REPUTATION IN AN INTERNET AUCTION MARKET

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We investigate how market participants possessing varying degrees of anonymity reduce asymmetric information costs in an electronic auction market using a quantifiable measure of reputation. The data suggest that purchasers in this self-enforcing market use reputation to price information asymmetries associated with counterparty risks. The results provide direct empirical evidence of an economic incentive for investing in reputation. The continually observable feedback of participants indicates that high seller reputation signals preferred traits, including advertised service accuracy, product description accuracy, delivery efficiency, and posttransaction communication. Despite some imperfections, the reputation measure represents clear differences in expected performance between high-reputation and low-reputation counterparties. (*JEL* L14, D44)

I. INTRODUCTION

Without transmission of credible information, asymmetries may lead to underproduction of goods or even market failure. Reputation mitigates inefficiencies associated with information asymmetries by providing an informative signal of quality.[1] The difficulty in quantifying reputation means that few studies can analyze empirically the role of reputation in markets. Our analysis of a quantified, market-observed measure of reputation provides direct evidence of the effect of a seller's reputation on the terms of a onetime real-world transaction, thereby contributing empirical support to a fundamental economic principle.

*We appreciate helpful comments by Christopher Anderson, Alex Butler, Bill Lane, Harold Mulherin, Kelley Pace, Chip Ryan, Gary Sanger, Steven Tadelis, Geoffrey Turnbull, Linda Van de Gucht, and University of Missouri–Columbia seminar participants.

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1. Other mechanisms that may assist in correcting asymmetric information include warranties (Gal-Or, 1989), product quality reviews provided by independent agents (Faulhber and Yao, 1989), advertising (Nelson, 1974), and acquisition and processing of information by brokers, such as credit bureaus (Ramakrishnan and Thakor, 1984).

This study empirically examines person-to-person transactions within the Internet market known as eBay. In this virtual market of unseen participants and products, buyers and sellers face the risks of repudiation, as the counterparty may deny the agreement after the fact. Buyers assume risks associated with lack of seller integrity and asymmetric information about the particular product, as the buyer is typically required to send payment before the seller ships the product. In addition, for many eBay transactions, the cost of enforcing a contract is high relative to the transaction's value, resulting in a practical absence of legal enforcement.[2]

By providing a history of trade execution information, eBay benefits market participants by reducing information asymmetries while achieving substantial transaction cost economies. Market participants relate personal experiences, which eBay uses to calculate a numerical reputation measure for each user. Market participants, in turn, can use this reputation measure to assess counterparty risk and adjust bidding behavior accordingly.

In a sample of 460 auctions held between January 1998 and July 1998, we find a positive relation between prices and eBay's reputation

2. In January 1999 eBay initiated insurance coverage protecting customers against fraud or mislabeling of goods. The policy provides buyers with $200 of coverage (minus a $25 deductible) if the seller's reputation is nonnegative at the time of the transaction.

Economic Inquiry
(ISSN 0095-2583)
Vol. 40, No. 3, October 2002, 633–650

measure. Higher-reputation sellers experience higher auction prices, ceteris paribus. Our findings suggest that repeat players are rewarded for building reputation. Consistent with the belief that the high-reputation seller's value of future transactions outweighs the value of taking advantage of the buyer in the current transaction, buyers are willing to pay more to a higher-reputation seller.

This article contributes to the literature not only by providing quantitative support of long-accepted reputation theories but also by illustrating the use of nontraditional markets as a natural laboratory for experiments. This article is an example of how a newly formed electronic market can provide the elements necessary for analytical research. We find that eBay transactions for this item exhibit characteristics similar to transactions in more conventional markets, namely (1) prices are higher when there is less quantity supplied (when fewer of the items are available the same day), (2) prices are lower during periods of lower demand (times less likely to have high traffic), (3) sellers with higher shipping and handling costs receive lower prices, and (4) sellers failing to provide information about shipping and handling fees (i.e., larger information asymmetries) receive fewer bids. Dramatic innovations in online market structure and increasing availability of online market data should enable researchers to examine directly other traditionally nonquantifiable economic ideas.

This article is organized as follows. Section II describes how reputation can be used to facilitate transactions in the presence of asymmetric information. Section III describes the eBay market, summarizes the listing and bidding processes, and discusses the reputation mechanism for this market. Section IV presents the price and reputation descriptive statistics associated with a consistently auctioned item and reports the empirical findings of how this item's highest bid price varies with the level of the seller's reputation. We conclude in section V with a discussion of eBay's continued attempts to add value to the market through recent structural changes.

II. ASYMMETRIC INFORMATION, REPUTATION, AND CONTRACT COSTS

Akerloff (1970) describes how asymmetric information may lead to market failure. Within his model, unless sellers can credibly signal the product quality, buyers are willing to pay only the expected average price. Sellers of higher-quality products are unwilling to sell at the lower average price, leaving only "lemons" in the market.

Reputation may alleviate some information asymmetries, thereby permitting a market for quality goods (Klein and Leffler, 1981; Shapiro, 1983; Diamond, 1989). The conditions needed for reputation to sustain a market for high-quality products are stringent. Reputation building can be considered a cost of entering a market, where subsequent profits represent a competitive return on a firm's investment in reputation. Hence, the present value of the premiums for producing a high-quality product must be sufficient to discourage the high-reputation seller from deceitfully producing low quality to gain a onetime windfall profit.

The efficacy of reputation depends on the expected life of the seller (i.e., number of repeat purchases) and the ability of an opportunistic seller to escape detection. Buyer skepticism (i.e., reluctance to use transaction outcomes to update prior beliefs) and noise about product quality can lead to exorbitant reputation-building costs, thereby impeding a market for transactions in quality goods (Allen and Faulhaber, 1988). Electronic markets introduce additional inefficiencies, as participants can change their names, such as with a different free e-mail service, thereby shedding negative reputation and associated repercussions (Friedman and Resnick, 1999).

Whether reputation has value is an empirical issue. In standard repeated game models, there is always an equilibrium where reputation is worthless. Empirical examinations of reputation generally use indirect measures, such as firm size and frequency of transactions. For example, Leach (1992) uses number of previous acquisitions as a measure of bidder reputation in the market for corporate control. Alternatively, Carter and Manaster (1990) measure underwriter reputation using the underwriter's relative position in tombstone announcements; Sappington and Wernerfelt (1985) use advertising expenditures and price differences as measures of brand strength.

Unlike indirect, possibly misspecified, proxies for reputation, we used a market-observed reputation measure derived from

the assessments of market participants, including counterparties of previous transactions. Such an investigation may improve our understanding of the formation of reputation within other dynamic, participant-monitored markets.

III. THE EBAY MARKET

eBay (www.ebay.com) is the largest person-to-person online trading community.[3] The eBay feedback mechanism is analogous to a credit bureau, as eBay provides a central repository for private information contributed by traders with firsthand knowledge (i.e., based on actual exchanges). Participants provide text comments, which eBay compiles and uses to create a profile of each user, accessible to all eBay users.[4] When providing feedback, the comment writer classifies the comment as positive, negative, or neutral.[5] Examples of positive feedback comments include:

- Item arrived quickly & as described. Well packed. Very pleasant experience. A+
- Excellent communication plus super fast delivery. Highly recommended +++++
- HONEST ENOUGH TO RETURN OVERPAYMENT!!!. . . HIGHLY RECOMMEND!!!! A+++

Examples of negative feedback include:

- Seller backed out after auction, couldn't get in touch w/them!
- Do not bid, and do not send your money! He never sent the item I paid for.
- Lied about product, then ignored e-mail; also, hides feedback.

Not all eBay feedback is transaction related.[6] As in Sobel (1985), market participants can build a reputation by providing information or performing services. The comments provide insights about the qualities valued by eBay users. Market participants encourage efficient payment by commenting on the speed of payment or item delivery. They mitigate asymmetric information costs by commenting on the accuracy of the product description and implied service, such as superior packaging. Furthermore, quick e-mail communication is a recurring theme of pleased purchasers.

One difficulty associated with any reputation system arises from discriminating between deliberate misconduct and honest confusions. For example, collectors may have a specific meaning for the phrase "collector quality" in an item description that may have nuances not understood by the novice. eBay encourages registered users to give negative feedback only after contacting the counterparty through e-mail or by other means and the counterparty still fails to redress the complaint. This policy helps set a standard for appropriate negative feedback. The stress on using other means to resolve conflicts encourages participants not to provide negative feedback for minor infractions, such as slow payment or product delivery.

The seller's reputation measure is clearly visible on every auction page. eBay creates and continuously updates a reputation measure for each participant by aggregating the number of positive, negative, and neutral comments contributed by unique individuals. Limiting the contribution of any one user to another player's reputation mitigates the damage caused by malicious players (whose reputation measure is also clearly visible on the auction page).

Noise in the eBay Reputation Mechanism

The eBay reputation measure and feedback profile make known only a portion of the private information of actual participants due to some participants' unwillingness to provide feedback. There is little economic motivation for providing feedback subsequent to a transaction.[7] Indeed, eBay

3. The appendix provides additional institutional details of the eBay market, including selling and bidding requirements.

4. Kollock (1999) provides a similar description of the feedback forum in his description of trust building mechanisms on the Internet.

5. Occasionally, irreversible mistakes are made, such as the following comment categorized by the writer as negative: "Great person to deal with! would recommend! Quick payment! A+++++++." No obvious feedback category mistakes appeared in the sample described in section IV.

6. eBay has recently changed the forum structure so that feedback pertains to a particular transaction. All of the transactions in the sample described in section IV took place before this change. In any case, a potential bidder can weigh the relative merits of transaction- and nontransaction-related comments.

7. For example, the following message was left in the eBay Café, a message board: "I've left positive feedback for every transaction I was satisfied with (19 out of 20); however, 3 have not left feedback for me as a buyer. I feel FB is important to sellers and buyers, however, some don't bother to post anything—any suggestions?"

users are motivated not to provide negative feedback of counterparties to avoid potential attack on one's own reputation.[8] See, for example, the following response to a negative feedback comment (user name and reputation omitted):

Complaint: CASHED MY CHECK, NO CARDS!!!!

Response: User is getting me "back" because he NEVER paid & I left him negative feedback.

Bull (1983) criticizes reliance on reputation arguments to explain the fulfillment of implicit contracts as "given that a breach has occurred, both sides have an incentive to claim that the other side broke the contract, irrespective of whether they did or not. But as there is no observable contract, it is not clear how the market can evaluate these two claims." Because the eBay feedback profile provides reputation of both complainant and respondent, relative reputations can be used in evaluating the merit of both claims.

An additional concern arises from the possibility that users easily can change their Internet identities. This introduces opportunities to misbehave without facing reputational consequences. Tadelis (1999) demonstrates that in a world with hidden information but not hidden action, even allowing for name changes, higher reputations will always support higher prices. Friedman and Resnick (1999) show that even in the presence of moral hazard, a large degree of cooperation can still emerge through a convention in which newcomers "pay their dues" by accepting poor treatment from players who have established positive reputations. Hence, regardless of noise in the reputation measure arising from the ability to shed negative reputation identities, we expect high-reputation sellers to earn higher bids on their auctions than low-reputation sellers.

It is difficult to disentangle reputation from experience. For example, the ability to walk away from a negative reputation suggests the eBay reputation measure may instead indicate the most recent number of transactions a user has performed reputably in the market. Experience factors that are ex ante observable to bidders (e.g., the ability to create eye-catching Web pages for auction descriptions) may also be correlated with the reputation measure. There is no particular reason to believe the reputation variable is exogenous; however, dealing with this issue is not within the scope of this article.

Despite the problems inherent in reputation mechanisms in general and the eBay system in particular, anecdotal evidence suggests that both eBay and its competitors value the reputation mechanism. Legal counsel representing eBay demanded that Internet auction competitors Edeal and Yahoo! refrain from posting eBay reputation feedback as part of user profiles (Evans, 1999). Reputation seems important to active eBay users as well. Participants in the eBay Café, a message board for market participants, often discuss which feedback (neutral or negative) is appropriate for their concerns and console each other when they undeservedly obtain negative feedback on eBay. In April 1999, FedTrust, a reseller of seized and forfeited vehicles, filed a federal lawsuit against a competitor for allegedly posting libelous statements as reputation feedback. According to the suit, after the messages were posted on eBay, new customers stopped contacting FedTrust and many existing customers canceled contracts (Segal, 1999).

IV. DATA AND EMPIRICAL ANALYSIS

To examine the eBay reputation measure, we select a sample of homogeneous items sold frequently on eBay. Because of the large number of ongoing auctions at the time, we selected the first limited-edition Harley-Davidson Barbie doll. Additional benefits of selecting this item are (1) a relatively limited supply of the item, as production was limited to 10,000 dolls; and (2) its value does not change with the fortune of an associated team or player, as does sports memorabilia.

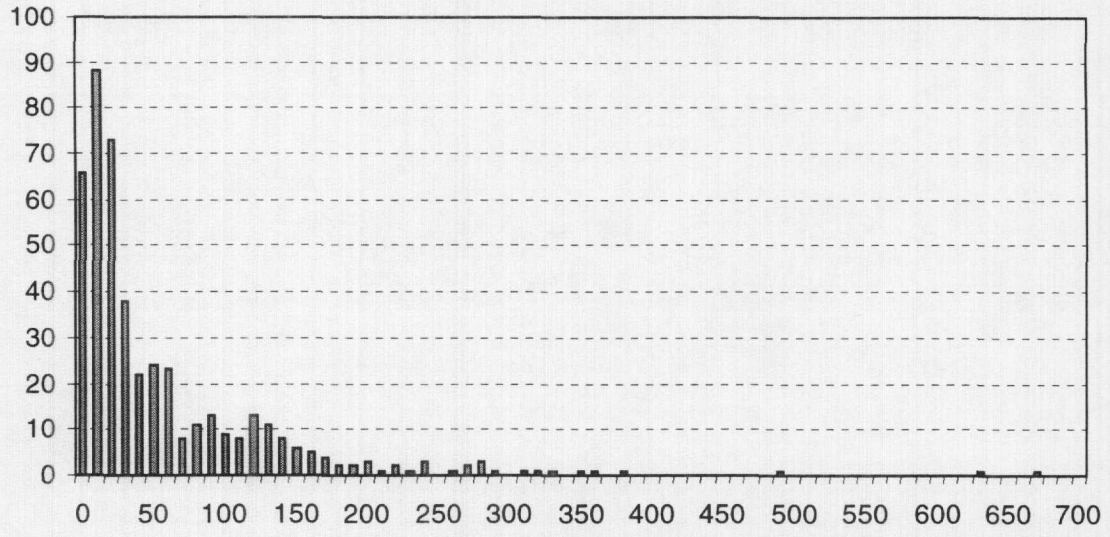
Sample Description

We collected information about all single-item eBay completed auctions held from

Several respondents replied with jests about the magnitude of their own feedback if all previous counterparties had provided feedback, implying that failure to provide feedback is common.

8. Some users attempt to avoid retaliatory negative feedback by "sniping a negative," or leaving negative feedback 59 days after the auction ends, in hopes that the other party is unable to leave transaction-related feedback within the 60-day window provided by eBay.

FIGURE 1
Distribution of Seller Reputation



Notes: Frequency distribution for seller reputation in a sample of 460 eBay auctions of collector-quality first-edition Harley-Davidson Barbie dolls. All auctions ended January 1998 through July 1998. Seller reputation is calculated by eBay as the difference in the number of positive and negative feedback comments made by unique users.

January 1998 to July 1998 of the Harley-Davidson Barbie dolls. We excluded auctions in which (1) the item was out of the original box (usually auctioned at a considerable discount), (2) the item was listed jointly with another item, such as a miniature motorcycle, and (3) items were sold in lots of two or three. Of these 531 auctions, 50 were eliminated because the item description indicated box damage. Of the remaining 481 auctions, we eliminated 7 because the item's description did not state that the item was (1) never removed from the box, (2) mint in the box, (3) in mint condition, or (4) of collector quality. All remaining Harley-Davidson Barbie dolls had indications that they were in new condition.

Sellers specify whether the auction length is three, five, or seven days, but the seller can end an auction early. We compared the time of day, reported to the second, of auction start and end to determine which auctions ended ahead of schedule. We eliminated 14 auctions that had incomplete auction lengths.

Our final sample consisted of 460 auctions completed between January 1998 and July 1998 of "collector-quality" Harley-Davidson Barbie dolls. The majority of participants were "repeat players" in the eBay market. Specifically, the average eBay reputation of sellers of Harley-Davidson Barbie dolls within our sample is 53, with an average highest bidder reputation of 23. Figure 1 provides a histogram of the distribution of seller reputation across the sample. About 14% of the auctions have sellers with zero reputation, and 6% of the auctions have sellers with a reputation of 200 or greater.

Sample summary statistics are provided in Table 1. As shown in the top panel, auctions had a median of 12 bids, with a median opening bid of $25. On average, an auction competed with 3.89 other auctions ending the same day. Only 268 of the auctions specified the amount of shipping and handling. For these items, the average cost of shipping and handling was $6.83. As shown in the bottom panel, length of auction and the day of the week of the auction end are associated with little variation in bidding activity and prices.

The mean (median) highest bid is $263.21 ($274.99). The highest bid ranges from $150 to $380 and generally increases over the time period. Figure 2 graphs the highest bids received by sellers with (1) zero reputation and (2) reputation in the 90th percentile.

TABLE 1
Summary Statistics for Online Auctions

	N	Mean	Median	Minimum	Maximum
Overall sample					
Number of bids	460	12.07	12	1	37
Price	460	263.21	274.99	150	380
Opening bid	460	56.21	25	0.01	290
Volume	460	3.89	4	1	9
Shipping	268	6.83	6	3	15
Seller's eBay reputation	460	53.38	21.5	0	670
Highest bidder's eBay reputation	460	22.85	4	−4	443

	Number of Auctions	Average Number of Bids	Median Number of Bids	Average Price ($)	Median Price ($)
Number of bids and prices, based on length of auction and ending day					
Length					
3 days	117	12.35	12	265.95	275.00
5 days	129	12.21	12	262.15	275.00
7 days	214	11.83	11	262.36	270.27
Ending day					
Monday	66	12.38	12	260.61	265.00
Tuesday	50	12.30	12	266.07	282.88
Wednesday	48	11.06	10	262.89	269.50
Thursday	47	12.45	13	275.37	280.00
Friday	54	12.52	12	274.90	280.00
Saturday	84	12.31	12	262.28	267.77
Sunday	111	11.65	11	253.48	265.00

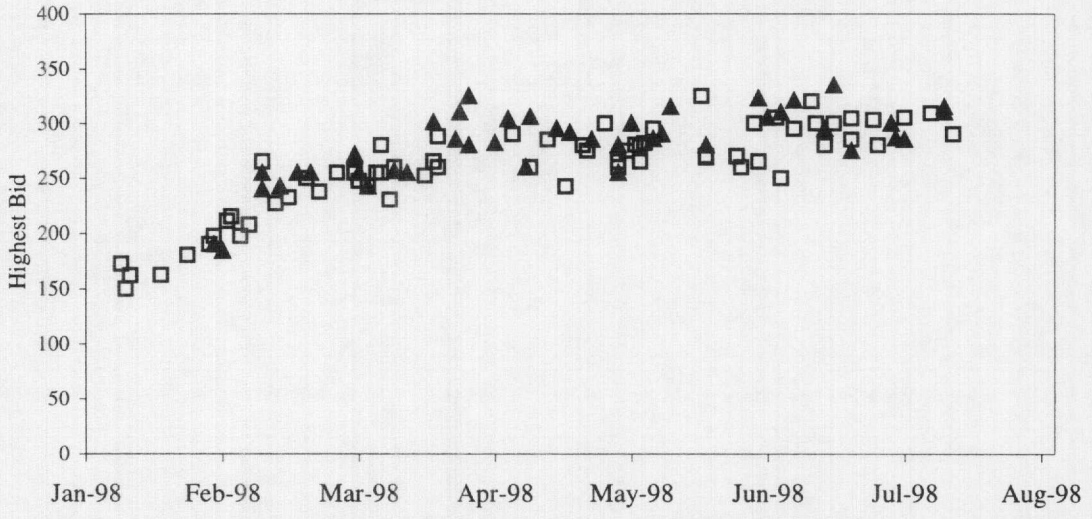
Notes: The sample consists of 460 eBay auctions of collector-quality first-edition Harley-Davidson Barbie dolls. All auctions ended between January 1998 and July 1998. Price is the highest auction bid. Highest bidder and seller reputation are calculated by eBay as the difference in the number of positive and negative feedback comments made by unique users. Volume is number of auctions ending on the same day. Shipping is the amount specified in the item description by the seller for shipping and handling charges. Not all sellers specify shipping and handling charges.

High-reputation sellers appear to have a larger highest bid price than zero-reputation sellers. We also calculate the pairwise difference in highest bids earned by 90th percentile reputation sellers and the previous auction. The mean (median) difference in the highest bid is $6.43 ($10), with a p value of 0.0013 for a Wilcoxon signed rank test that the median difference in prices is zero.

Table 2 provides characteristics of auctions based on how the seller structures the auction with respect to opening price and whether there is a hidden reserve. Sellers specify whether the auction has a hidden reserve, a minimum price that the seller is willing to accept. Bidders observe whether an auction has a reserve, but not the amount of the reserve. Sellers also specify the opening price for the auction. Of the 460 auctions, 323 specify a hidden reserve. Nine auctions fail to meet the hidden reserve. Because sellers are not required to sell if the hidden reserve is not met, these nine auctions may not have generated actual transactions.

The percentage of auctions that result in a transaction is higher than other eBay studies. All of our observed auctions receive at least one bid, and 97% of auctions with a hidden reserve have a high bid greater than the reserve. Alternatively, for a sample of Pokémon cards sold by the authors, Katkar and Lucking-Reiley (2000) find that 46% of auctions with a secret reserve result in a sale, whereas 70% of public reserve auctions result in a sale. Bajari and Hortaçsu (2000) find that 85% of coin auctions result in sales. We attribute the greater success rate of our sample to greater liquidity for a higher-priced item. Unlike the Pokémon card sample, there is a broader base of experienced

FIGURE 2
Highest Auction Bids for High- and Zero-Reputation Sellers



Notes: Highest auction bids for zero- and high-reputation sellers in eBay auctions of collector-quality first-edition Harley-Davidson Barbie dolls. All auctions ended between January 1998 and July 1998. Seller reputation is calculated by eBay as the difference in the number of positive and negative feedback comments made by unique users. High-reputation sellers have a reputation in the 90th percentile. ▲ = 90th percentile seller reputation; □ = zero seller reputation.

collectors, some with decades of Barbie-collecting experience. Additionally, the average auction price is higher for our sample than for coin or Pokémon card samples, increasing the potential profit for arbitrage when it appears that an item will go unsold.[9]

Note that the typical auction structure changes over the time period. Auctions with low opening price and no reserve occur earlier in the time period; auctions with a high opening bid and a high reserve occur later in the time period. The highest bid varies across auction structures, with the largest high bid in auctions with a hidden reserve and high opening bid. However, caution should be used in interpreting these univariate results, because the auction structure changes and the highest bid price increases over the time period.

Table 3 provides a more detailed description of seller reputation. In addition to the eBay reputation measure, we provide sample characteristics for the number of positive feedback comments and number of negative feedback comments.

By its formulation, the eBay reputation measure will grow with the experience of the seller whenever the seller does a good job for the majority of transactions. Therefore, instead of simply using this consolidated value, bidders may also consider the seller's negative feedback comments or proportional number of negative feedbacks. Twenty-three percent (104) of transactions have sellers with at least one negative feedback comment. Of these 104, the average negative feedbacks is 2.27 with a high of 15. The proportional number of feedbacks, determined as the average ratio of negative comments to (positive comments plus one), hereafter *NEG/POS*, was 0.0097.

Table 3 also provides reputation measures for low-reputation sellers (sellers with eBay reputation less than the median) and high-reputation sellers (those with eBay reputation in the 90th percentile or higher). Note that half of the high-reputation sellers have negative feedback. *NEG/POS* ranges between 0.0000 and 0.0420 with a mean of 0.0060 for

9. Anecdotal evidence suggests that this item's liquidity remains high since early 1998. A perusal on June 4, 2001, of eBay auctions completed during the previous 30 days found 37 completed auctions, only 1 of which received zero bids.

TABLE 2
Hidden Reserves and Opening Bids

	All Auctions	No Reserve		Hidden Reserve	
		Open <$100	Open >$100	Open <$100	Open >$100
Number of auctions	460	111	26	280	43
Reserve not met				8	1
Month (Jan = 1)	4.21	3.33	4.46	4.4	5.02
	4	3	4	4	5
Number of bids	12.07	15.52	6.42	11.84	8.02
	12	15	6	11	8
Price	263.21	248.34	269.51	265.75	281.07
	274.99	255	283	275	280
Seller's reputation	53.38	79.14	58.62	46.02	31.63
	21.5	39	20	20	15
Highest bidder's reputation	22.85	16.44	28.08	23.98	28.88
	4	5	4	3	5
Volume	3.89	3.90	3.85	3.89	3.84
	4	4	4	4	4
Shipping	6.83	6.46	6.15	7.1	6.57
	6	6	5.6	6.8	6.8
Number that specify shipping	268	81	9	156	22
% of auctions	58	73	35	56	51

Notes: The sample consists of 460 eBay auctions of collector-quality first-edition Harley-Davidson Barbie dolls. All auctions ended between January 1998 and July 1998. When initiating an auction, the seller specifies the opening bid and whether the auction has a minimum reserve. Potential bidders observe whether a hidden reserve is present, but not the reserve amount. Price is the highest auction bid. Highest bidder and seller reputation are calculated by eBay as the difference in the number of positive and negative feedback comments made by unique users. Volume is number of auctions ending on the same day. Shipping is the amount specified in the item description by the seller for shipping and handling charges. Not all sellers specify shipping and handling charges. Median is given beneath the mean.

high-reputation sellers and between 0.0000 and 0.2860 with a mean of 0.0090 for low-reputation sellers, suggesting that sellers who receive a higher proportion of negative feedback do not transact with the same eBay identity. Yet, there are some with higher ratios who find it worthwhile not to start over.

Table 4 provides the correlation between reputation measures and reputation components. The eBay reputation measure, calculated as the number of positive feedback comments less the number of negative feedback comments, is positively related to both the number of positive comments and the number of negative comments.[10] Similarly, seller experience (calculated as total number of feedback comments from unique users) is positively related to the number of positive comments and the number of negative comments. With the information in Table 3, this suggests that as a seller gains experience, he or she will have some negative feedback. Alternatively, sellers that receive a disproportionate amount of negatives can drop out or create a new identity. Because an experienced seller is likely to have some negative feedback, buyers may be concerned more with whether negative feedback is greater than expected given the seller's experience. *NEG/POS* is not correlated with seller experience.

10. Vincent (1995) suggests a similar relation between low opening bid and prices for auctions in which bidders use bidding activity to determine affiliated value. However, for our sample of frequently auctioned homogeneous items, the availability of information on recently completed auctions is likely to provide more information about affiliated value than the actual auction process.

Hypothesized Cross-Sectional Variation in Price and Number of Bids

Table 5 provides a list of variable definitions used in the empirical analysis and the

TABLE 3
Reputation Measures

	N	Mean	Median	Minimum	Maximum
Seller's reputation					
Positive feedback	460	53.90	21.5	0	679
Negative feedback	460	0.51	0	0	15
eBay reputation	460	53.38	21.5	0	670
Negative/(Positive + 1)	460	0.0097	0	0	0.2857
Has negative feedback	104	2.27	1	1	15
Low-reputation sellers					
Positive feedback	230	6.90	4.5	0	21
Negative feedback	230	0.10	0	0	4
eBay reputation	230	6.80	4	0	21
Negative/(Positive + 1)	230	0.0090	0	0	0.2860
Has negative feedback	17	1.41	1	1	4
High-reputation sellers					
Positive feedback	46	240.09	4.5	141	679
Negative feedback	46	1.30	0.5	0	9
eBay reputation	46	239.78	201.5	140	670
Negative/(Positive + 1)	46	0.0060	0.0010	0	0.0420
Has negative feedback	23	2.61	1	1	9
Reputation of highest bidder					
Positive feedback	460	22.99	4	0	443
Negative feedback	460	0.13	0	0	7
eBay reputation	460	22.85	4	−4	443
Negative/(Positive + 1)	460	0.0137	0	0	4
Has negative feedback	47	1.26	1	1	7

Notes: The sample consists of 460 eBay auctions of collector-quality first-edition Harley-Davidson Barbie dolls. All auctions ended between January 1998 and July 1998. eBay reputation is the difference in the number of positive and negative feedback comments made by unique users. Experience is the total number of comments made by unique users. *NEG/POS* is (number of negatives)/(number of positives + 1).

TABLE 4
Correlation between Reputation Measures

	eBay Reputation	Number of Positives	Number of Negatives	*NEG/POS*	Experience	Has Negative Feedback
eBay reputation	1.0000 (0.0000)					
Number of positives	0.9999 (0.0001)	1.0000 (0.0000)				
Number of negatives	0.3546 (0.0001)	0.3707 (0.0001)	1.0000 (0.0000)			
NEG/POS	(0.0164) (0.7253)	(0.0072) (0.8776)	0.4951 (0.0001)	1.0000 (0.0000)		
Experience	0.9950 (0.0001)	0.9962 (0.0001)	0.4285 (0.0001)	0.0206 (0.6595)	1.0000 (0.0000)	
Has negative feedback	0.3304 (0.0001)	0.3399 (0.0001)	0.6384 (0.0001)	0.6043 (0.0001)	0.3606 (0.0001)	1.0000 (0.000)

Notes: The sample consists of seller reputation and feedback measures for 460 eBay auctions of collector-quality first-edition Harley-Davidson Barbie dolls. All auctions ended between January 1998 and July 1998. eBay reputation is the difference in the number of positive and negative feedback comments made by unique users. Experience is the total number of comments made by unique users. *NEG/POS* is (number of negatives)/(number of positives + 1).

TABLE 5
Variable Definitions and Hypothesized Relation with Price and Number of Bids

Variable	Price Effect	Bids Effect	Definition
PRICE			Highest bid price.
BIDS	+		Number of bids made in the auction. Because auction characteristics may affect the number of bids as well as the winner's price, *BIDS* is estimated simultaneously with *PRICE*.
REPUTATION	+	+	Seller reputation variable provided by eBay at the time of the auction. eBay calculates reputation as the difference between the number of positive and negative feedback comments made by unique registered users. We expect reputation to have a positive effect on price and bids because more bidders are able to reduce expected transaction costs with more reputable sellers.
LOW REPUTATION	−	−	Seller reputation is less than the median seller reputation of 21.5 over the time period. We expect fewer bidders and lower bids when the seller has lower reputation.
HIGH REPUTATION	+	+	Seller reputation is greater than or equal to the 90th percentile seller reputation of 140. We expect more bidders to bid higher when the seller has a higher reputation.
EXPERIENCE	+	+	The number of feedback comments made by unique registered users. We expect more bidders to bid higher when the seller has more experience, as poorly performing sellers are less likely to survive.
NEG/POS	−	−	Negative feedback/(positive feedback + 1). We expect fewer bidders to bid lower prices when a seller has proportionally greater negative feedback.
OPENING BID		−	Opening bid. We expect a higher opening bid to generate fewer total bids.
RESERVE		−	Indicator variable that takes on a value of one if the auction has a secret reserve price. We expect lower bids for auctions with a secret reserve.
JAN, FEB, MAR, APR, MAY, JUN, JUL			Indicator variables that take on a value of one if the auction ends in that month. The monthly indicator variables control for and reflect changes in the sample period market conditions.
CREDIT	+	+	Indicator variable that takes on a value of one when the seller identifies that he or she will accept credit cards. We expect more bidders and higher bids if the bidders have more payment options. In addition, with credit cards, buyers have more opportunity to dispute the charges.
SHIPPING	−	−	The amount of shipping and handling to be paid by the buyer (specified in the seller's product description). We expect higher shipping costs to reduce the amount of the highest bid because of the increased transaction costs.
HIGH SHIPPING	−	−	Indicator variable that takes on a value of one if the seller advertises shipping and handling costs greater than $10.
NO SHIPPING AMOUNT	−	−	Indicator variable that takes on a value of one if the seller does not indicate the costs associated with shipping and handling.

continued

TABLE 5 continued

Variable	Price Effect	Bids Effect	Definition
SMOKE-FREE	+	+	Indicator variable that takes on a value of one when the seller advertises that the product was kept in a nonsmoking environment. The buyer may perceive a higher-quality product in this case.
LATE HOUR	−	−	Indicator variable that takes on a value of one if the auction ends between midnight and 4 A.M., Pacific Standard Time. Auctions typically have a three-, five-, or seven-day length, and the time of the auction's end is a function of the time the auction was submitted to eBay. Fewer potential bidders will be online at this time.
VOLUME	−	−	Number of auctions ending on this date. A high number of auctions suggests a high quantity supplied on this date. With higher supply, we expect lower prices.
DAYS 3, DAYS 5, DAYS 7	+	+	Indicator variables that take on a value of one if the auction lasts three, five, or seven days, respectively. Longer auctions should attract more bidders.
ENDS ON SAT, ENDS ON SUN	+	+	Indicator variables that take on a value of one if the auction ends on Saturday or Sunday, respectively. With higher demand (more potential bidders), we expect more bids and higher prices.

hypothesized relations with price and number of bids. We are interested in how auction characteristics, especially seller reputation, affect the number of bids and highest auction price. We hypothesize that sellers with low reputations will not obtain as high a price, on average, as sellers with high reputation. Similarly, high-reputation sellers should receive more bids. We measure reputation using (1) the reputation number provided by eBay, (2) two indicator variables to indicate sellers with a high reputation (greater than or equal to the 90th percentile reputation of 140) and sellers with a low reputation (less than the median reputation of 21.5), (3) *NEG/POS*, and (4) experience.

We expect a negative relation between the opening bid set by the seller and the number of bids, as a low opening bid may attract interest from potential bidders (Katkar and Lucking-Reiley, 2000). Similarly, secret reserves may inhibit potential bidders, who suspect that the sellers may have unwarranted expectations and the reserve set too high. Such bidders will not make an investment in the bidding process. Therefore, we hypothesize that bidding activity will be lower when there is a secret reserve.

Forty-two of the observed sellers indicate that they accept credit cards. Because buyers can dispute a credit card bill, a bidder may be willing to pay more using this option to reduce counterparty risk. Additionally, most auctions specify that an item will be shipped immediately on receipt of payment by money order or cashier's check. A seller may wait for the check to clear before shipping the item. The number of bidders may be higher with the credit card payment option, when the item will ship immediately. The ability to pay by credit card does present some risks, however. The seller may be using the site as an opportunity for fraud and may use the credit card information for other purposes.[11] We expect that higher reputation sellers will benefit most from accepting credit cards.

Shipping costs are measured using the shipping amount specified in the seller's item description. Shipping costs are considered high when greater than $10. If bidders consider the total cost of the item, then there should be a negative relation between shipping costs and the highest auction bid. High

11. Recent intermediary services, such as PayPal, have eliminated many of these concerns.

shipping costs may also deter some potential bidders, so we expect a negative relation between number of bids and shipping costs. Although it is customary for the buyer to pay for shipping charges on eBay auctions, not all sellers specify shipping and handling charges in the item description. We include a dummy variable to indicate whether the seller lists the shipping amount. Whereas potential bidders can contact the seller via e-mail with questions about these charges, uncertainty may deter some potential bidders.

Fifty-four of the observed auctions advertise that the item was kept in a nonsmoking environment. These items may be perceived as being of higher quality and receive a higher price.

Supply and demand should affect the price and number of bids. Because Bajari and Hortaçsu (2000) provide evidence that, despite eBay's recommendations, bidding activity is concentrated at the end of the auction, we examine potential supply-and-demand changes associated with the ending time of the auction. Several auctions ending on the same date suggest large supply, and hence lower prices and bids. Because more potential customers may be online on the weekend, demand could be greater for auctions ending on Saturday or Sunday, and these auctions may receive a greater number of bids and higher prices. If the auction ends at a late hour, we expect few potential bidders, and the number of bids and price should be low. Whether an auctions lasts three, five, or seven days may influence the number of potential bidders, as longer auctions provide more opportunities for bidders to submit bids. Hence, five- and seven-day auctions should experience more bids.

Multivariate Results

We measure how cross-sectional characteristics affect price and the number of bids. Omitted variables likely to affect price are also likely to affect the number of bids. For example, a vague or grammatically incorrect item description may garner less bidder trust, resulting in both lower bidding activity and lower price. We estimated equations for price and number of bids simultaneously using seemingly unrelated regression estimation to improve efficiency:

$$(1)\quad PRICE_i = \alpha_1 + \sum_{j=2}^{7} \alpha_j MONTH_{i,j} + \alpha_8 BIDS_i + \alpha_9 REPUTATION_i + e_i,$$

and

$$(2)\quad BIDS_i = \beta_1 + \sum_{k=2}^{7} \beta_k MONTH_{i,k} + \beta_8 OPENING\ BID_i + \beta_9 RESERVE_i + \beta_{10} REPUTATION_i + u_i.$$

Variable definitions for *PRICE, BIDS, REPUTATION, OPENING BID*, and *RESERVE* are noted in Table 5. Monthly indicator variables (not reported in the tables) control for changes in supply and demand within the market over the time period.[12]

Table 6, model 1 provides estimates of the basic equations. The coefficient for the number of bids in the first equation is positive and significant, suggesting that a higher number of bids is associated with higher prices. Auction characteristics, such as seller reputation, affect prices both directly and indirectly by influencing the number of bids. We find that seller reputation affects both price and number of bids. In the first equation, the estimate for the coefficient of *REPUTATION* is 0.04, positive and significant ($p = 0.0014$), which is consistent with sellers with higher reputation receiving a higher price. The coefficient for seller reputation in the second equation is positive, 0.004 ($p = 0.1066$). Hence sellers with high reputation also attract more bids, which results in a higher price.

The positive relation between reputation and price suggests that there is a return on investment in reputation. The marginal cost of acquiring reputation should equal the marginal gain of reputation estimated in the models. Consider an auction in the middle of the sample period (April) with an opening bid at the median ($25) that does not contain a reserve. For a seller with median

12. We also estimated the equations without the monthly indicator variables, replacing them with a moving average of the previous five transaction prices (to control for changes in supply and demand over the time period). The results are similar to those provided.

TABLE 6
Cross-Sectional Analysis of the Relation between Seller Reputation and Auction Prices and Number of Bids

	1		2		3	
Model	**Coefficient**	***t***	**Coefficient**	***t***	**Coefficient**	***t***
PRICE						
Intercept	168.82	42.71	172.14	40.47	168.91	42.77
BIDS	0.44	2.38	0.41	2.24	0.41	2.23
REPUTATION	0.04	3.22				
LOW REPUTATION			−3.10	−1.57		
HIGH REPUTATION			8.51	2.57		
EXPERIENCE					0.04	3.40
NEG/POS					33.47	1.06
Adjusted R^2	0.7804		0.7809		0.7808	
BIDS						
Intercept	15.09	19.05	15.65	19.04	15.01	19.03
OPENING BID	−0.03	−11.02	−0.03	−10.83	−0.03	−11.02
RESERVE	−2.12	−4.45	−2.13	−4.48	−2.14	−4.50
REPUTATION	0.004	1.62				
LOW REPUTATION			−0.70	−1.56		
HIGH REPUTATION			0.46	0.60		
EXPERIENCE					0.004	1.76
NEG/POS					16.26	2.29
Adjusted R^2	0.2791		0.2793		0.2870	

Notes: Seemingly unrelated regression estimates of the prices and number of bids for collector-quality first-edition Harley-Davidson Barbie dolls auctioned in eBay auctions January 1998 to July 1998. Variable definitions and hypothesized relations are provided in Table 5. Coefficients of monthly dummies for February to July are not reported.

reputation (*REPUTATION* = 21), model 1 predicts that a seller would receive a price of $281.04 and 13.15 bids. Increasing seller reputation by one point would increase the price by $0.04 to $281.08 (13.15 bids). The predicted difference in the prices received by a seller with 0 reputation ($280.20, 13.06 bids) and a seller with reputation at the 90th percentile ($285.76, 13.67 bids) is about $5.56.

It is not likely that there is a linear relation between prices and reputation. For example, additional reputation for a seller already perceived as having high reputation would have little value. Rather than using a continuous variable for reputation, model 2 estimates price and number of bids as a function of two indicator variables, *LOW REPUTATION* (seller reputation less than or equal to the median) and *HIGH REPUTATION* (seller reputation at or above the 90th percentile). Sellers with low reputation command lower prices and attract fewer bids. High-reputation sellers earn a higher price ($p = 0.0003$) and receive more bids ($p = 0.1201$) than low-reputation sellers. For our previous example of an April auction, the predicted differences in prices received by a high-reputation seller ($291.59, 14.01 bids) and a low-reputation seller ($279.50, 12.85 bids) is $12.09 in an auction with 1.16 additional bids. The difference in predicted prices suggests that it is costly to shed a pseudonym and build a new reputation; a high-reputation seller would give up about $12 per auction to start over. Hence, experienced sellers may not find it worthwhile to create a new identity.

About 15% of the high-reputation sellers have a *NEG/POS* ratio greater than the overall sample average of 0.97% revealed in Table 3. These sellers apparently do not find it worthwhile to create a new identity.

Therefore, model 3 examines the relative importance of the seller's negative feedback and experience to potential bidders. Experience is positively related to both price and number of bids. *NEG/POS* is not significantly related to price but is positively related to number of bids.[13] This relation is inconsistent

13. We also examined whether other measures of negative feedback are related to price and bidding activity by estimating additional specifications similar to model 3, replacing *NEG/POS* with the following negative feedback measures: (1) a dummy for a seller having any negatives, (2) a dummy for a seller having more than one negative,

with the idea that bidders are not concerned about the relative frequency of negative and positive feedback and suggests that bidders are concerned only with seller experience. This may be the case if sellers walk away from an identity after acquiring too much negative feedback, as in Friedman and Resnick (1999). Hence the eBay reputation metric appears to measure the seller's experience using the seller's current pseudonym.

For all three models, the number of bids is negatively and significantly related to the opening bid and presence of a hidden reserve.[14] Consistent with Bajari and Hortaçsu (2000) and Katkar and Lucking-Reiley (2000), we find that the number of bids is negatively related to the opening price. As they note, a high minimum bid deters potential bidders by raising the expected price, thereby reducing incentive to enter the auction. Including a hidden reserve lowers the number of bids by about two bids. Setting an opening bid at the sample mean of \$56 rather than the median of \$25 decreases number of bids by about one ($31 \times 0.033 = 1.02$).

Table 7 provides extensions of model 2 by including product and auction characteristics that may influence transaction prices. Model 4 provides estimates of several product and market characteristics hypothesized to influence price and number of bids. Model 5 is limited to auctions that contain a shipping amount and to variables that were statistically significant in the estimation of model 4. Coefficients of monthly indicator variables are not reported.

To examine the effects of temporary supply changes on auction prices and the number of bids, model 4 includes *VOLUME*, the number of auctions ending on the same day. The coefficient for *VOLUME* is negative and significant ($p = 0.0332$), which is consistent with higher prices when there is less quantity supplied. For a midsample (April) auction, median reputation seller (neither *HIGH REPUTATION* nor *LOW REPUTATION*), and opening bid (\$25), model 4 predicts a price of \$285.45 on a median-volume (4) day. If volume is decreased to 2, rather than the median of 4, predicted price increases to \$287.81.

The coefficient for *LATE HOUR* (a dummy variable indicating that the auction ended between midnight and 4 A.M. PST) is negative and significant (model 4: $p = 0.0101$), consistent with lower demand at this time. The highest bid falls by \$8.92 when the auction ends during this time. From an arbitrageur's perspective, the \$8.92 is less than the eBay transaction fee of about \$9.50 for these auctions, precluding any arbitrage between late hours and other auctions.

Variables that indicate whether the seller permits payment with a credit card are not different from zero in the price equation. However, there is a secondary effect in that high-reputation sellers permitting credit cards obtain a significantly greater number of bids in their auctions, which is positively related to the price. Model 4 predicts that a high-reputation seller accepting credit cards would receive \$12.86 more than a low-reputation seller. In addition, the high-reputation seller generated a substantial increase in bids from 14.16 to 19.08, with an associated increase in price of about \$2.[15]

The length of the auction does not affect price. The day of the week does not affect the number of bids, nor does whether the auction ends on Saturday or Sunday. We find no significant differences for other day of the week variables in a similar model (not reported). There is a positive (\$5.50) and significant ($p = 0.0597$) relation between whether a product is advertised as having been stored in a nonsmoking environment, suggesting that quality is perceived to be higher.

Last, we examine the effect of shipping costs on bidding activity and prices. The norm in this market is that the buyer will pay shipping and handling charges. At the time of this study eBay did not have a specific field in the listing form for shipping and handling

(3) dummies for high and low measures of *NEG/POS*, and (4) unanticipated negative feedback measured as the prediction error from estimating negative feedback as a function of experience. The results are qualitatively similar to those presented for *NEG/POS* in model 3.

14. As a check for robustness of results to censoring associated with potential bidders avoiding auctions with secret reserves and high minimum bids, we estimated the models for the subsample of auctions with no reserve and a minimum opening bid less than the sample median of \$25. The coefficient estimates and significance levels are similar to those reported for the full sample.

15. Although this premium is not enough to cover a typical 3% small vendor fee, the seller's transaction costs of processing the payment are reduced, and the possibility of delayed payment is eliminated. Alternatively, the \$2 increase in value may explain why such a small percentage of the sellers accept credit cards.

TABLE 7
Cross-Sectional Analysis of Auction Prices and Number of Bids

	4 ($n = 460$)		5 ($n = 268$)	
Model	**Coefficient**	***t***	**Coefficient**	***t***
PRICE				
Intercept	177.82	35.13	190.50	25.58
BIDS	0.42	2.31	0.10	0.43
LOW REPUTATION	−3.68	−1.81	−4.54	−1.75
HIGH REPUTATION	8.90	2.61	7.68	1.91
*CREDIT * LOW REP*	−6.52	−1.32		
*CREDIT * HIGH REP*	3.48	0.37		
SHIPPING HIGH	−26.24	−2.27		
SMOKE-FREE	5.50	1.89	7.76	1.94
LATE HOUR	−8.92	−2.58	−8.97	−2.06
VOLUME	−1.11	−2.14	−1.28	−1.88
DAYS 5	−2.53	−0.99		
DAYS 7	−1.38	−0.60		
SHIPPING AMOUNT			−1.30	−2.05
Adjusted R^2	0.7881		0.7872	
BIDS				
Intercept	16.98	16.68	16.73	11.40
OPENING BID	−0.03	−10.51	−0.03	−5.90
RESERVE	−2.22	−4.60	−2.64	−4.00
LOW REPUTATION	−0.83	−1.78	−0.42	−0.68
HIGH REPUTATION	−0.19	−0.24	0.37	0.37
*CREDIT * LOW REP*	0.04	0.04		
*CREDIT * HIGH REP*	4.91	2.30	11.19	3.24
NO SHIPPING INFO	−0.93	−1.27		
SHIPPING HIGH	−0.34	−0.13		
DAYS 5	−0.45	−0.78		
DAYS 7	−0.92	−1.76	−0.79	−1.36
ENDS ON SUN	−0.12	−0.20		
ENDS ON SAT	−0.22	−0.39		
VOLUME	−0.16	−1.16		
SHIPPING AMOUNT			−0.09	−0.57
Adjusted R^2	0.2839		0.2314	

Notes: Seemingly unrelated regression estimates of the prices and number of bids for collector-quality first-edition Harley-Davidson Barbie dolls auctioned in eBay auctions January 1998 to July 1998. Variable definitions and hypothesized relations are provided in Table 5. Coefficients of monthly dummies for February to July are not reported.

charges, but many sellers (268 of 460) provided shipping information in the product description field. From model 4, failure to provide shipping costs (*NO SHIP INFO* = 1) has a negative but not a significant effect on bids. eBay has since modified its listing form to add shipping and handling fields in which the seller specifies who pays, how much, and whether the fee includes out-of-country shipping. The coefficient for sellers with high (greater than $10) shipping and handling costs, *SHIPPING HIGH*, is significant and reduces the highest bid by $26.24.[16]

Model 5 estimates the relation between the highest bid price and shipping and handling fees for the 268 auctions in which the seller indicate the shipping and handling fee. The coefficient in the price equation for shipping amount is −1.30, suggesting that each dollar of shipping and handling reduces the winning bid by $1.30. However, the standard

16. We also examine *FOREIGN*, an indicator variable that takes on a value of one when the seller identifies that he or she does not live in the United States. In these instances, the buyer is likely to expect longer shipping delays and higher shipping costs. When *SHIPPING HIGH* is excluded from the analysis, we find a negative and significant relation between *FOREIGN* and *BIDS* and for *FOREIGN* and *PRICE*. The correlation between *SHIPHI* and *FOREIGN* is 0.37 and significant at the 0.0001 level.

error is 0.637. Therefore, the coefficient of $1.30 is not significantly different than $1, as we would expect. Shipping and handling fees do not affect the number of bids.[17]

The high shipping coefficient is much larger than the difference between regular and high shipping costs. This suggests that quoting high shipping costs is a bad strategy. Sellers specifying higher shipping are less experienced (the correlation between *SHIPPING* and *EXPERIENCE* is -0.0894, $p = 0.1443$). Similarly, high-reputation sellers specify lower shipping costs on average than less experienced low-reputation sellers ($7.05 versus $6.07, $p = 0.0037$).

V. CONCLUSION

This article provides direct empirical evidence of the importance of market-generated reputation in a dynamic market with asymmetric information. eBay participants instantaneously observe a continuously updated, quantified measure of reputation based on contributions by market participants. Despite imperfections in the eBay reputation metric, such as the lack of motivation for participants to provide negative feedback, seller reputation significantly affects the price submitted by the highest bidder.

The finding that bidders value seller reputation suggests that reputation mitigates some of the problems associated with information asymmetries. We scrutinized explicit feedback statements from eBay participants to identify the most highly desired seller attributes for which reputation becomes a proxy. The participant feedback suggests that buyers desire sellers who quickly deliver the product, accurately describe the product, adequately describe the shipping and packaging service, and effectively communicate after the auction.

In addition to the evidence supporting the value of reputation, we provide evidence that this market exhibits characteristics associated with many other markets, namely,

1. with less quantity supplied, indicated when fewer of the items are available the same day, prices are higher;
2. with lower demand, indicated by the time of day when site traffic is low, prices are lower;
3. with larger transaction costs, in the form of higher shipping and handling costs, prices are lower; and
4. with less information available, as when sellers omit the shipping and handling fees from the item description, auctions receive fewer bids.

eBay has evolved and addressed some of the imperfections identified herein. For example, eBay has reduced one potential information asymmetry by modifying its listing form to add fields in which the seller can specify shipping and handling fees and include the amount, who pays, and additional costs for out-of-country shipping. eBay has also changed the feedback form structure, so that potential bidders can determine whether feedback is transaction related.

A more dramatic change is the recent requirement that new sellers report a credit card number to eBay. Requiring credit card numbers addresses concerns expressed by Friedman and Resnick (1999) about the inefficiencies that arise from allowing cheap pseudonyms, whereby a misbehaver can avoid reputational consequences by changing to a new identity. Friedman and Resnick propose using free but irreplaceable pseudonyms, thereby preserving anonymity, and describe how to use standard encryption techniques to implement such a device. The new credit card requirement allows eBay to identify more accurately actual seller identity, limiting the ability of sellers to shed pseudonyms and start fresh after misbehaving.

Reputation models imply that sacrificing anonymity allows market participants to build reputations, thereby alleviating inefficiencies associated with information asymmetries. The difficulty in quantifying reputation, however, means that few studies are able to analyze empirically the role of reputations in markets. Our analysis of a quantified, market-observed version of reputation provides direct measurement of the effect of a seller's reputation on a onetime real-world transaction. We identify sources of noise in the eBay reputation measure. Despite this noise, there are clear differences between the expected performances of high- and low-reputation sellers. The purchasers

17. We checked the robustness of models 4 and 5 using the reputation metrics of models 1 and 3 instead of the *HIGH REPUTATION* and *LOW REPUTATION* measures in model 2. The coefficients of the nonreputation variables are similar in magnitude and significance to those reported here.

in this self-enforcing market use reputation to price information asymmetries associated with counterparty risks.

APPENDIX: INSTITUTIONAL DETAILS OF THE eBAY MARKET IN 1998

HOW TO BECOME A REGISTERED USER

Fill out a form online. Provide an e-mail address and mailing address. eBay will send a confirmation e-mail to which the user must reply. Hence all registered users must have a unique e-mail address.

Only registered users may list an item or bid on an item.

HOW TO LIST AN ITEM

Seller writes a title and a description. The listing description may include a picture. Sellers specify whether the auction will last 3, 5, or 7 days from the time the item is listed. Hence auction's ending time is a function of the time of day when the item was listed.

Sellers can set a reserve (minimum) price.

Sellers must agree to accept the highest bid if the reserve is met. However, sellers often advertise that they will not sell to bidders with negative or hidden feedback.

Sellers are now required to provide a credit card number in order to list an item. Sellers who listed an item on eBay before October 22, 1999, do not have to provide this information.

VIEWING ITEMS FOR SALE

Potential bidders can view auctions by product category or search auction descriptions. Both of these options provide a list of auction titles. Clicking on an auction title enables the user to view the full item description, including the seller's user ID and reputation. Seller feedback can be viewed by clicking on the seller's reputation number.

HOW TO BID ON AN ITEM

Only registered users may bid on an item.

Bidders state their maximum bid. eBay hides the bid, and bids in small increments up to a maximum bid amount. eBay bids just enough for the highest bidder to win.

AFTER THE AUCTION

After the auction, the seller and buyer contact each other via e-mail. The buyer usually pays for the item by check or money order. After the seller receives the payment, he or she ships the item to the buyer.

PROVIDING FEEDBACK

Any registered user can provide feedback. When providing feedback, the user specifies whether the feedback is positive, negative, or neutral.

HIDING FEEDBACK

eBay members may choose to hide all of their feedback comments, but not the number of feedback comments in each category. Although individual feedback comments cannot be removed, eBay has recently changed the feedback reporting so that counterparties can respond.

AGGREGATION OF FEEDBACK INTO A REPUTATION MEASURE

The following excerpt describes how eBay calculates reputation for each member (currently found at http://pages.ebay.com/services/forum/feedback.html):

The Feedback Rating system is easy. You receive:

- +1 point for each positive comment
- 0 points for each neutral comment
- −1 point for each negative comment

You can leave multiple comments in someone's Feedback Profile, but they'll only count once. This makes the system fair. No one person can "tip the scales" in either feedback direction, positive or negative.

GAMING THE SYSTEM, SELF-GENERATED REPUTATION

Because reputation is a function of the comments of *unique* users, the gamer must register multiple times, each with a unique e-mail address. The gamer can then send feedback from multiple accounts. Potential bidders view the time and date of the feedback, and so the gamer would have to provide feedback in a random time sequence. Potential bidders can view the reputation of the users who provided feedback; the gamer should provide feedback on more than one of his or her accounts, so that it will appear that higher feedback users have provided feedback.

REFERENCES

Akerlof, G. "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism." *Quarterly Journal of Economics,* 84, 1970, 488–500.

Allen, Franklin, and Gerald R. Faulhaber. "Optimism Invites Deception." *Quarterly Journal of Economics,* 103, 1988, 397–407.

Bajari, Patrick, and Ali Hortaçsu. "Winner's Curse, Reserve Prices and Endogenous Entry: Empirical Insights from eBay Auctions." Working Paper, Stanford University, 2000.

Bull, Clive. "Implicit Contracts in the Absence of Enforcement and Risk Aversion." *American Economic Review,* 73, 1983, 658–71.

Carter, Richard, and Steven Manaster. "Initial Public Offerings and Underwriter Reputation." *Journal of Finance,* 45, 1990, 1045–67.

Diamond, Douglas W. "Reputation Acquisition in Debt Markets." *Journal of Political Economy,* 97, 1989, 828–62.

Evans, Mark. "Edeal Rejects Demand from Giant eBay Toronto Firm in David v. Goliath Battle." *Globe and Mail,* June 11, 1999, B6.

Faulhaber, Gerald R., and Dennis A. Yao. "'Fly-by-Night' Firms and the Market for Product Reviews." *Journal of Industrial Economics,* 38, 1989, 65–77.

Friedman, Eric J., and Paul Resnick. "The Social Cost of Cheap Pseudonyms." Working Paper, Rutgers University, 1999.

Gal-Or, Esther. "Warranties as a Signal of Quality." *Canadian Journal of Economics,* 22, 1989, 50–61.

Katkar, Rama, and David Lucking-Reiley. "Public versus Secret Reserve Prices in eBay Auctions: Results from a Pokémon Field Experiment." Working Paper, Vanderbilt University, 2000.

Klein, Benjamin, and Keith B. Leffler. "The Role of Market Forces in Assuring Contractual Performance." *Journal of Political Economy,* 89, 1981, 615–41.

Kollock, Peter. "The Production of Trust in Online Markets," in *Advances in Group Processes,* edited by E. J. Lawler, M. Macy, S. Thyne, and H. A. Walker. Greenwich, CT: JAI Press, 1999.

Leach, J. Chris. "Repetition, Reputation, and Raiding." *Review of Financial Studies,* 5, 1992, 685–708.

Nelson, Phillip. "Advertising as Information." *Journal of Political Economy,* 82, 1974, 729–54.

Ramakrishnan, Ram T. S., and Anjan V. Thakor. "Information Reliability and a Theory of Financial Intermediation." *Review of Economic Studies,* 51, 1984, 415–32.

Sappington, David E. M., and Birger Wernerfelt. "To Brand or Not to Brand? A Theoretical and Empirical Question." *Journal of Business,* 58, 1985, 279–93.

Segal, David. "E-Buse Alleged in Online Auction; Car-Seller Says Rival Posted Misleading Messages on eBay." *Washington Post,* April 28, 1999, E1.

Shapiro, Carl. "Premiums for High Quality Products as Returns to Reputations." *Quarterly Journal of Economics,* 98, 1983, 659–80.

Sobel, Joel. "A Theory of Credibility." *Review of Economic Studies,* 52, 1985, 557–73.

Tadelis, Steven. "What's in a Name? Reputation as a Tradeable Asset." *American Economic Review,* 89, 1999, 548–63.

Vincent, Daniel R. "Bidding off the Wall: Why Reserve Prices May be Kept Secret." *Journal of Economic Theory,* 65, 1995, 575–84.