities of dealer behavior altogether note that standard English auction theory predicts that the minimum bid should have an effect on the final price only when there is a single bidder; their empirical results largely support this prediction. They focus on the effects of feedback and auction length. In papers that also neglect the possibility of a dealer, and considering the auction of baseball cards on eBay, Highfill and O'Brien (2009) investigate the question of whether the size of the deviation of the minimum bid from the book price affects the probability an item was sold, and found it does not,

while Highfill and O'Brien (2008) simply argue that various book prices *per se* have a significant effect on final price, that the minimum bid is close to the lowest of the book prices, and that minimum bids have a small positive effect on final price.

A couple of other observations may be in order. There is an extensive literature that uses eBay auction data for similar items to examine other questions. For coins, see Standifird and Weinstein (2007), Melnik, and Alm (2005), and Melnik, and Alm (2002) for feedback, and Durham, Roelofs, and Standifird (2004) for the buy-it-now feature. For cards, see Katkar and Reiley (2006) for secret reserve price and Jin and Kato (2006) for reputation and quality. For art see Gastwirth, Johnson, and Hikawa (2011) for reputation and quality and Highfill and O'Brien (2007) for common vs. private value auctions. And it is a rare empirical paper that does not consider the minimum bid at all. In fact, Hasker and Sickles (2010) in their survey of puzzles about eBay auctions assert that low minimum bids is one such puzzle; they provide various explanations for this but do not focus on the type of product of the present paper and thus on the effect of dealers.

Finally, as for the second empirical contribution of the paper, as far as the authors are aware, this paper is the first to introduce the popularity measure, the proportion of auctions for a given president that result in a sale.[2]

II. A Simple Theoretical Framework

Consider an item sold on eBay whose price is determined by the interaction of three agents. (The item is sold by auction, but the timing aspects of bidding are abstracted from in the present model as well as such factors as shipping and handling, item category, etc.) The "seller" puts the item up for auction and sets the starting price or minimum bid, P_{min}. Suppose there are at least two "collectors" who have a reservation price V for the item; this is the "value" of the item. The collectors sometimes take the time to find items on eBay; sometimes they buy directly from a "dealer" (in a transaction that does not take place on eBay). The probability that one collector bids (on eBay) for the item is p; the probability that two or more collectors bid is q. These probabilities are known in advance. For example, suppose there are two collectors and the probability that the first collector bids is 1/4 while the probability that the second collector bids is 1/3. Then the probability of one collector

bidding is $p = 1/4 * 2/3 + 3/4 * 1/3 = 5/12$ while the probability of both collectors bidding is $q = 1/4 * 1/3 = 1/12$. The probability that no collector bids is $1 - p - q = 3/4 * 2/3 = 1/2$.

The "dealer" is an agent who is not the original seller of the item, but he or she knows the market for the item well enough that he or she will buy an item on eBay and resell it to a collector in a non-eBay transaction—if the numbers make sense. It is assumed that both the seller and the dealer know the value of the item. The seller knows the bidding probabilities, but does not have any other way to sell the item. The dealer, on the other hand, is sure that he or she will be able to resell the item (not on eBay) to a collector for its value. One way to imagine this would be that the dealer keeps a brick and mortar store and has been in the business long enough to be able to predict with certainty that a collector will walk into the store and buy the item (in whatever time frame is considered reasonable). Alternatively, we might imagine that the dealer has a list of collectors he or she often works with, and is sure that some specific collector would be willing to pay the value of the item when contacted by the dealer.

The dealer needs to make enough from a given transaction to cover his or her costs, e.g., the opportunity cost of his or her time. This minimum, denoted W, by assumption is independent of the value of the item. The dealer bids on an item if and only if $P_{min} \leq V - W$. For a simple example, suppose an item has a value of \$120, and the dealer feels like he or she must make at least \$55 on the item for the transaction to be worthwhile, then he or she will bid on the item if the minimum bid is \$65 or lower. But since the seller knows both the item's value and the opportunity cost of the dealer's time, the seller never chooses a minimum bid lower than that required to get the dealer to bid, which implies that $P_{min} \geq V - W$. Therefore the minimum bid is exactly $P_{min} = V - W$; the dealer bids exactly the minimum bid and wins the auction if and only if no collectors bid.

The expected final price of the item (which is also the seller's expected revenue) is

$$E(P_1) = p(P_{min} + 1) + qV + (1 - p - q)\, P_{min}\,. \tag{1}$$

(Denote the final price in this case by P_1.) A collector always bids V, but in eBay you only pay the second highest bid plus one bid increment, assumed here to be \$1. Thus if one (and only one) collector bids against

the dealer, he or she will win the auction and pay $(P_{min} + 1) = (V - W + 1)$; the probability of this outcome is p. If at least two collectors bid against each other, the one arriving at V first wins and pays V; the probability of this outcome is q. If no collectors bid the dealer wins the auction at the minimum bid $P_{min} = V - W$ with a probability of $(1 - p - q)$. Substituting the minimum bid $P_{min} = V - W$ into the expected price equation for this case gives:

$$E(P_1) = V + p - (1 - q)\, W = (V - W) + p + qW. \tag{2}$$

To continue the numerical example, for $V = 120$, $W = 55$, $p = 5/12$, $q = 1/12$ the minimum bid is \$65 (=120 – 55) and the expected final price is \$70(= 120 + 5/12 – 11/12 ∗ 55).

Consider now the case where the minimum bid is too high for the dealer to bid on the item, i.e., $P_{min} > V - W$. The expected final price is

$$E(P_2) = pP_{min} + qV + (1 - p - q) \cdot 0.$$

(Denote the final price in this case by P_2.) In the first term one collector bids the minimum bid; in the second at least two collectors bid against each other so that the winner pays V; in the third term no one bids for the item. In this case notice that the seller would set the minimum bid such that $P_{min} = V$, i.e., to get the highest expected final price in the case that there is only one bidder. Substituting $P_{min} = V$ yields

$$E(P_2) = pP_{min} + qV = (p + q)\, V. \tag{3}$$

For example, if the value of an item is \$60, the expected price would be \$30 (= 6/12 ∗ 60).

Equations (2) and (3) are shown in Figure 1. The expected price when the dealer bids, $E(P_1)$, is the line with slope one and a positive x-intercept. The expected price when the dealer does not bid, $E(P_2)$, is the line starting from the origin with a slope less than one. The expected price lines intersect when $\hat{V} = (W(1-q) - p)/(1 - p - q))$. The decision rule for the seller is as follows. When $V < \hat{V}$ set the minimum bid at the value, $P_{min} = V$ because $E(P_2) > E(P_1)$. We will call these relatively "low" value items. In this case the dealer will not enter the auction. When $V > \hat{V}$ set the minimum bid at the value, $P_{min} = V - W$

because $E(P_1) > E(P_2)$. We will call these relatively "high" value items. For the numerical example, $\hat{V} = \$100 = (W(1-q)-p)/(1-p-q)) = 55*11/12-5/12)/(1/2))$. The minimum bids are shown by the black large dashed lines. The takeaway for the seller is that sometimes it is optimal to set a low minimum bid for a high priced item because by doing so he or she creates a situation where the dealer will bid on the item.

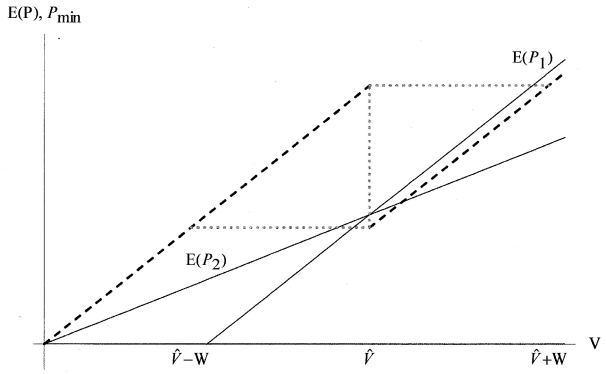

Figure 1. Expected Final Price and Minimum Bid as a Function of Value

Notice that this model predicts that a seller might well set the same minimum bid for both a high and a low value item. Figure 2 further investigates the relationship between the minimum bid and the expected final price.

Recall that in the example of Figure 1 the dividing point between low and high value items is $\hat{V} = \$100$. Thus the seller is indifferent between setting the minimum bid at \$100 with an expected final price of \$50, or setting the minimum bid at \$45 $(= \hat{V} - W)$ and getting an expected final price also of \$50. An item with a value of \$45 $(= \hat{V} - W)$ will have a minimum bid of \$45 and an expected final price of \$22.50. The minimum bid, \$45 is thus optimal for an item with a value of \$45 but also for an item with a value of \$100. The expected final prices differ between these two values, but the minimum bid does not. As mentioned, an item with value of \$100 might optimally have a minimum bid of \$100.

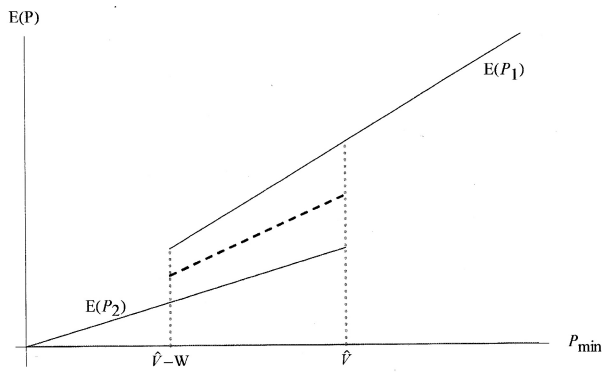

Figure 2: Expected Final Price as a Function of Minimum Bid

An item with a value of \$155 $(= \hat{V} + W)$ also has a minimum bid of \$100 $(= (\hat{V} + W) - W)$. The expected final price for the item with a value of \$155 is \$105.

Summarizing, as shown in Figure 2, for items with values between \$45 and \$100 the minimum bids range from \$45 to \$100. But for items with values between \$100 and \$155 the minimum bids also range from \$45 to \$100. Equivalently, the range of minimum bids from \$45 to \$100 is consistent both with values from \$45 to \$100 and with values from \$100 to \$155. More generally, the range of minimum bids from $\hat{V} - W$ to $\hat{V}$ is consistent with values from $\hat{V} - W$ to $\hat{V}$ and also with values from $\hat{V}$ to $\hat{V} + W$. Using Figure 2 to arrive at predictions for the empirical model, for items with a very low value, below $\hat{V} - W$, a one dollar increase in the minimum bid implies a $p + q$ increase in the expected final price. For very high value items, with values above $\hat{V} + W$ so that the minimum bids are above $\hat{V}$, a one dollar increase in the minimum bid implies a one dollar increase in the expected final price. For items with "moderate values" between $\hat{V} - W$ and $\hat{V} + W$ a sufficient condition for a coefficient between zero and 1 is for the distribution of values to be uniform. In that case the average expected final price would be the average of the two final prices (noticing that the range of values is the same between $\hat{V} - W$ and $\hat{V}$ for both $E(P_2)$ and

E(P_1)). These "average expected final prices" are shown by the large dashed line. The slope of this line is $0 < (1 + p + q)/2 < 1$.

In summary, in the final price regressions the coefficient on the minimum bid is predicted to be between $p + q$ and one.

III. Data and Empirical Model

Table 1 contains the descriptive statistics for the data set. Data was collected for 1486 items being auctioned on the eBay website during the months October 2009 through January 2010. All items were from the category Collectibles; Historical Memorabilia; Political; US; Presidents & First Ladies. We restricted our attention, however, to Presidential memorabilia. Examples include everything from signed cards, to cufflinks, to campaign buttons. For the regressions, whether the item sold, number of bids, and final price are the dependent variables respectively. The item was actually sold 43 percent of the time or in 645 auctions. The mean number of bids was 1.50 with a standard deviation of 3.32. The auction with the highest number of bids was 52. The mean of the final price was $77.57 but with a relatively large standard deviation of $631.60.

Of the independent variables, the first is the minimum bid or starting price set by the seller for each auction. The minimum bid for an auction can also be interpreted as the reserve price of an item; the mean value of this variable was $68.49 with a standard deviation of $630.31-which is very similar to the standard deviation of the final price. On average the final price to minimum bid ratio is $1.13 \approx 77.57 / 68.49$. The next three variables measure different auction characteristics. The buy-it-now (BIN) variable is binary, taking a value of one if this purchase option was available for an auction and zero otherwise. This feature allows the buyer to terminate the bidding process by paying a set price determined by the seller. Relatively few auctions, only 17%, had this feature. The next variable measured the shipping and handling fees charged by the seller. The mean for the shipping and handling fees is $4.82 with a relatively large standard deviation of $6.58. The final auction variable was seller feedback rating. The seller feedback score is calculated as the number of positive feedbacks minus the number of negative feedbacks.

TABLE 1–Descriptive Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
Sold	0.43	-	0.00	1.00
Bids	1.50	3.32	0.00	52.00
Final Price	77.57	631.60	0.01	16000
Minimum Bid	68.49	630.31	0.01	16000
Buy-It-Now	0.17	-	0.00	1.00
Shipping and Handling	4.82	6.58	0.00	150.00
Seller Rating	5516.53	11604	0.00	170885
Republican	0.42	-	0.00	1.00
Democrat	0.53	-		
Years Since Death	45.74	52.13	0.00	211
Percent Sold	0.43	0.09	0.00	1.00
Washington	0.0255	-	0.00	1.00
Jefferson	0.0026	-	0.00	1.00
Madison	0.0006	-	0.00	1.00
Monroe	0.0013	-	0.00	1.00
Jackson	0.0020	-	0.00	1.00
WH Harrison	0.0033	-	0.00	1.00
Tyler	0.0006	-	0.00	1.00
Taylor	.00134	-	0.00	1.00
Fillmore	0.0020	-	0.00	1.00
Pierce	0.0006	-	0.00	1.00
Lincoln	0.0753	-	0.00	1.00
Grant	0.0053	-	0.00	1.00
Hayes	0.0006	-	0.00	1.00
Garfield	0.0040	-	0.00	1.00
Cleveland	0.0087	-	0.00	1.00
McKinley	0.0215	-	0.00	1.00
T Roosevelt	0.0282	-	0.00	1.00
Taft	0.0121	-	0.00	1.00
Wilson	0.0161	-	0.00	1.00
Harding	0.0033	-	0.00	1.00
Coolidge	0.0047	-	0.00	1.00
Hoover	0.0107	-	0.00	1.00
FD Roosevelt	0.0430	-	0.00	1.00
Truman	0.0168	-	0.00	1.00
Eisenhower	0.0376	-	0.00	1.00
Kennedy	0.1958	-	0.00	1.00
Johnson	0.0302	-	0.00	1.00
Nixon	0.0794	-	0.00	1.00
Ford	0.0094	-	0.00	1.00
Carter	0.0390	-	0.00	1.00
Reagan	0.0847	-	0.00	1.00
GH Bush	0.0296	-	0.00	1.00
Clinton	0.0403	-	0.00	1.00
GW Bush	0.0242	-	0.00	1.00
Obama	0.1433	-	0.00	1.00

Higher values of this variable mean a seller, on net, has received a greater number of positive feedbacks which should enhance the reputation of a seller. The mean seller feedback rating was 5,516.53 with a standard deviation of 11,604. Many of the sellers in the sample have high feedback values and have sold many items on eBay.

The next four variables are specific to the president whose memorabilia is being auctioned. Forty two percent of all auctions were for Republican presidents, 53% for Democrats; the remainder being for the early parties like Federalist, Democratic-Republican, and Whig. The third variable was the number of years since the president's death. For living presidents this value was set at zero. On average, the number of years since the president's death was 45.74. The percent sold is the proportion of items of a given president that sold. For example, Kennedy, the president with the most items, had 291 items, 138 of which sold, making the percent sold 47%. On average, the percent sold was 43% so Kennedy's items had a somewhat higher proportion sold than average.

The remainder of the variables show the proportion of all auctions were of the given president's items. For example, Kennedy's items were .1958 ≈ 291 / 1486, almost 20%, of the sample. Obama was the president with the second most items, a little over 14%.

Four different regressions are specified: (1) the probability of the item being sold, (2) number of bids, (3) final price including the number of bids, and (4) final price without bids. Notice that our theory above only provides predictions for the final price regressions.

In the first regression, the auction outcome, sold or not sold, is the dependent variable. Since the variable is binary, the first regression uses logit analysis. The first independent variable is the minimum bid; in general an increase in the minimum bid should decrease the probability of a sale by reducing the range of reservation prices from which bids are drawn. The prediction for the buy-it-now option on the probability of a sale is ambiguous and depends on the buy-it-now price itself. A buy-it-now price set excessively high will decrease the probability of a sale by discouraging those bidders with relatively low reservations prices. On the other hand, a buy-it-now price set too low will increase the probability of a sale as bidders will quickly activate this option to end the auction. Increased fees for shipping and handling should decrease the probability of a sale since higher fees increase the total cost of a transaction. There should be a positive relationship between seller

feedback rating and probability of a sale, buyers being more willing to buy from a seller they trust. There are no predictions for the presidential variables but they are all being compared to Obama which is the default presidential category. Notice that percent sold is omitted from this regression to avoid using percent sold for all a president's items to explain the probability of one specific item from a given president selling.

In the second regression, the auction process variable, bids, is the dependent variable. The regression is estimated using the Poisson model for count data because the bid data is a discrete variable limited to small values. The independent variables for these regressions are the same as those used in the sale/no sale logit regression. The predicted signs for the auction variable coefficients are the same except for the buy-it-now option which should definitely decrease the number bids since any use of this option allows a buyer to preempt the bidding process. The popularity measure, the percent (of a given president's item that) sold variable should have a positive coefficient. It is not clear how the political variables or individual president dummies should affect the number of bids.

In the third and fourth regressions, the final price is investigated; one regression includes the bids variable while the other omits the bids variable. Except for the treatment of bids, the predictions for the explanatory variables in the third and fourth regressions are the same. These regressions are estimated using a left-censored Tobit. In the sample, 645 items or 43% ended in no sale which implies that the minimum bid exceeded the willingness-to-pay for these auctions. To deal with these left-censored observations, a Tobit maximum likelihood estimation technique with variable cut-offs, the minimum bid, is used. The predictions for the signs of the coefficients are similar to those in the earlier regressions. The theory suggests that the effect of a higher minimum bid should be positive but less than one. The effect of the buy-it-now variable should be negative. If the buy-it-now price is set excessively low, a buyer may quickly use this option, preempt entry by other buyers and so decrease the final price. Conversely, if the buy-it-now price is set too high, this will discourage bidding and the item will remain unsold. Shipping and handling are predicted to have a negative effect on the final price. There are no predictions about the political party variables; years since death might have a positive effect as it might increase the scarcity or value of an item; the popularity variable,

percent sold, should have a positive effect on the final price. Finally, the presidential dummies allow us to measure the value of that president's items against Obama's the default category.

In the first final price regression where the number of bids is an independent variable, an increase in the number of bids will increase the final price because more bids increase the range of reservation prices from which bids are drawn. In the second final price regression, the bids variable is not included. Though the signs for the independent variables should be the same, the interpretation of the coefficients is somewhat different. These coefficients represent the total effect of the independent variables on the final price including the variables' indirect effect via its influence on the number of bidders. Another way to interpret these coefficients is that they measure the effect of the independent variables on the bidder's willingness-to-pay.

IV. Empirical Results

Table 2 gives the results for the four regressions. For ease of interpretation and comparability marginal effects are reported for both the logit and Poisson regressions. (The regular regression coefficients are reported in the appendix.) The first column gives the marginal effects of the logit regression for the sold/not sold equation. As expected, an increase in the minimum bid significantly decreased the probability of the sale of an item of presidential memorabilia. Though its predicted effect was ambiguous, the existence of the buy-it-now (BIN) option significantly decreased the probability of an item being sold and the effect was relatively large. Also, as expected, an increase in positive feedback for sellers significantly increased the probability of an item being sold. None of the other non-presidential dummies significantly affected the probability of an item being sold. Of the presidential dummies, eight significantly affected the probability of a sale with six having a positive effect and two having a negative effect as compared to the default category for the presidential dummies, Obama. The presidents that had a positive effect were Washington, Jackson, Cleveland, Wilson, Franklin Delano Roosevelt, and Kennedy. The presidents with the negative effect were Eisenhower and the elder Bush. In absolute terms, the largest marginal effects for the presidential dummies were for Jackson, Cleveland, and Washington.

TABLE 2–Regressions

Variable	Sold or Not Sold	Bids	Final Price With Bids	Final Price Without Bids
Minimum Bid	-.001*** (-3.979)	-.01*** (-4.388)	.93*** (17.261)	.60*** (4.956)
Bids	-	-	18.97*** (24.915)	-
Buy-it-now	-.10*** (-3.259)	-2.23*** (-5.314)	-7.05 (-.708)	-83.12*** (-5.272)
Shipping and Handling	-.0005 (-.199)	.02*** (3.061)	1.51*** (3.563)	2.40*** (3.453)
Seller Feedback	.00002** (2.099)	.0001*** (3.355)	-.0001 (-.379)	.0004 (1.152)
Years Since Death	-.001 (-1.508)	.004 (1.265)	.559** (2.528)	.585* (1.752)
Percent Sold	-	3.06*** (3.471)	70.16 (1.231)	256.52*** (2.895)
Republican	.06 (.762)	.31 (1.375)	7.57 (.425)	15.359 (.603)
Democrat	-.16 (-1.027)	-.51 (-1.069)	18.99 (.612)	-40.54 (-.891)
Washington	.38** (2.309)	-1.89*** (-2.974)	-84.27** (-2.246)	-181.49*** (-3.142)
Jefferson	-.08 (-.273)	-2.17 (-1.065)	-339.227 (-.029)	-577.40 (-.030)
Jackson	.53*** (4.058)	-1.91 (-1.290)	-409.99 (-.030)	-701.06 (-.032)
WH Harrison	-.08 (-.317)	-1.51 (-1.238)	-382.82 (-.038)	-629.93 (-.039)
Lincoln	.16 (1.140)	-.05 (-.158)	-58.77** (-2.254)	-74.87* (-1.923)
Grant	.13 (.582)	1.13*** (2.635)	-35.91 (-.927)	42.11 (.766)
Garfield	.305 (1.361)	-2.08** (-2.354)	-62.76 (-1.206)	-199.81** (-2.378)
Cleveland	.39** (2.500)	-.43 (-.710)	-37.03 (-1.027)	-50.06 (-.914)
McKinley	-.03 (-.287)	-.63* (-1.817)	-32.04 (-1.112)	-90.00* (-2.112)
T Roosevelt	-.008 (-.065)	-.19 (-.580)	-54.43* (-1.944)	-80.85** (-2.041)
Taft	.21 (1.275)	-91** (-2.188)	11.83 (.380)	-61.84 (-1.310)
Wilson	.31** (2.233)	-.09 (-.250)	-17.17 (-.634)	-19.85 (-.493)

Variable	Sold or Not Sold	Bids	Final Price With Bids	Final Price Without Bids
Harding	.17 (.683)	.27 (.517)	-49.96 (-.993)	-71.77 (-.995)
Coolidge	.31 (1.485)	-.79 (-.1374)	-8.25 (-.179)	-96.12 (-1.369)
Hoover	1.6 (.964)	-.13 (-.361)	-12.67 (-.356)	-57.17 (-1.085)
FD Roosevelt	.29*** (2.790)	.26 (.874)	-4.72 (-.235)	.87 (.029)
Truman	.15 (1.180)	.93** (2.531)	-18.32 (-.661)	27.45 (.773)
Eisenhower	-.19** (-2.450)	-1.45*** (-2.936)	.93 (.032)	-67.04 (-1.573)
Kennedy	.17** (2.534)	.19 (.994)	-7.31 (-.529)	-4.75 (-.233)
Johnson	-.04 (-.504)	-.79 (-1.564)	-19.52 (-.702)	-30.42 (-.734)
Nixon	-.13 (-1.327)	-.96** (-2.478)	15.69 (.543)	-57.15 (-1.370)
Ford	.02 (.150)	-1.02* (-1.698)	33.45 (.837)	-42.09 (-.710)
Carter	.07 (.908)	-.19 (-.657)	12.42 (.705)	9.51 (.373)
Reagan	-.15 (-1.622)	-.54 (-1.429)	21.88 (.725)	-33.78 (-.781)
GH Bush	-.19** (-2.038)	.09 (.241)	-16.82 (-.474)	-35.64 (-.739)
Clinton	-.01 (-.144)	-.18 (-.629)	5.82 (.314)	-.78 (-.029)
GW Bush	-.13 (-1.082)	-.25 (-.547)	17.64 (.503)	-33.91 (-.673)
Constant	.09 (.571)	-.50 (-.912)	-174.47*** (-4.503)	-191.20*** (-3.378)
Percent correct or Log-likelihood	62.11%	-3253.267	-2113.657	-2430.171
N	1486	1486	1486	1486

For the Poisson bids equation, the results generally conformed to expectations. As predicted, an increase in the minimum bid decreased the number of bids though the effect was relatively small. Also, as expected, the availability of the BIN option significantly decreased the number of bids and the effect was relatively large. Against expectations, higher shipping and handling fees significantly increased the number of bids. Possibly, higher fees for shipping and handling signals that the seller provides better quality service. An increase in positive seller

feedback by one unit significantly increased the number of bids by a small amount. But noting from Table 1 that both the mean and the standard deviation for the feedback scores are quite large, increasing positive feedback by one standard deviation will have a much more substantial effect on the expected number of bids than, for example, increasing shipping and handling by a standard deviation. Percent sold, a measure of the popularity of a president's memorabilia, had a significant positive and large effect on the number of bids. Neither party affiliation had a significant marginal effect on bids. Of the presidential dummies, nine had a significant effect on the number of bids with two having positive effects and the rest having negative effects. Recall again that the effect of each presidential dummy is being compared to the default category Obama. The presidents that had a positive effect on bids were Grant and Truman. In absolute terms, the largest effects were those of Washington, Garfield, and Eisenhower with the other presidents having smaller effects.

The last two columns of Table 2 contain the results for the final price regressions with the third column equation including bids as an explanatory variable and the column four equation not having bids as an explanatory variable. Both of the final price regressions were estimated using left-censored Tobit. With bids included in the regressions, an increase in the minimum bid, as predicted, significantly increased the final price for an item. Notice that the coefficient is less than one which is consistent with our theory.[3] Also, as predicted, an increase in the number of bids significantly increased the final price and the effect was relatively large. Similar to the bids equation and against expectations, an increase in shipping and handling had a positive, significant effect on the final price. An increase in the number of years since the death of a president significantly increased the final price but its effect was relatively small. Of the presidential dummies, only three of the presidents, Washington, Lincoln, and Theodore Roosevelt, had a significant effect on the final price and for all three the effects were negative and large. Given that the default category was Obama, the items for these presidents sold for lower amounts than for Obama. This result is puzzling on its face, but the explanation might involve the interaction of value, frequency, and minimum bid. Recall our theory suggests that high value items sometimes have a relatively low minimum bid to entice dealers into the auction. If sellers have less experience with these presidents than with Obama and these president's items have a relatively

high value, sellers may have less expertise about the appropriate minimum bid for high valued items for Washington, Lincoln, and Theodore Roosevelt compared to Obama. Although beyond the scope of the present paper, further development of the model might focus on information gathering by sellers about dealers.

The last column in Table 2 has final price as the dependent variable but bids were not included as an explanatory variable. Recall that in this equation the coefficients represent the total effect of the explanatory variables on the final price including the variables' indirect effect via their influence on bids. An alternative way to interpret the results of this equation is that the coeffcients measure the effect of these variables on a bidder's willingness-to-pay. The results for the no-bids equation were similar to the bids equation but many of the variables in the no-bids final price equation had larger coefficients than in the bids final price equation. This indicates that some of the effects of the explanatory variables were affecting final price through their effects on bids. Examining the effect of minimum bid showed that it had a positive, significant effect on the final price. The effect was smaller than in the third regression which itself was less than one. The BIN option had a large, significant, and negative effect on the final price. On the other hand, BIN was not significant in the bids regression. Similar to the bids regression, shipping and handling had a significant, positive effect on the final price but the effect was small. Again, the number of years since the death of a president significantly increased final price but the effect was small. The percent sold variable was significant and had a very large, positive effect on the final price-while it did not in the bids equation, suggesting that the primary effect of the popularity variables was via the number of bids. In the no-bids equation, five of the presidential dummies significantly affected final price. These presidents were the same as the bids equation except Garfield and McKinley were also significant. Again, all the effects were negative and quite large compared to Obama, the default presidential category. Moreover, the effects were larger than those in the bids equation which indicates the presidential variables affected the final price, at least partially, via bids.

V. Conclusion

The paper considers the auction of items on eBay where it might plausibly be the case that for low value items the seller sets a minimum

bid at that value, but for high value items the seller sets a minimum bid below the item's value hoping to entice a dealer into bidding on the item. The resulting theoretical prediction is that the coefficient describing the relationship between minimum bid and final price should be between zero and one. The empirical estimates in the final price regressions for presidential memorabilia are consistent with this prediction. Future work might test the same theoretical prediction in other markets which have a significant presence of dealers as defined in the paper; such items might include coins, stamps, or other valuable collectables. The second innovation of the paper was to include a variable for the popularity of a particular president's memorabilia. Empirically it was found that this variable had a positive effect on bids, and thus indirectly on the final price. Future work might include this variable in the study of such collectibles as baseball cards-where the popularity of a given player might be an important determinant of auction outcomes.

APPENDIX

Table 2 in the text reports the marginal effects for the logit and Poisson regressions. The coefficients for these regressions are found in Table 3. Notice that for the logit regression the sign and significance of the marginal effects and the reported coefficients are the same for all non-presidential dummy variables. The same result holds for the Poisson regression except for the Democrat dummy which here is negative and significant.

TABLE 3–Regressions Coefficients for the Logit and Poisson Regressions

Variable	Sold or Not Sold	Bids
Minimum Bid	-.005*** (-3.701)	-.0088*** (-8.015)
Bids	-	-
Buy-it-now	-.46*** (-3.065)	-1.51** (-13.693)
Shipping and Handling	-.002 (-.207)	.01*** (4.628)
Seller Feedback	.10** (2.161)	.00009*** (5.284)
Years Since Death	-.005 (-1.295)	-.00009 (-.639)
Percent Sold	-	2.41*** (6.272)
Republican	.38 (1.077)	.11 (1.053)
Democrat	-.41 (-.692)	-.73*** (-3.689)
Washington	1.39* (1.737)	-.83*** (-3.050)
Jefferson	-.88 (-.648)	-2.93 (-.012)
Jackson	2.55 (1.623)	-1.37 (-1.345)
WH Harrison	-.42 (-.334)	-.68 (-1.070)
Lincoln	.55 (1.009)	.17 (1.036)
Grant	.26 (.315)	.91*** (4.858)
Garfield	1.19 (1.179)	-1.31 (-3.070)

Variable	Sold or Not Sold	Bids
Cleveland	1.30* (1.805)	.09 (.350)
McKinley	-.20 (-.354)	-.37** (-2.156)
T. Roosevelt	-.08 (-.151)	-.06 (-.351)
Taft	.73 (1.116)	-.65*** (-3.184)
Wilson	1.00* (1.854)	.17 (.971)
Harding	.72 (.706)	.11 (.432)
Coolidge	1.25 (1.258)	-.65** (-2.226)
Hoover	.51 (.752)	-.22 (-1.091)
FD Roosevelt	1.01** (2.572)	.36*** (2.845)
Truman	.37 (.809)	.78*** (5.073)
Eisenhower	-1.01* (-1.945)	-1.03*** (-4.480)
Kennedy	.64** (2.485)	.24*** (2.663)
Johnson	-.33 (-.874)	-.33 (-1.371)
Nixon	-.61 (-1.190)	-.85*** (-4.563)
Ford	.07 (.104)	-.96*** (-3.156)
Carter	.07 (.251)	-.07 (-.512)
Reagan	-.72 (-1.347)	-.60*** (-3.181)
GH Bush	-.88 (-1.499)	-.21 (-1.047)
Clinton	-.15 (-.501)	-.107 (-.708)
GW Bush	-.47 (-.761)	-.50** (-2.251)
Constant	.08 (.145)	-.04 (-.179)
Percent correct or Log-likelihood	62.24%	-3250.435
N	1486	1486

References

Bajari, Patrick, and Ali Hortacsu. 2003. "The Winner's Curse, Reserve Prices, and Endogenous Entry: Empirical Insights from eBay Auctions." *RAND Journal of Economics* 34(2): 329-355.

Depken, Craig A. and Brandon Gregorius. 2010. "Auction Characteristics, Seller Reputation, and Closing Prices: Evidence from eBay Sales of the iPhone." *International Journal of Electronic Business* 8(2): 170-186.

Durham, Yvonne, Matthew R. Roelofs, and Stephen S. Standifird. 2004. "eBay's Buy-it-Now Function: Who, When, and How." *Topics in Economic Analysis and Policy* 4(1): 1-22.

Friesner, Dan, Kent Hickman, and Matthew McPherson. 2009. "Remorse, Risk Aversion and Efficiency in eBay Coin Auctions." *Atlantic Economic Journal* 37(1): 117-118.

Gastwirth, Joseph L., Wesley O. Johnson, and Hiro Hikawa. 2011. "Estimating the Fraction of 'Non-genuine' Artwork by Henry Moore for Sale on eBay: Application of Latent Class Screening Test Methodology." *Journal of the Royal Statistical Society: Series A (Statistics in Society)* 174(3): 805-822.

Hasker, Kevin, and Robin Sickles. 2010. "EBay in the Economic Literature: Analysis of an Auction Marketplace." *Review of Industrial Organization* 37(1): 3-42.

Highfill, Jannett, and Kevin O'Brien. 2009. "The Determinants of Sales on eBay: The Case of Baseball Cards." *Applied Economics Letters* 16(13-15): 1421-1424.

Highfill, Jannett, and Kevin O'Brien. 2008. "Do Price Guides Guide eBay Prices: The Market for Individual Baseball Cards." *American Economist* 52(1): 58-65.

Highfill, Jannett, and Kevin O'Brien. 2007. "Bidding and Prices for Online Art Auctions: Sofa Art or Investment." *Journal of Cultural Economics* 31(4): 279-292.

Jin, Ginger Zhe, and Andrew Kato. 2006. "Price, Quality, and Reputation: Evidence from an Online Field Experiment." *RAND Journal of Economics* 37(4): 983-1005.

Katkar, Rama, and David H. Reiley. 2006. "Public versus Secret Reserve Prices in eBay Auctions: Results from a Pokemon Field Experiment." *B.E. Journal of Economic Analysis and Policy: Advances in Economic Analysis and Policy* 6(2): 1-23.

Lucking-Reiley, David, Doug Bryan, Naghi Prasad, and Daniel Reeves. 2007. "Pennies from eBay: The Determinants of Price in Online Auctions." *Journal of Industrial Economics* 55(2): 223-233.

Melnik, Mikhail I., and James Alm. 2002. "Does a Seller's Ecommerce Reputation Matter? Evidence from eBay Auctions." *Journal of Industrial Economics* 50(3): 337-349.

Melnik, Mikhail I., and James Alm. 2005. "Seller Reputation, Information Signals, and Prices for Heterogeneous Coins on eBay." *Southern Economic Journal* 72(2): 305-328.

Melnik, Mikhail I., Yongsheng Xu, and James Alm. 2009. "The Choice of Opening Prices on eBay." *Manchester School* 77(4): 411-429.

Standifird, Stephen S., and Marc Weinstein. 2007. "The Transaction Cost Economics of Market-Based Exchange: The Impact of Reputation and External Verification Agencies." *International Journal of the Economics of Business* 14(3): 409-431.

Endnotes

1. The "minimum bid" is the starting price of an item set by the seller and known to potential buyers. Although eBay allows sellers to set a secret reserve price this option was not used by any seller in our data.
2. This popularity measure is only for items sold on eBay, not for example, for items sold at other venues such as swap meets. Depken and Gregorius (2010) have a daily popularity measure in a context of sales of the same item while ours is a sample-wide popularity measure.
3. As a robustness check of this result we also ran a final price regression with the predicted bids from the Poisson regression instead of the actual bids. The coefficient on the minimum bid variable is still between zero and one.