Buying and Selling Tractors on eBay: Differences from In-Person Auctions

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Few sounds capture the rhythm of agricultural economies better than the syncopated cadence of an auctioneer echoing across a clutch of farmers gathered around the auction block. This seemingly timeless portrait of economic exchange in rural America has changed, however, as advances in technology alter the way auctions are conducted. The advent of telephone bidding, video links and, more recently, internet bidding platforms change the nature of auctions by broadening the pool of potential sellers and bidders. As the commercial success of eBay and other online auction sites suggest, the internet provides many possible advantages over in-person auctions. Internet auction sites provide extensive listings and powerful search technologies, which can create markets for specialized product categories, even when buyers and sellers are geographically dispersed. This issue is particularly important for U.S. agriculture because, as production becomes increasingly concentrated among fewer entities, the number of potential bidders within a given radius of any particular location continues to diminish.

A key strength of the internet – the pooling of bidders from geographically dispersed locations – can also be a weakness, as distance removes a critical advantage of in-person auctions, i.e., bidders directly inspecting merchandise. While some internet sites that hold agricultural equipment auctions attempt to directly offset this weakness by providing inspection services (e.g., www.IronPlanet.com), the most widely used internet auction site, eBay, does not provide such up-front risk mitigation services. eBay does other things, however, including the posting of reliability ratings of individual sellers and the use of on-line photos and videos that allow buyers to inspect aspects of goods from a distance. Starting in June of 2005, eBay also began offering its *Buyer Protection Plan*, an after-the-fact risk mitigation service to business equipment purchasers in the form of a fraud protection policy that refunds buyers' outlays up to $20,000 for business equipment (including farm equipment) sold by eBay sellers in the case of seller fraud or undisclosed equipment defects.

KEY QUESTIONS

As online sales of farm equipment become more widespread, questions arise about the nature of price determination in online versus traditional markets. We present empirical evidence from recent auctions for used farm tractors conducted on eBay and via in-person auctions. We are interested in several questions. Do eBay and in-person auctions yield similar average prices for comparable equipment? Second, what influences whether tractors are offered for sale on eBay versus in-person auctions? Then, we want to take a step back and ask, what kind of tractors are being offered for sale on eBay and which ones are actually getting sold, i.e., generating bids that surpass reserve prices? In this installment we focus on the first question: does comparable equipment sell for the same on eBay and in in-person auctions?

DATA

To answer this question we use data from internet and in-person used tractor auctions conducted between June 1, 2005 and March 31, 2006 in 11 Midwestern states (IA, IL, IN, KS, MI, MN, NE, ND, OH, SD, WI). The internet sample was purchased through eBay's service provider program. The data includes information about auctions that took place in eBay's "Tractor and Farm Machinery" category, including the final sales price, make, model, engine horsepower, year, hours of use, auction date, seller zip code, and other information describing the auction items and the nature of the auction. The in-person auction data was purchased from Machinery Pete's Farm Equipment FACT's Report, which summarizes results from retirement, estate, dealer and consignment auctions reported by a network of more than 600 auctioneers. The FACT's information includes sales price, make, model, engine horsepower, year, hours of use, auction date and location (region within a state), and other descriptive information. The data do not represent the entire universe of used tractor transactions for the Midwest during this period, as other internet auction sites regularly transact tractors and some auctioneers may not report to the FACT's Report, but this likely represents a wide, representative sample from the universe of used tractors.

Several filters were applied to each data set to arrive at a sample used for analysis. For both samples, tractors with model years earlier than 1960 were excluded to focus on tractors that were most likely purchased for operational rather than collectible purposes. Also tractors of 30 horsepower and less were excluded to focus on tractors most likely to be used in agriculture rather than nursery or landscape operations. Items that were classified by the seller as "for parts" or "not running" and items that were sold with expensive additional implements such as backhoes were excluded. Items with less expensive implements such as loaders or mowers were included. Finally, the data set was also limited to the 13 manufacturers (makes) that contributed more than 89 percent of sample observations (John Deere, International Harvestor, Massey Fergusson, Ford, Case, CaseIH, New Holland, Ford-New Holland, Allis Chalmers, Oliver, White, Versatile, and Belarus). The complete data set (see table 1 for summary statistics) included 588 eBay observations (about 30% of all observations) and 1,770 in-person observations for a total of 2,358.

APPROACH

The way we approach answering our key question is to find the statistical relationship between the price of a used tractor and its key attributes like horse power, hours, age, manufacturer and transmission type. This is known as the *hedonic modeling* approach. We use the data and some statistical techniques to develop this relationship for both tractors sold on eBay and in in-person auctions. We then predict each tractor's sale price for both auction venues (eBay and in-person), apply the relevant commissions and calculate the difference.

We'll note a couple things about commissions. eBay commissions for business and industrial capital equipment sales are 1% of the final sale price with a maximum charge of $250, a $20 listing fee, and a variety of optional fixed-fee listing enhancements

(e.g., bold lettering) targeted to improve item visibility among potential bidders (we assume $55 in additional fees).

In-person auctions feature commissions that typically range from 2.5 percent to 15 percent, often with no limit on the maximum total commission paid. To the best of our knowledge, detailed information concerning the average commission structures for U.S. farm equipment auctions is not available, though industry sources suggest that the bulk of commissions fall in the five to ten percent range. The data provided to us from the FACT's report does not include information concerning the commission or fees charged. As a point of reference, we list the commission structure of an internet-based auction house, IronPlanet.com, which provides features similar to that of an in-person auction company, including equipment inspection and lien searches. This firm features a block-rate commission structure outlined in table 2. We also assume each sale costs an additional $450 in fees. The eBay – in-person difference between the total commissions paid for various sales prices can vary dramatically; the difference for a $1,000 item is about $100 and the difference for a $100,000 item is more than $6,000.

In table 3 we list six example calculations for the predicted price in each sale venue, the difference in net sales revenues between the two venues, and the size of the in-person commission that would make eBay and in-person auctions yield the same net sales revenue. We also provide the average and median across all tractors in the sample and for all tractors that sold for less than $20,000 and, hence, would be covered by eBay's *Buyer Protection Program*.

The results are quite stark. The median tractor (i.e., half of the tractors sold for a price less than this tractor, the other half sold for more) was predicted to sell for $7,706 on eBay and for $10,996 at an in-person auction. Once the typical commissions and fees are deducted this results in a $2,197 more from an in-person sale. In fact, the commission on the in-person auction would need to rise to 31.3% before both venues would offer the same predicted level of net sales revenues. We do not adjust for the differences in other costs that accompany a sale in each venue. For example, at an in-person auction, the seller must transport the tractor to the sale location, which could erode the perceived advantage of in-person auctions with regard to net revenues as eBay sellers need not transport the item to a central location. On the other hand, eBay sellers may incur costs associated with internet technology, including the cost of the computer, internet hook up, and any charges for taking digital photos or videos to post on the eBay sale site, though many of these costs may be quite small if the seller already is engaged with internet activities.

The average tractor in the sample is predicted to sell on eBay for less than half the price it is predicted to fetch at an in-person auction. In fact, all three of our example tractors in the top half of table 3, which are predicted to sell for more than $20,000 at an in-person auction, are predicted to sell for considerably less on eBay. For example, the Case-IH tractor is predicted to generate $23,367 less if sold on eBay than if sold at an in-person auction.

Once we move to the smaller, older, lesser-valued tractors depicted in the bottom half of table 3, we see that the eBay discount persists but is diminished. Recall, all these tractors would be covered by eBay's *Buyer Protection Program* as each is predicted to sell for less than $20,000. The net sales revenues for the median tractor in the 'under $20,000' sample are only $489 less if sold on eBay, though this still translates to the idea

that an in-person auctioneer could charge a 26.1% commission and still generate similar net sales revenues. However, at this point, the added costs of transporting the item to the sale and the inconvenience with such transportation may begin to grow closer to the $489 bump in revenue promised by the in-person sale. In fact, for 2 of the 3 example tractors in the bottom half of table 3, eBay generates higher net sales revenues, including $1,416 more for that 43-year-old Allis Chalmers D17 with a front-end loader.

Another more straightforward way to verify if the two auction venues are generating similar prices is to simply compare the price for a single used tractor model that is frequently sold in both outlets. The most commonly sold used tractor in this data set is the John Deere 4020. More than 57,000 units of this tractor were produced by John Deere at its Waterloo, Iowa, factory between 1963 and 1971, making it one of the most common models ever produced in U.S. agriculture. Our data set includes the sales price of 83 units, including 23 sold via eBay. The in-person and eBay 4020's had statistically similar profiles with respect to age, hours, presence of ancillary implements, reliance upon diesel fuel and horsepower, though about 13 percent of the eBay 4020's feature manual transmission while none in in-person auctions list this feature (if we leave these tractors out, it doesn't change our results). So, other than the difference in transmission types, eBay and in-person offerings of the 4020 appear to quite similar with regard to their attributes. (We would have liked to do this with more models, but there weren't other models with enough sales in both venues to provide a statistically rigorous test).

The mean in-person auction price ($8,212.50) is quite close to that of the eBay sample ($8,166.37). Several statistical tests suggest that the two venues yield the same sales price for this venerable tractor. Hence, in-person and eBay auctions provide similar prices for the John Deere 4020's sold in the Midwest during this time frame. This provides some additional evidence of convergence in average sales prices for used tractors that sell for less than the upper limit of eBay's consumer protection policy.

SUMMARY

Markets for durable and non-durable agricultural inputs are being altered by the emergence internet-based trading venues. We explore differences between internet and traditional markets for used tractors using data from eBay and in-person used tractor auctions. We find the average price received in eBay auctions is substantially lower than that received in in-person auctions; the average tractor in our sample is predicted to generate nearly $10,000 less in net sales revenue if sold on eBay. However, the percentage discount for eBay tractors is smaller for items that sell for less than $20,000 – the price threshold beyond which goods are no longer covered by eBay's *Buyer Protection Program*. In fact, for the most frequently traded model in our data set (the John Deere 4020), which normally sells for prices well below the $20,000 threshold, the distribution of prices obtained in eBay and in-person auctions is no different.

This suggest that, from the buyer's point of view, purchasing newer, more powerful tractors on eBay may offer the opportunity to source key capital inputs at a discount compared to traditional in-person auctions. However, these buyers must bear additional risk both because they cannot be present to personally inspect the merchandise and because occurrences of fraud or misrepresentation cannot be fully covered under

existing eBay's *Buyer Protection Program*, which currently covers items up to only $20,000.

From a seller's point of view eBay is attractive because it offers great flexibility (e.g., absolute freedom to choose sale dates, no transportation of equipment to a central location) and low commissions (capped at $250). However, for tractors that sellers think will sell above the $20,000 limit of the eBay buyer protection program, our calculations suggest that in-person auctions generate greater total seller revenue, i.e., the higher commissions paid to in-person auctioneers are outstripped by higher selling prices. Indeed, the in-person flat commission rate that we predict would equalize seller revenues gained from eBay and in-person auctions averages 31.3 percent, which is double the highest commission charged by in-person auctioneers.

Smaller, older tractors, which commonly sell for prices less than $20,000, can often generate more revenue if sold on eBay. The in-person flat commission rate that would equalize seller revenues gained from eBay and in-person auctions averages only 29.2% percent across our sample of used tractors that sell for less than $20,000, while 39 percent of the tractors that sold for less than $20,000 in our sample are predicted to generate more seller revenue if sold on eBay. For the internet-savvy seller with older tractors to sell, eBay may be an attractive sales outlet.

Table 1. Sample Summary Statistics

		Overall		
Variable	Definition	Mean	S.D.	Range
Price	Final sale price (U.S. $)	19,473.57	22,663.06	180 – 158,000
eBay	sold on eBay	30%		
Horse	Engine horsepower (100's)	1.25	0.78	0.30 – 4.70
Age	Years since date of manufacture	24.98	12.76	1 – 46
Hours	Engine hours (1000's)	4.11	2.22	0.51 – 28.34
Implement	tractor sold with implement	15%		
Diesel	engine fuel is diesel	88%		
Manual	transmission is manual	49%		
4WD	four-wheel drive	35%		
Weekend	auction ends on weekend	26%		
Jun	sold in June	6%		
Jul	sold in July	10%		
Aug	sold in August	9%		
Sep	sold in September	7%		
Oct	sold in October	5%		
Nov	sold in November	9%		
Dec	sold in December	16%		
Jan	sold in January	9%		
Feb	sold in February	11%		
Mar	sold in March	18%		
JD	make is John Deere	46%		
IH	make is International	15%		
MF	make is Massey Fergusson	5%		
Ford	make is Ford	6%		
CaseIH	make is Case-International	9%		
Case	make is Case	5%		
FNH	make is Ford-New Holland	3%		
AC	make is Allis Chalmers	4%		
Oliver	make is Oliver	3%		
NH	make is New Holland	1%		
White	make is White	1%		
Versatile	make is Versatile	2%		
Belarus	make is Belarus	1%		

Table 2. Assumed Farm Equipment Commission Structure for Full Service Auctions

Final Selling Price	% Commission
< $10,000	12.5%
$10,000 to $19,999	8.4%
$20,000 to $49,000	7.4%
$50,000 to $99,999	6.9%
≥ $100,000	6.4%

Notes: An average of $450 in fixed fees are also assessed to the seller in addition to the calculated commission.

Table 3. Predicted Prices, Net Revenues, Equalizing Commissions and Sale Venue.

	Predicted Price: eBay	Predicted Price: In-Person	Net Revenue: eBay – In-Person	Equalizing Flat Commission
All Tractors				
Median of All Tractors in Full Sample	7,706	10,996	-2,068	31.3%
Average of All Tractors in Full Sample	9,789	21,448	-9,795	55.2%
John Deere, Diesel Manual, 2WD, 300 HP, 2,000 hours, 10 years old, June weekend sale	32,737	55,132	-18,466	41.2%
Ford-New Holland, Diesel, Automatic, 4WD, 170 HP, 6,000 hours, 10 years old, August Weekday	16,468	24,875	-6,356	34.8%
Case–International, Diesel, Automatic, 4WD, 145 HP, 4,600 hours, 8 years old, February weekday	18,536	45,456	-23,367	59.8%
Tractors that Sold for < $20,000				
Median of All Tractors in <$20,000 Sample	5,326	7,038	-489	26.1%
Average of All Tractors in <$20,000 Sample	5,855	8,077	-872	29.2%
Versatile, Diesel, Manual, 4WD, 7,000 hours, 280 HP, 25 years old, December weekday sale	10,541	11,557	224	10.4%
Allis Chalmers w/ loader, Gas, Manual, 2WD, 2,500 hours, 50 HP, 43 years old, October weekend	3,141	2,372	1,416	NA
International, Diesel, Manual, 2WD, 4,000 hours, 146 HP, 27 years old, August weekend	6,804	9,464	-1,141	29.6%

Notes: Prices predicted from hedonic models reported in Diekmann, Roe and Batte (2007). Net revenue calculations deduct the eBay commission (the minimum of 1% of sale price or $250) and eBay fees of $75 and, for in-person auctions, deduct fees of $450 and a commission calculated using the rates in table 2. Equalizing commission is the commission rate charged at the in-person auction that would yield the same net sales proceeds from eBay and the in-person auction.