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Multi-dimensional Quality Sorting Between Online and Offline Auctions: The Role of Attribute Transparency

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Abstract

We analyze how sellers of used construction equipment sort products between online and offline auctions based on the quality and transparency of different machine attributes. Mechanics collect attribute-specific quality data from a random sample of machines offered in online and offline auctions within a single regional market. Sellers are more likely to offer machines online if quality is high for attributes whose integrity can be measured via photo (e.g., general appearance) and are more likely to offer machines offline if quality is high for attributes whose integrity is more reliably evaluated in person (e.g., engine). Quality averaged across all attributes is unrelated to auction choice, meaning standard tests of adverse selection can mask the subtle but persistent effects of asymmetric information in this market. These findings correspond with predictions from our novel model of platform choice, which builds from standard signaling models and accommodates multiple quality dimensions with auction-specific quality transparency. We confirm several additional predictions from this model for our sample market.

Model

A good with two quality systems: transparent and opaque;

A transparent quality system is apparent to bidders online and offline, $t \in \{H, L\}$;

An opaque quality system is apparent to bidders offline but not online, $i \in \{H, L\}$;

The item can be of 4 types $q_{i,i} \in \{q_{H,H}, q_{H,L}, q_{L,H}, q_{L,L}\}$;

The probability of each type is common knowledge and sums up to 1;

The number of bidders in each platform is the same;

The distribution function of valuations for a tractor of type $q_{i,i}$ is $F_{i,i}(v)$,

where $V^{i,L} < V_{i,H}$, $t, i \in \{H, L\}$;

A seller pays a commission for using physical platform.

Testable Hypotheses

1. Sellers sort items between auction platforms such that the quality of opaque attributes offline will be no worse than the quality of opaque attributes online, *ceteris paribus*.
2. The items sellers sort to offline auctions will feature a non-negative correlation between the quality of transparent and opaque attributes.
3. Prices for items with high opaque quality sold offline will be greater than or equal to prices for items sold online, which will be greater than or equal to prices for items with low opaque quality sold offline, *ceteris paribus*.

The model is silent about the following aspects:

1. The difference between the global quality (average of transparent and opaque attributes) of items offered online and offline.
2. The correlation between the quality of transparent and opaque attributes of items listed online is unknown. A positive correlation will emerge if bidders believe that it is not very likely that an item with low transparent quality will have high opaque quality.

Data

Sample of 72 Bobcat skidsteers offered for sale

- Within 200 miles of Columbus during 2009 – 2011
- With > 1000 hours
- eBay or physical auctions

Inspections by mechanics trained by Bobcat dealer

- Hour-long in-person inspection with > 40 individual items assessed
- 6 systems given rating on 4-point scale
- Not all eligible machines inspected due to time conflicts
- Inspection was never refused by seller
- 3 different mechanics all trained using same materials

Summary Statistics

Variable	eBay (N=32)	In-Person (N = 38)	P-value
Hours	2408	2186	0.70
Age (years)	9.4	7.5	**0.03
Horse Power	56.6	59.6	0.30
Mean Quality	2.85	2.90	0.57
Appearance	2.81	2.68	0.22
Chassis	2.84	2.74	0.57
Op Station	2.88	3.05	0.15
Engine	2.84	2.97	0.45
Drivetrain	2.84	2.87	0.54
Hydraulics	2.91	3.00	0.47
Tire Tread Remaining	51.48	41.80	0.21
Has tracks	0.06	0.18	0.15
Sold?	0.25	0.95	**0.00
Sale Price (sold only)	12,602	12,414	0.99
Max(price, max bid)	10,838	12,414	0.22

Probit: Offered on eBay =1

Variable	Overall Quality	Instr. Overall Quality	System Quality	Instr. System Quality
Log(Hours)	-0.116 (0.273)	-0.063 (0.315)	0.125 (0.400)	0.344 (0.392)
Log(Age)	1.011** (0.494)	1.159** (0.541)	1.721** (0.668)	2.134*** (0.832)
Log(HP)	0.341 (0.822)	0.489 (0.823)	1.004 (0.994)	1.518 (1.102)
Tracks	-0.855 (0.575)	-0.963* (0.270)	-1.070 (0.659)	-1.329** (0.678)
Log(Ave_Qual)	0.338 (1.259)	1.606 (1.749)	--	--
Log(Tread)			0.465** (0.188)	0.543*** (0.201)
Log(Appear)			1.265 (0.857)	2.830** (1.197)
Log(Chassis)			1.410* (0.845)	2.327*** (0.883)
Log(Operator)			-0.492 (1.092)	-0.918 (1.119)
Log(Hydraul)			-0.807 (1.114)	0.208 (1.159)
Log(Drivetrain)			1.065* (0.625)	0.929 (0.659)
Log(Engine)			-2.308*** (0.753)	-1.829** (0.815)
Intercept	-2.932 (3.859)	-3.858 (3.793)	-10.069* (4.986)	-14.966*** (5.335)
Log pseud. likelihood/ Pseudo-R ²	-44.61 0.08	-44.22 0.08	-37.22 0.23	-34.10 0.29

Conclusions

- Overall quality equivalent b/w eBay & in-person auctions
- Ostensibly, no adverse selection
- Complex used items give rise to a nuanced adverse selection
- High quality in attributes that are opaque via photo sort to in-person

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