Tractors on eBay and Farmers and Consumers Market Bulletin: An Analysis on the Determinants of Price and Price Differences

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Abstract

We investigate the determinants of price for tractor auctions on eBay and tractors that are listed on Farmers and Consumers Market Bulletin (FCMB) in Georgia. Surprisingly, seller reputation is not an important factor while engine hours and the presence of air conditioning appear to influence price on eBay auctions. On average prices for tractors that sold on eBay are not different than those on FCMB. The analysis also suggests that farmers may benefit from the use of online venues.

Keywords: Internet auctions, farm machinery, local listings.

JELCodes: D82, L14.

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Introduction

The birth of internet has spurred an unprecedented growth on online business sales during the last decade. The largest online site, eBay, had gross total sales of $748 million in 1999 which rose to $60 billion in 2008. A large variety of products are sold on eBay with prices ranging from pennies to hundreds of thousands of dollars. However, despite its obvious advantages, a big disadvantage is that buyers cannot physically inspect the items before purchase, forcing buyers to rely more on seller reputation. Naturally, there has been substantial research on eBay looking at the relationship between price and a variety of covariates such as seller's feedback rating, time when auction ends, quality of pictures, day of the week etc.,(e.g. Houser and Wooders , 2006; McDonald and Slawson , 2002; Melnik and Alm, 2005; Andrews and Benzig, 2007). These studies have examined a diversity of products such as U.S. silver Morgan dollar coins (Melnik and Alm, 2005), Pentium III processors (Houser and Wooders, 2006; Anwar et al., 2006), Harley-Davidson Barbie dolls (McDonald and Slawson, 2002), used cars (Andrews and Benzig, 2007) etc. Online commerce has also expanded agricultural markets especially with respect to agricultural inputs such as seeds, farm machinery, etc. However, to date, with the exception of Diekmann, Roe and Batte (2008) who looked at the price differences on tractors sold on eBay and tractors sold through in-person auctions, there have been no other studies on online agricultural markets. Clearly, online markets differ from more traditional local markets which rely mainly on postings on local newspapers, magazines

and market bulletins provided by the agricultural state departments. The Farmers and Consumers Market Bulletin (FCMB) in Georgia for example has been around for 89 years and has provided a medium of exchange between local buyers and sellers for a wide variety of agricultural inputs and outputs. These two types of markets outlets differ in two fundamental ways; the way price is determined (auctions vs. price negotiation) and the mode of interaction between buyers and sellers (internet vs. telephone/in person).

Online auctions provide new opportunities for both buyers and sellers of farm machinery. Many farm machinery equipment dealers and individuals list their products on line. As internet use is growing among rural areas questions arise on the costs and benefits of using traditional markets and online markets. This study investigates several aspects of these two types of markets. First we examine the main determinants of prices for tractors offered on eBay taking into consideration seller reputation and whether the seller is a professional dealer or an individual. Second we investigate the factors that affect the probability of sale on eBay and FCMB. Finally we investigate whether prices received on eBay are comparable to those on Georgia's FCMB. The rest of the paper is organized as follows. Section two provides a description of the characteristics of eBay tractor auctions and tractor listings on FCMB. The third section describes the data and the methodology used. Results are discussed in the fourth section and concluding remarks are provided in section five.

eBay Motor Auctions and FCMB listings

Any individual or dealer can list a tractor for sale on eBay. The sellers are required to choose the length of the auction (usually up to 10 days) and they can also specify a

minimum price, a reserve price and also a 'buy it now' option where potential buyers can buy the item without bidding. eBay uses a proxy bidding system so that bidders can bid as high as they want but the current bid registered is higher than the current highest bid by just a minimum bid increment. The highest bidder wins the auction and pays the price of the second highest bid plus the minimum increment.

After the sale is completed the winning buyer and the seller can leave feedback rating on each other. This is the mechanism by which sellers and buyers gain their reputation on eBay and reduce some of the asymmetries that arise when buyers are not able to physically inspect the item that they purchase. This information is accessible to all and at anytime both buyers and sellers can check the feedback rating score (the number of positive feedback ratings +1 plus the number of negative feedback ratings -1 and neutral feedback ratings 0) and also their reputation (percentage of positive feedback rating).

eBay also provides warranty against some type of fraud which may be generated by posting misleading information from sellers. In June 2005 eBay introduced the business equipment purchase protection program which includes farm equipment and provides protection of up to $20,000 against certain losses associated with seller fraud and undisclosed defects. eBay does not charge a listing fee (for the first 4 motor vehicles listed within 12 months) but charges a successful insertion fee (when you receive your first bid on a listing without a reserve price or when your reserve price is met) of $125. An insertion fee of $20 is charged with the 5^{th} motor vehicle listing within 12 months. There is $7 charge for reserve price and there are also other small fees for additional

photos and advertisement quality enhancing features. There is no charge when there are no bids on an item or when the bids are lower than the item's reserve price.

Georgia's FCMB is a more 'local' venue as it provides listings only within the state of Georgia. The listings on FCMB are free and the bulletin is printed weekly since 1920 and biweekly since 2003. Items can be listed for up to two editions (28 days) and farmers who subscribe get a free print out and they can also check out the listings for free online.

Data and Methodology

We use two datasets in this study. The first dataset was collected by hand and contains 359 observations from tractors listed on eBay between April and September 2009. A 500 miles radius was applied to the eBay tractor listings from the city of Macon which is located in the middle of the state of Georgia. Only the auctions that received at least one bid were recorded. The second dataset has 117 observations collected through phone interviews with individuals who listed tractors on FCMB in Georgia during the same time period. A total of 300 farmers were called during that period.

The variables collected from eBay and FCMB can be divided into three main categories; seller, auction and tractor characteristics. Seller characteristics include feedback rating, reputation and whether the seller is a dealer. Auction characteristics include starting price, duration of the auction in days, number of bidders, number of bids, presence of a reserve price, whether the auction ends after 5pm, whether it ends on weekend and whether the tractor is sold or not. Tractor characteristics include make,

model, year, horse power, working hours, whether the tractor has air conditioning and whether it is a two or a four-wheel drive.

The eBay dataset provides additional information on seller feedback rating, number of bidders and bids received while data from the FCMB provides information on seller location as well as buyer location in some cases. During the phone interview farmers that listed their tractors on FCMB were asked for the lowest price that they would accept for the sale of the tractor. Farmers were also asked whether they were willing to post online but only two out of fourteen farmers who answered said they were willing to, and only one indicated that he/she also uses tractorhouse.com to advertise. Almost all of them mentioned that they prefer to advertise locally. A description of the variables is provided in table 1.

From the original sample, 34 percent and 23 percent of the listings resulted on a sale on eBay and FCMB, respectively. After dropping observations that did not provide any information on one or more of the variables of interest, the observations in the final samples are reduced to 208 for eBay and 60 for FCMB.

Three regression models are used to investigate the determinants of price of tractors for these two outlets and what affects the sale of a tractor in each outlet. The dependent variable in the first regression model is the final price and the independent variables include seller, retail value from the tractor blue book, tractor and auction characteristics. The retail value from the tractor blue book is included to account for differences based in the year and specific model of the tractor.

The first regression model has two specifications; one that includes all auctions on eBay and the other only the auctions that resulted in a sale. The second regression is a

logit model where the dependent variable is whether the tractor sold or not, and the independent variables are tractor characteristics for the FCMB sample and the same independent variables as in the first model for the eBay sample. In the third model we use a tobit regression where we include all auctions from eBay and FCMB. The dependent variable in the third model is *Saleprice* which is equal to the sale price if the tractor actually sold in either market (or zero if it did not sell) and the independent variables are tractor blue book value, engine working hours, the presence of air conditioning and a dummy variable for eBay auctions. The coefficient in front of the eBay dummy variable will indicate if prices received on eBay are significantly different from those received on FCMB.

Several variables are expected to influence the final price of tractors on eBay. Quite a few studies on internet auctions have found that seller reputation has a positive and significant effect on final price (e.g. Ba and Pavlou 2002, McDonald and Slawson 2002, Houser and Wooders 2006). However, there are studies that have found no significant positive effect of reputation on price (e.g. Melnik and Alm 2005, Resnick and Zeckhauser 2002). The time auction ends is also expected to influence final price. McDonald and Slawson (2002) found that auctions of limited edition Barbie dolls ending between midnight and 4 am received lower prices. Andrews and Benzing (2007) found that eBay car auctions ending after 5 pm receive higher prices. Lucking-Reiley et al. (2007) found that collectible penny auctions ending on a weekend gain higher final prices. Final prices in their study were also positively related to the length of auction, minimum bids and the presence of a reserve price.

With respect to tractor characteristics Diekmann, Roe and Batte (2008) find a positive relationship between the price, auctions ending on a weekend and tractor horse power and a negative relationship between engine hours and price. However their study does not control for sellers' feedback rating and other online auction characteristics and focuses more on the price difference for used tractors sold on eBay and in-person auctions.

Results

Coefficient estimates on the determinants of prices on all eBay auctions are presented in the first and the second column of table 2. The only difference between the first and the second column is the inclusion of dummy variables for tractor makes. The starting price appears to influence the final price received on eBay. The coefficient of *startprice* has a significant positive effect at above 99 percent level. The magnitude suggests that an increase by $1 in the starting price generates on average an increase of 29 cents in the price received on eBay. The coefficient of *Bbookprice* is 0.5 and significant at above 99 percent level suggesting that prices on eBay are lower than those specified by the tractor blue book. In addition, auctions with a reserve price receive on average $1,545 more than auctions with no reserve.

Seller reputation variables are not statistically significant in these specifications.[1] This may be due to the fact that the tractors on eBay are covered by a $20,000 business equipment protection warranty against fraud. In fact, out of 67 tractor auctions that resulted in a sale on eBay, only 9 auctions ended in prices higher than $20,000. The other

[1] We also tried alternative specifications such as log log, quadratic terms, etc. However, the main results did not change.

variable that is part of seller characteristics is whether the seller is a dealer or an individual which does not seem to influence tractor price.

Among variables that describe auction characteristics only the number of bids appears to influence final price. The coefficient of *Bids* is statistically significant above the 99 percent level. One additional bid generates on average an additional $150 dollars on the final price.

Engine working hours (*Hours*) and the presence of air conditioning (*AC*) included in the regression influence final price at above the 99 percent level. One additional hour lowers the final price by 83 cents. The magnitude of *AC* suggests that tractors with air conditioning receive on average final prices that are $2,915 higher than prices of tractors with no *AC*. *Weekend* and *After5pm* do not influence price.

The regression model in the second column of table 2 includes dummy variables for the tractor makes. Coefficient estimates are very similar to the ones in the first column. However, interestingly the coefficient of *Dealer* is negative and significant and suggests that dealers receive prices that are on average $1,429 lower than the prices received by private individuals. This is surprising when contrasted to Andrews and Benzing (2007) who examine eBay auctions for used cars and find that dealers receive higher prices compared to individuals that sold their cars on eBay. Coefficient estimates in front of the tractor make should be interpreted relative to *AChalmers* tractors which are the control group.

Several differences appear when the regression model includes only the auctions that resulted in a sale. First, *startprice* does not have a significant effect on price. Second, the presence of a reserve price does not generate higher prices. Finally the coefficient of

Dealer is significant at above the 95 percent (as opposed to above the 90 percent level in the previous specification) and its magnitude indicates that dealers receive on average $2,406 less than private individuals. However, results here should be interpreted with caution as the analysis involves only 67 auctions that resulted in a sale.

There are several factors that affect the probability of sale in each outlet as indicated in the fourth and fifth column. The coefficient of *Startprice* is positive and significant but has a very small effect on the probability of sale. Surprisingly, auctions that last for 10 days have a lower probability of sale than tractors that last for 3 days (the control group). Usually studies (e.g. Lucking-Reiley et al. 2007) have found a positive and significant relationship between the length of the auction and price and no significant negative effect. As expected, a higher number of participants increases the probability of sale for a tractor. Results from the FCMB sample suggest that John Deere, Kubota, Massey Fergusson and Long tractors have a higher probability of sale.

Finally we investigate how do prices on eBay and FCMB differ. The last specification reveals that prices generated on eBay for those tractors that sold is not statistically different from those tractors sold on FCMB. This finding is different from the findings of Diekmann, Roe and Batte (2008) who found significant differences between tractor prices on eBay and similar equipment sold on in-person auctions with eBay auctions generating significantly lower prices. However, they did not find differences for tractors fully covered by eBay's buyer protection program.

We make another attempt to compare the tractors on eBay and FCMB and try to draw inferences about potential prices that could be obtained by farmers that use only FCMB to sale their tractors. The question we try to answer is whether some of the

tractors on FCMB may receive prices equal to or higher than the lowest price that sellers are willing to take if they posted their tractors on eBay. In order to answer this question we compare tractors of exactly the same, year, make and models and also account for differences in other tractor characteristics (e.g. engine hours) that appear to influence price on eBay.

One factor that plays an important role in tractor sales is the distance between the seller and the buyer. For example buyers cannot physically inspect tractors that are 'too' far. Furthermore they also have to pay relatively large amounts for shipping even if they choose to buy the tractor. In our FCMB sample we asked the sellers who sold their tractors about the location of the buyer. The average distance between buyers and sellers for those tractors that actually sold on FCMB was 50 miles. Obviously, distance also plays a role here, as we cannot compare tractors listed on FCMB with tractors listed on eBay that are thousands of miles away, but our eBay sample includes tractors listed within 500 miles from the middle of Georgia. Thus, we compare similar tractors that are sold within what we deem a 'reasonable' distance. First tractors of the same make and model were selected and a total of 65 matches were found. We dropped those matches where one of the tractors did not have information on engine hours and the presence of air conditioning. That left us with 34 matches. The average distance between seller location on eBay and seller location on FCMB was 414 miles with a standard deviation of 169 miles. To account for the differences in engine hours and the presence of air conditioning we borrow the coefficients from model 1. We also subtract the fees that eBay would charge if farmers from the FCB would list their tractors on eBay. This exercise resulted in 10 matches where the eBay prices were at least equal to or higher

than the initial asking price on FCMB for the same tractor. Two out of the 10 tractors that matched were already sold on FCMB but the remaining 8 account for more than 50 percent[2] of the tractors that were actually sold on FCMB. The mean of the price difference was $3,347. Although not enough data are available to draw further inferences and employ proper matching estimators, this simple exercise suggests that farmers may benefits by using eBay as a potential outlet for their tractors.

Concluding Remarks

As more and more agricultural inputs are traded on internet based markets, research is necessary to explore the main determinants of price in these 'new' venues. We investigate tractors that are listed on eBay and find that seller feedback rating does not influence price while engine hours and the presence of air conditioning are negatively and positively related to price, respectively. Individuals that list tractors on eBay receive higher prices on average than dealers. In addition tractor auctions that result in a sale on eBay on average do not exhibit prices different from those tractors that sold on FCMB.

Traditional markets such as FCMB in Georgia are still widely used. However, one on one matching suggests that in several cases there may be opportunities for farmers who list on FCMB to get prices that are equal to or even higher than their lowest acceptable price if they listed their tractors on eBay. According to USDA only 8 percent of the farmers in Georgia that have internet access use it to conduct agricultural market activities (USDA-NASS, 2009). Online auctions appear to be favorable for those farmers that seek to sell farm machinery. Thus encouraging more internet usage and introducing

[2] Out of 60 observations in the final sample from FCMB, 14 resulted in a sale.

training programs on online agricultural markets may prove to be beneficial for farm households.

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Table 1. Variable Description

Variable	Description	eBay	FCMB
Startprice	Starting price	4717.355 (7966.591)	
Endprice	Ending Price	13162.63 (10732.96)	
Bbookpr	Tractor blue book price	15947.48 (14230.15)	
Resvprice	=1 if there is a reserve price	0.716 (0.4518)	
Sold	=1 if sold	0.322 (0.468)	0.228 (0.422)
Dealer	=1 if seller is a dealer	0.485 (0.501)	
Fdbkrating	Seller feedback rating	458.870 (1109.518)	
Pctposrating	Percent positive feedback	92.805 (24.181)	
Bidders	Number of bidders	8.562 (4.187)	
Bids	Number of bids	17.605 (9.109)	
After 5 pm	=1 if auction ends after 5pm	0.606 (0.489)	
Days3	=1 if auctions lasts 3 days	0.206 (0.405)	
Days5	=1 if auctions lasts 5 days	0.153 (0.361)	
Days7	=1 if auctions lasts 7 days	0.576 (0.495)	
Days10	=1 if auctions lasts 10 days	0.216 (0.412)	
Weekend	=1 if auction ends on weekend	0.278 (0.449)	
HP	Horse power	81.658 (41.127)	68.859 (51.877)
Hours	Engine working hours	2834.395 (2605.489)	1948.733 (2288.177)
4WD	=1 if four wheel drive	0.478 (0.501)	0.353 (0.482)
AC	=1 if air conditioning is present	0.432 (0.496)	0.242 (0.432)
JohnD	=1 if make is John Deere	0.471 (0.500)	0.433 (0.499)
Kubota	=1 if make is Kubota	0.072 (0.259)	0.083 (0.278)
MasseyF	=1 if make is Massey Fergusson	0.096 (0.295)	0.066 (0.257)
NewH	=1 if make is New Holland	0.096 (0.295)	0.052 (0.225)
Case	= 1 if make is Case	0.048 (0.214)	0.035 (0.185)
Case_IH	=1 if make is Case International	0.033 (0.180)	0.052 (0.225)
International	=1 if make is International	0.038 (0.192)	0.050 (0.219)
Ford	=1 if make is Ford	0.086 (0.281)	0.066 (0.251)
Long	=1 if make is Long	0.009 (0.097)	0.033 (0.181)
Versatile	=1 if make is Versatile	0.004 (0.069)	
Zetor	=1 if make is Zetor	0.010 (0.098)	
Mahindra	=1 if make is Mahindra	0.014 (0.119)	0.033 (0.181)
McCormick	=1 if make is McCormick	0.005 (0.069)	0.050 (0.219)
Deutz	=1 if make is Deutz	0.005 (0.069)	0.016 (0.129)
Farmtrac	=1 if make is Farmtrac	0.005 (0.069)	
Century	=1 if make is Century	0.004 (0.069)	
AChalmers	=1 if make is Allis Chalmers	0.033 (0.180)	
Lowestprice	Lowest price willing to accept		17663.33 (15774.85)
	Number of observations	208	60

Table 2. Determinants of price for used tractors on eBay and FCMB.

	eBay (All Auctions)		eBay (Auctions with tractors that sold)	eBay (All Auction)	FCMB (All Auctions)	Ebay and FCMB
Dependent Var.	Endprice	Endprice	Endprice	Sold	Sold	Saleprice
Independent Var.						
Startprice	0.298*** (0.068)	0.256*** (0.067)	-0.036 (0.142)	0.000*** (0.000)		
Bbookpr	0.535*** (0.0351)	0.559*** (0.038)	0.563*** (0.079)	-0.000* (0.000)	-0.000 (0.000)	0.138 (0.097)
Resvprice	1545.284* (808.074)	1427.309* (793.099)	1609.704 (1614.713)	0.169 (0.121)		
Ln(Fdbkrating)	-16.185 (223.951)	20.567 (222.988)	113.806 (303.401)	0.169 (0.121)		
Ln(Pctposrating)	153.007 (327.696)	138.357 (320.398)	-629.116 (554.981)	0.058 (0.190)		
Dealer	-914.469 (703.595)	-1429.62* (688.695)	-2406.693** (1164.533)	0.337 (0.395)		
Bidders	168.019 (133.969)	94.781 (134.601)	-126.326 (185.9261)	0.217*** (0.076)		
Bids	150.955*** (56.173)	160.992*** (56.514)	144.743*** (81.998)	0.009 (0.031)		
After 5 pm	-599.542 (698.056)	-708.649 (694.744)	575.449 (1132.441)	0.473 (0.401)		
Days5	-861.180 (1674.821)	-548.865 (1647.895)	-1218.076 (2743.365)	-0.873 (0.894)		
Days7	-1604.769 (1518.320)	-1239.132 (1501.641)	-82.942 (2183.405)	-0.477 (0.788)		
Days10	-687.401 (1658.237)	-719.1383 (1642.139)	2613.796 (2648.841)	-1.648* (0.900)		
Weekend	-21.541 (737.861)	-71.159 (738.146)	746.616 (1160.643)	(0.266) (0.400)		
Hours	-0.837*** (0.141)	-0.758*** (0.146)	-0.652** (0.263)	-0.000 (0.000)	-0.000 (0.000)	-0.558 (0.621)
AC	2915.744*** (770.473)	3252.765*** (785.430)	2964.071** (1439.583)	-0.054 (0.445)	0.894 (1.188)	1033.663 (3411.475)
JohnD		2006.416 (2328.956)	4322.152 (3714.957)	-0.132 (1.289)	17.336*** (1.570)	
Kubota		1139.884 (2536.235)	3753.609 (3784.571)	0.920 (1.384)	19.835*** (1.896)	
MasseyF		-432.435 (2474.604)	1014.889 (4111.667)	0.511 (1.364)	16.829*** (1.883)	
NewH		424.437 (2493.926)	4490.636 (4260.428)	-0.798 (1.431)		
Case		-135.029 (2676.021)	2369.636 (4495.1)	0.870 (1.440)		
Case_IH		776.154 (2869.820)	1073.254 (4368.839)	0.826 (1.540)		
International		-1144.457 (2932.552)	1720.663 (4654.84)	-0.314 (1.646)		
Ford		-303.878 (2549.878)	1040.364 (3943.136)	-0.258 (1.417)		
Long		4013.450 (3923.165)			18.211*** (2.086)	
Versatile		-3116.891 (5059.646)				
Zetor		1374.154 (3903.123)	3521.497 (4305.083)			
Mahindra		-6938.074 (5271.963)				
McCormick		-24241.550*** (6678.597)				
Deutz		-6003.566 (6254.383)				
Century		-5894.701 (6318.624)				
Ebay						4099.245 (3446.458)
Constant	561.558 (2214.689)	4914.875 (5042.431)	2238.304 (5054.870)	-3.284** (1.642)	-17.796*** (1.584)	-14292.51*** (3711.316)
N	208	208	67	200	60	278

*, **, *** significant at the 90%, 95% and 99% level, respectively.