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Insights into Online Auction Market Structure of eBay in 2006-2007: A Historical Perspective

Yanbin Tu[1], Steven R. Clinton[1], Adora Holstein[2]
[1]*Department of Marketing, Robert Morris University*
[2]*Department of Economics and Legal Studies, Robert Morris University*

ABSTRACT: *The online auction market has experienced rapid growth in the last decade and has been playing an important role in our economy. Given the size and nature of auction markets, it is important for potential entrepreneurs and market traders to understand these markets. However, the market structure of online auctions has not been adequately examined in the literature. This study extends existing research by using eBay's auction data for the Xbox game console to understand the evolution and characteristics of eBay users, and to investigate the nature of competition in this market in 2006-2007. Among others, we find that the Xbox game console market could be best categorized as a mix market with a dominant Consumer to Consumer (C2C) segment because it had many individual sellers. We also discuss the theoretical contributions and managerial implications of our findings regarding three dimensions of online auction market structure, and identify future research directions.*

KEYWORDS: *eBay, Online Auction, Entrepreneurship, Market Structure, HHI (Herfindal-Hirschman Index) Index, Gibrat's Law.*

1. Introduction

With the advent of the Internet and information technology innovation, the online auction market has experienced rapid growth in the last decade and has been playing an important role in our economy (Barua, Whinston, & Yin, 2000). This growth has been most evident at eBay. Founded in September 1995, eBay's worldwide revenues totaled more than US$3.4 billion in the fourth quarter of 2011, with 100.4 million active users -- an increase of 35% over the fourth quarter of 2010.

Although virtual and ubiquitous, electronic marketplaces provide a place where sellers and buyers can meet, communicate, and exchange information, products and money, just like traditional markets. While offering broader markets and reduced transaction costs, transactions in cyberspace also involve greater information asymmetry about market participants and products (Bakos, 1997). In a traditional market channel, manufacturers, wholesalers and retailers reduce information asymmetry through repeated transactions, lengthy histories, and face-to-face interactions. Even when entering into a

new transaction, the traditional channel offers potential entrants information about their prospective business partners either through word-of-mouth business media, independent entities (e.g., the Better Business Bureau), and other references. These various information sources offer a measure of trust to the respective channel participants. Research shows that trust plays a crucial role in smooth functioning channels (Ba, Whinston, & Zhang, 2003; Brynjolfsson & Smith, 2000).

In contrast, the online auction market offers no such information sources. To counteract this critical shortcoming, online markets such as online auction in eBay rely upon feedback mechanisms to provide buyers and sellers with information about their respective parties. These feedback mechanisms list basic information about users, and "score" buyers and sellers. The information available from a feedback system helps eBay users build trust and conviction in conducting business transactions. Consequently, the online feedback systems are also called online reputation systems (Lin et al., 2006). Existing studies explore the roles of reputation in traditional markets (Klein & Leffler, 1981; Shapiro, 1982; 1983) and in electronic markets (Ba & Pavlou, 2002; Chiu, Huang, & Yen, 2010; Dellarocas, Fan, & Wood, 2004; Dewally & Ederington, 2006; Dewan & Hsu, 2004; Gefen, Benbasat, & Pavlou, 2008; Houser & Wooders, 2006; Li, 2010; Melnik & Alm, 2002; Pavlou & Dimoka, 2006; Resnick & Zeckhauser, 2002; Resnick et al., 2006; Wolf & Muhanna, 2011; Zhang, 2006) from the perspectives of the behavioral sciences, marketing, economics, and management information systems. As online feedback systems record the activities and profiles of eBay users, the systems contain important information about market structure.

Given the size and nature of the Business to Consumer (B2C) and Consumer to Consumer (C2C) online auction markets, it is important for potential market traders to understand such market structure. In fact, entrepreneurs and traders need to understand the basic characteristics of a market to decide whether to enter the market or not. In addition, as Lin et al. (2006) point out, understanding electronic market structure will also help entrepreneurs, business practitioners, researchers and market makers identify target markets, predict market growth trends and implement effective marketing strategies. There are existing studies addressing the market structure of online auctions from different perspectives of the market. Hou and Blodgett (2010) propose a simple theoretical framework with a two-dimensional market structure (thick vs. thin) and quality uncertainty (high vs. low) to reconcile previous findings of online auction pricing. They define the market structure from the perspective of products and product conditions: "A thin market involves items that are more heterogeneous across key attributes and are of varying quality levels; some examples are used furniture and rare antiques." They find that previous studies are not necessarily at odds. In fact, previous studies are consistent with their findings and results. Arora et al. (2007) use game theory to study the effects

of information-revelation policies under market-structure uncertainty in electronic reverse auctions. They address market-structure uncertainty as the uncertainty about the number of competitors in the market. This definition is more consistent with that in the economics literature. In the work of Alt and Klein (2011), they summarize the electronic markets research in the last twenty years and describe market structure in terms of market fragmentation, concentration, and information asymmetry. Lin et al. (2006) study market structure by investigating the characteristics of market participants in eBay. They find that seller reputation, rather than buyer reputation, is log-normally distributed. Li, Li, and Lin (2008) extend the work, and compare the market structures of eBay in the U.S.A. and of Taobao in China. They suggest that online transaction volumes of Taobao sellers demonstrate many stochastic properties similar to those on eBay with some distinguishing properties, such as a faster growth rate but a declining concentration trend. They also find that Taobao sellers held stabilized transaction volumes while market growth slowed in 2006.

However, the existing studies on online auction market structure still show certain untapped areas. First, so far no studies have been conducted to discuss the length of market participation since entry into the online auction markets. In fact, the eBay membership length can tell us some information about eBay users' seniority and how seniority is related to remaining active in the market. Second, existing studies explore the structure of the entire market without focusing on one specific product market. Lin et al. (2006) and Li et al. (2008), test *Gibrat's Law* for the entire markets in eBay and Taobao. General conclusions derived from the whole market or macro level need to be validated at the individual product or micro level. In addition, knowledge about the market structure at the product level might be more useful for market participants.

This paper extends the research into online auction market structure by addressing how the distributions of online feedback scores reflect the market structure of eBay in 2006-2007. Following the definition of market structure in the economics literature, we are particularly interested in three aspects of the market: (1) the characteristics of eBay users, (2) the extent of market competition, and (3) the evolution of eBay users. This study contributes to the literature in three ways:

(1) Existing studies do not provide information about eBay users' membership length, whereas our study takes this factor into consideration, so that we can have a complete picture of the demographics of market participants;

(2) Existing studies do not differentiate between eBay bidders and winners, in fact winners are relatively important to sellers because the winners finally buy and pay the items. We will address this differentiation in this study; and

(3) The Herfindal-Hirschman Index of market concentration and *Gibrat's Law* of market evolution were tested in the literature at the macro level. We will test these at the individual product (micro) level by using a relatively large sample size.

The rest of the paper is structured as follows: First, we describe the feedback systems at eBay. Second, we explain the research framework and data collection. Third, we demonstrate the basic characteristics of market participants, measure the extent of market competition, and study the evolution of users. Then, we discuss theoretical contributions and managerial implications of our findings. Finally, we draw conclusions.

2. eBay's feedback systems (eBay My World) and eBay users

We chose eBay to investigate the characteristics of online auction users because it is currently the largest online auction site with over 80% market share. Before we address the online auction market structure, we need to introduce eBay's feedback systems (i.e., eBay My World) because the systems contain the information about eBay users, feedback scores, and auction listing history which can be used to study market structure. Online feedback systems are critical to building online trust in electronic marketplaces. These systems record and report an online trader's feedback according to other traders' purchase and/or selling experience. Resnick and Zeckkauser (2002) estimated that there is a 52.1% probability that a buyer will give a seller a feedback score, which is lower than the 60.6% probability that a seller will give a buyer a feedback score. The feedback system, eBay My World, is the most popular and successful one. Before an auction, bidders can judge a seller by checking the seller's feedback scores, detailed seller ratings, and reviews left by previous buyers and sellers for this seller. If bidders accrue sufficient trust on the seller, they are more likely to bid and buy the items listed by the seller. After fulfillment of an auction transaction, both the buyer and the seller can provide feedback by rating each other. There are three types of ratings available: positive, neutral and negative. The overall feedback scores, positive percentage, membership starting date, and other information are published on eBay's site. Beyond summary information, eBay users can read each feedback along with detailed comments and reviews left by buyers and sellers. Therefore, we can use eBay users' feedback reputation scores as a proxy of their transaction volumes in a given period of time. These transaction volumes can be taken as an important indicator for eBay users' capacity in the market. In addition, comparing the feedback scores from buyers with those from sellers, we can measure whether an eBay user is sell-dominant or buy-dominant at eBay. Figure 1 is a representative example for one seller's feedback profile.

Figure 1 eBay Feedback Systems

3. Research framework and data collection

There is no common definition of market structure in the literature. As mentioned before, Hou and Blodgett (2010) define market structure from the perspective of products and product conditions. Alt and Klein (2011) describe market structure in terms of market fragmentation, concentration, and information asymmetry. Lin et al. (2006) and Li et al. (2008)'s market structure research mainly investigates the firm's growth pattern, firm's entry and exit, and market concentration. In this study, we define market structure as "the interconnected characteristics of a market, such as the number and relative strength of buyers and sellers, and degree of collusion among them, level and forms of competition, extent of product differentiation, and ease of entry into and exit from the market" (BusinessDictionary.com). This definition is consistent with the economics literature. In this study, we describe the online auction market structure according to the: (1) characteristics of *eBay users*, (2) extent of *online auction market competition*, and (3) *evolution of eBay users*. The framework we use to study the market structure is summarized in Figure 2.

First, we describe eBay users' demographics, which differ from traditional customer demographics (e.g., age, income, education, etc.). The descriptors that we call "demographics" of eBay users consist of the amount of feedback, feedback scores, eBay membership length, and stated location in the online environment. The distribution of eBay users' feedback scores and membership length, in particular, are fundamental to

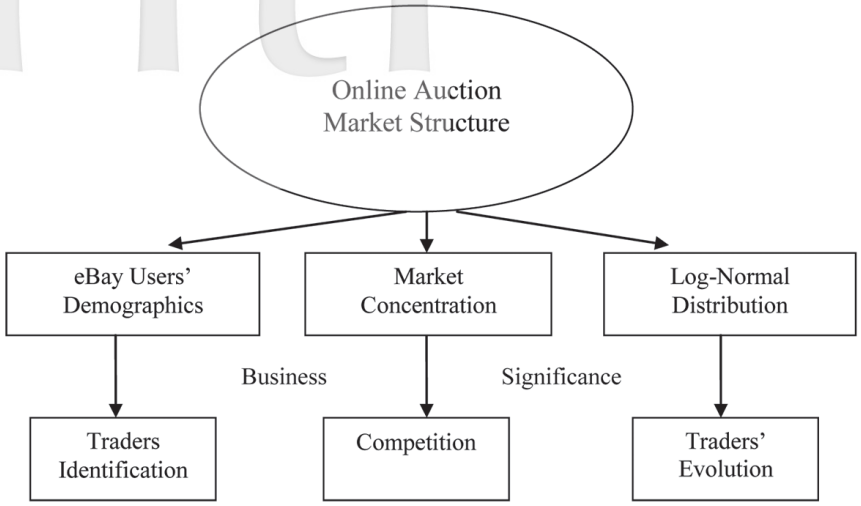

Figure 2 Research Framework

understanding the basic characteristics of eBay users. The business significance of these demographics is that they help marketers understand who eBay traders are, and identify the right business counterparts and target markets. For example, new buyers with trust concerns towards sellers might choose eBay power sellers to bid or buy as they seem to be more truthful to these buyers. Moreover, as an online auction house, eBay can better serve market participants if it understands them better.

Second, we investigate the degree of concentration of the Xbox game console market. Sellers vary from retailers of new Xbox game consoles to individuals who resell used ones. Knowledge of market concentration is very useful for possible stakeholders to make decisions on entry and exit strategy.

Third, we test whether eBay users' feedback scores are log normally distributed. *Gibrat's Law* proposes that the firm's growth rate is irrelevant to its size, thus suggesting that firm size is log normally distributed (Hart & Oulton, 1996; Lin et al., 2006). Moreover, Lin et al. (2006) find that seller reputation scores which is related to transaction volumes, rather than buyer reputation scores, is log-normally distributed. In this study, we will test the log-normal distribution on eBay data for Xbox game consoles to obtain an insight into the firm's growth pattern.

4. Demographics of eBay users

Computer programs were written to act as agents to automatically collect data from eBay. The data collection spanned over a period of three and a half months in 2006-2007.

We chose the Xbox game consoles for this study because they had a reasonable market thickness measured by the number of auction listings and active bidding everyday. All together, we collected 9,583 online auction listings for Xbox game consoles, of which 7,403 resulted in transactions. Within the 9,583 auction listings, there were 5,894 unique sellers, and 24,664 unique buyers, culminating in 6,340 unique winners (see Table 1 for a summary).

Although 5,894 eBay users acted as sellers of Xbox game consoles, a closer examination of their feedback history reveals that some sellers also participated as buyers in other auction listings. So, we further divide these sellers into "Sell Dominant" users (2,887) and "Buy Dominant" users (2,876). In the same fashion, we divide bidders and winners into these two categories. Table 2 provides a detailed breakdown of our auction participants.

Table 2 tells us that a majority of eBay users were buyers. The sellers/buyers ratio is 22.6% (2,887 + 2,375)/(2,876 + 20,408). Next, we list the feedback scores histograms for Xbox game console sellers, buyers, and winners in Figures 3-5. Half of the sellers had more than 70 feedback scores. On the other side, half of the bidders had more than 20 feedback scores, and half of the winners had more than 28 feedback scores. Overall, sellers had more feedback scores than buyers and winners. This suggests that sellers

Table 1 Summary of eBay Users

	Auction listings	Unique sellers	Unique bidders	Unique winners
	9,583	5,894	24,664	6,340
Success	7,403	5,291	23,473	6,340
Failure	2,180	1,548	3,166	N.A.

Table 2 Divisions of eBay Users

	Total	Sell Dominant	Buy Dominant
Seller	5,894	2,887 (48.98%)	2,876 (48.8%)
Average Feedback Scores	612.102	1,128.148	119.304
Average Membership Length	3.714	3.715	3.784
Bidder	24,664	2,375 (9.63%)	20,408 (82.74%)
Average Feedback Scores	98.339	449.299	65.810
Average Membership Length	2.992	3.617	3.087
Winner	6,340	642 (10.13%)	5,689 (89.73%)
Average Feedback Scores	115.260	541.889	70.764
Average Membership Length	3.190	3.735	3.226

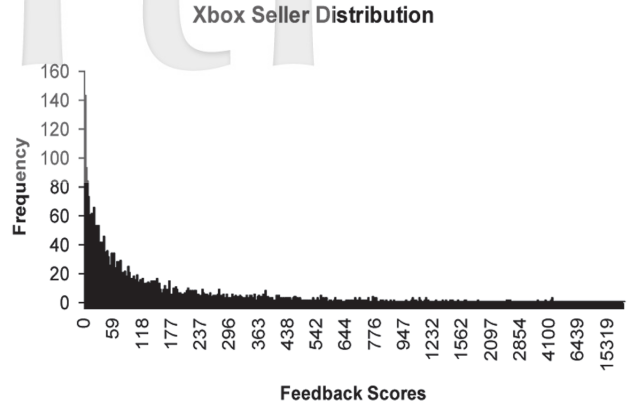

Figure 3 Seller Distribution

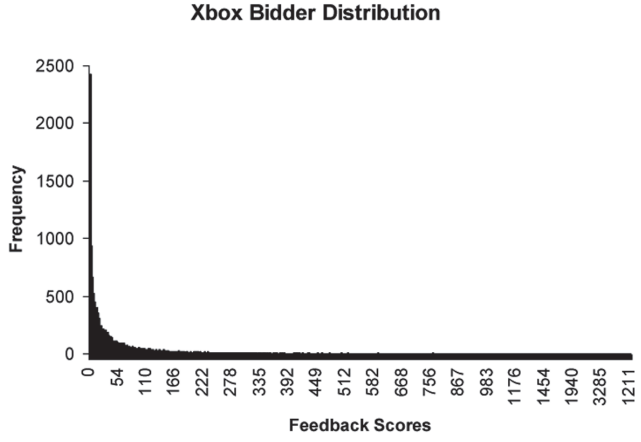

Figure 4 Bidder Distribution

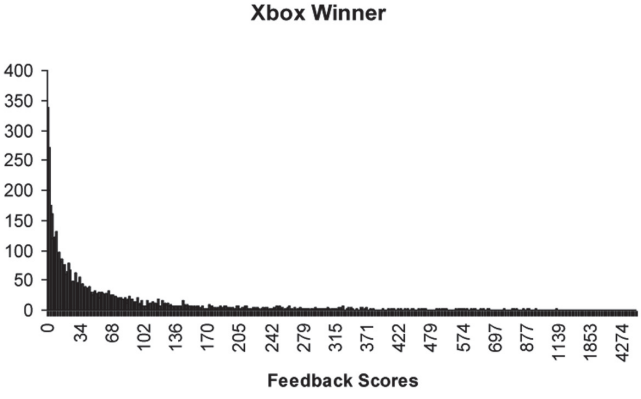

Figure 5 Winner Distribution

were generally more active than buyers in the online auction market. The histograms of the eBay membership lengths tell us that overall, sellers had a longer membership than bidders and winners. Figure 6 below illustrates the distribution of sell-dominant and buy-dominant sellers by membership length.

Table 3 lists the positive percentages for sellers and bidders with different membership lengths. It appears that sellers had a higher positive percentage of feedback scores than bidders for short membership lengths, while bidders had a higher positive

Figure 6 Proportion of Sell-Dominant and Buy-Dominant Sellers

Table 3 Positive Percentages in Membership Lengths

	Seller	Bidder	t-value
Overall	*0.953*	*0.888*	*10.858***
0 - 1 year	0.848	0.702	6.954**
1 - 2 years	0.956	0.927	2.525*
2 - 3 years	0.976	0.955	2.036*
3 - 4 years	0.976	0.962	1.387
4 - 5 years	0.977	0.964	1.253
5 - 6 years	0.983	0.979	0.440
6 - 7 years	0.976	0.988	-1.641
7 - 8 years	0.954	0.984	-1.678
8 - 9 years	0.984	0.994	-0.415
9 - 10 years	0.992	0.993	-0.015

Note: *Significance at 5% level; **Significance at 1% level.

percentage than sellers for long membership lengths. However, we find this difference not to be statistically significant. In Figures 7-10 we also list the positive percentage of feedback scores for sellers, bidders, and winners based on feedback scores and membership length. The overall average of positive percentage of feedback scores for sellers was higher than that of bidders. Differences also existed in the positive percentage of feedback scores between sellers and bidders based on different membership lengths (see Figure 11).

5. Characteristics of market competition

By studying market concentration, we can determine how competitive the Xbox game console market is. More importantly, we want to identify whether the market

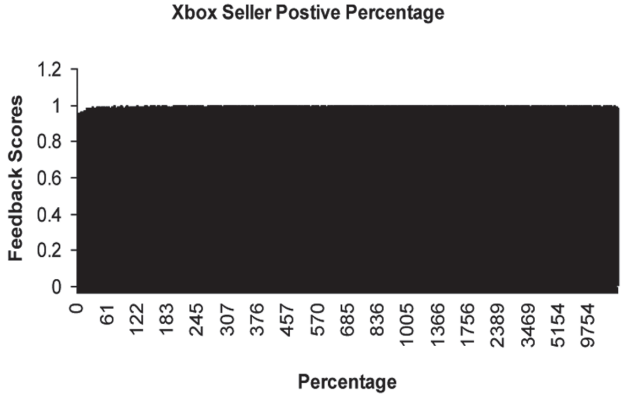

Figure 7 Seller Positive Percentage

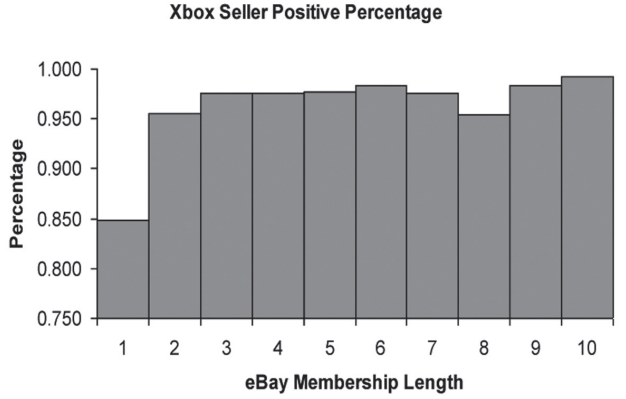

Figure 8 Seller Positive Percentage

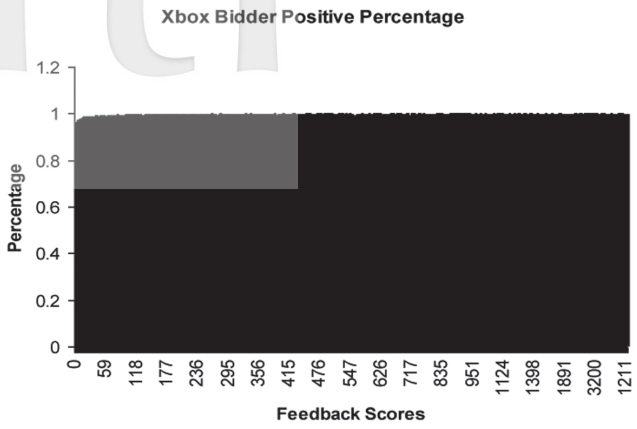

Figure 9 Bidder Positive Percentage

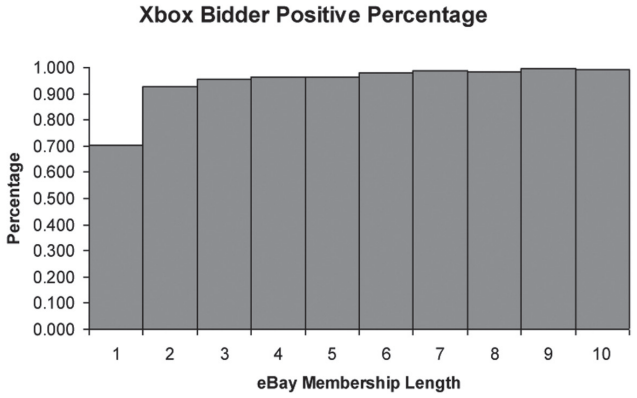

Figure 10 Bidder Positive Percentage

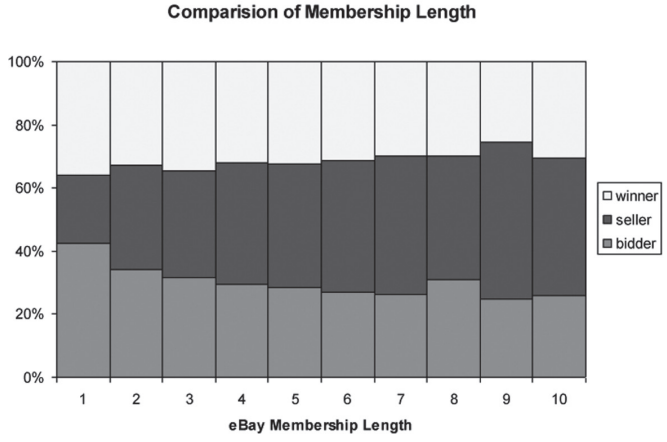

Figure 11 Comparison of Membership Length

is predominantly a B2C or C2C market. We measure the market share P_n of the top n feedback scores as:

$$P_n = \sum_{k=n}^{N} \frac{n * m_n}{T}$$

where m is the feedback score and T is the sum of feedback scores.

Table 4 lists the top 10 sellers with market shares in terms of auction listings. Table 5 lists the top 10 sellers with largest market shares in terms of auction transactions. Among 5,894 sellers, the largest market shares for both cases fell in the range of 1.4%-1.7%. For all other sellers, market share was less than 1%. The 10-seller concentration ratios were 5.4% and 6.5% for auction listings and auction success, respectively.

Table 4 Top 10 Sellers with Auction Listings

# of Listings	Seller	Market Share
136	webstore11	0.014192
83	demortdieselsouth	0.008661
48	Mobilepc	0.005009
39	auctions4aliving	0.004070
38	Sobebooay	0.003965
38	psober3449	0.003965
38	willsrealdeals	0.003965
36	Trickingitout	0.003757
30	Ponybids	0.003131
29	ckttoys	0.003026

Table 5 Top 10 Sellers with Auction Success

# of Transactions	Seller	Market Share
129	webstore11	0.017425
78	demortdieselsouth	0.010536
46	mobilepc	0.006214
38	willsrealdeals	0.005133
37	Psober3449	0.004998
36	trickingitout	0.004863
31	sobebooay	0.004187
30	ponybids	0.004052
28	megamixxer	0.003782
27	Ckttoys	0.003647

Figure 12 depicts the cumulative change of market share in terms of auction transactions starting from the sellers with largest feedback scores to sellers with 0 feedback score. From right to left, the curve increases rapidly, then smoothly. It indicates that sellers with higher feedback scores had relatively higher market shares. This trend is more obvious for sell-dominant sellers in Figure 13.

The Herfindal-Hirschman Index (HHI) has been widely used to measure the concentration level of a market (Hirschman, 1964). An HHI value of 0 indicates a perfectly competitive market and an HHI value of 10,000 suggests a monopoly market. For sampled data in the given period, we follow the literature and extend HHI to a sample-based HHI (S-HHI). Table 6 lists the HHI values for auction listings and auction transactions. Table 7 shows the

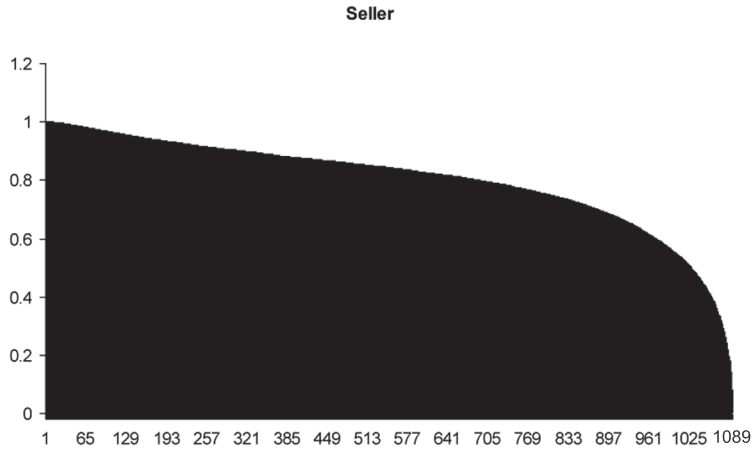

Figure 12 Cumulative Change for Sellers

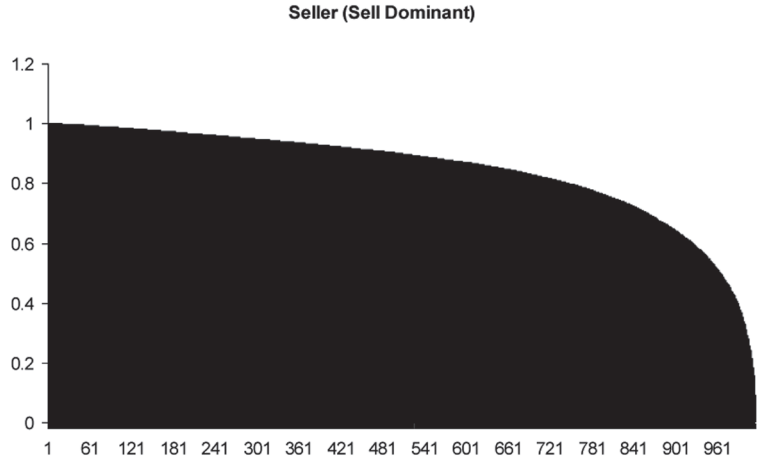

Figure 13 Cumulative Change for Sell-Dominant

Table 6 HHI for Auction Listing and Success

	Auction Listing	Auction Success
HHI	6.923	9.245
# of Sellers	5,894	5,291

Table 7 S-HHI for Sellers

	Seller	Seller (Sell Dominant)	Seller (Buy Dominant)
S-HHI	0.015	0.0370	0.090
Sample Size	5,894	2,887	2,876

S-HHI for auction listings based on types of sellers. From Tables 6 and 7, we observe the following results: (1) The HHI values for auction listings and transactions are relatively low, which indicate that the Xbox game console market was very competitive. (2) The S-HHI values for sellers, sellers with sell-dominant and sellers with buy-dominant are very low, which consistently indicate the Xbox game console market was a competitive one. These results are consistent with the findings in Lin et al. (2006) and Li et al. (2008).

From the above analysis, we can claim the Xbox game console market at eBay was very competitive in 2006-2007. Moreover, considering the market had many individual sellers, with no one enjoying any monopoly power, we can confidently characterize it as a mix market (B2C and C2C) with a dominant C2C segment.

6. Characteristics of eBay users' evolution

Using feedback scores as a proxy of transaction volumes, the histograms of logarithmic value of transaction volumes for Xbox sellers, bidders and winners are shown in Figures 14-16, respectively. For seller datasets, the graphic distributions are close to bell-shaped normal distributions. On the other hand, the shapes of the bidder and winner dataset distributions are not symmetric. A large number of bidders -- along with winners -- had reputation scores of 1. Thus, bidders' and winners' feedback distributions are more right-skewed than those of sellers. To check the differences based on types of users, in Figures 17-19 we present the histograms of sellers with sell-dominant, bidders with buy-dominant, and winners with buy-dominant, profiles. The patterns in Figures 17-19 are similar to those in Figures 14-16.

To check the type of distribution, we conduct the Wald test on sellers, bidders, and winners, the results of which are shown in Table 8. We also tested log-normality on sellers, bidders and winners each divided as sell-dominant and buy-dominant. Tables 8-9

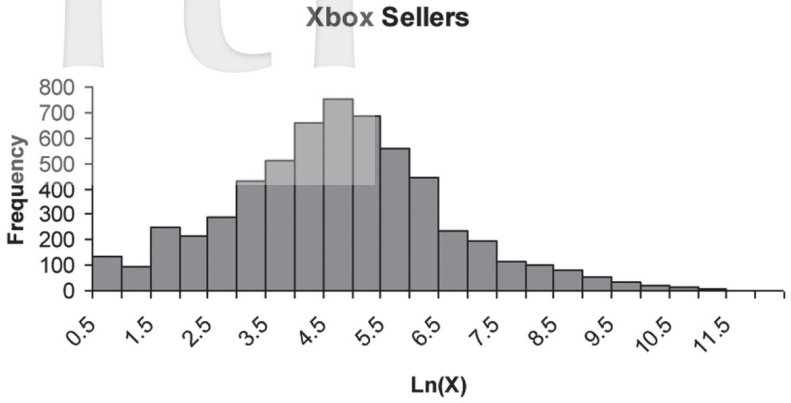

Figure 14 Seller Transaction Volumes

Figure 15 Bidder Transaction Volumes

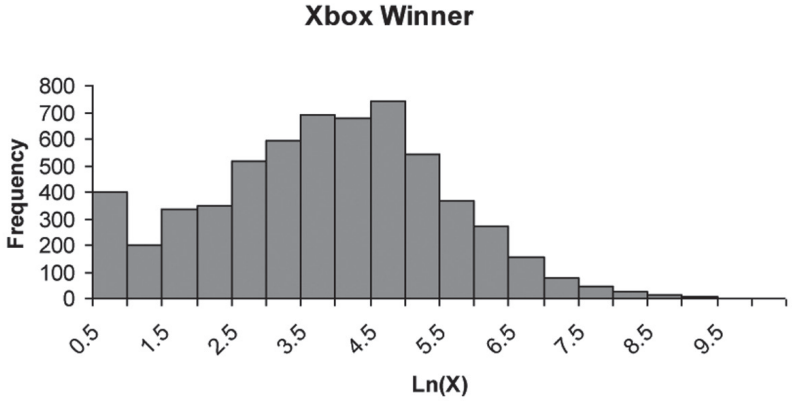

Figure 16 Winner Transaction Volumes

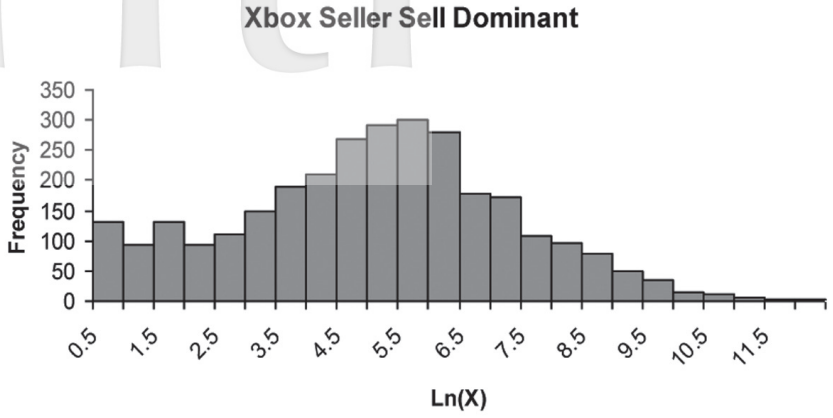

Figure 17 Sellers with Sell-Dominant

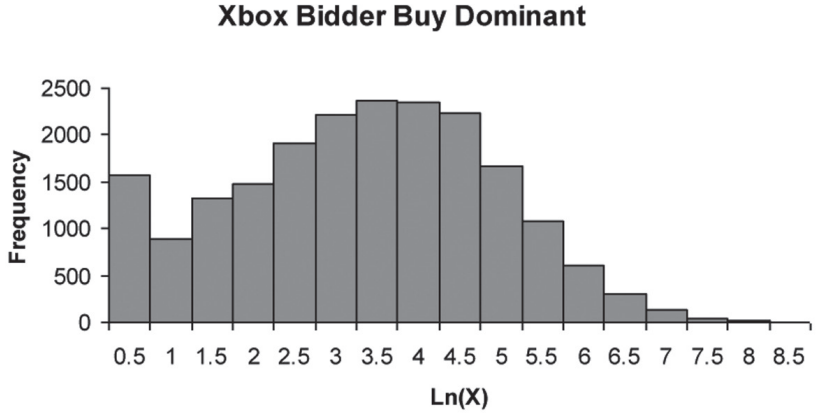

Figure 18 Bidders with Buy-Dominant

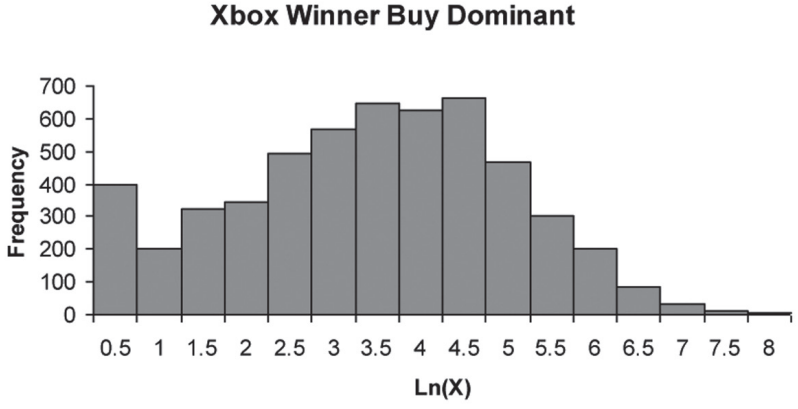

Figure 19 Winners with Buy-Dominant

Table 8 Wald Test on Sellers, Bidders, and Winners

	Seller	Bidder	Winner
Skewness	0.293	0.014	-0.011
Kurtosis	0.602	-0.238	-0.114
# of Observations	5,699	22,146	5,855
Wald-Value	167.60	52.99	3.29

Table 9 Wald Test Based on Sell-Dominant and Sell-Dominant

	Seller Sell-D	Seller Buy-D	Bidder Buy-D	Bidder Sell-D	Winner Buy-D	Winner Sell-D
Skewness	0.019	-0.231	-0.124	-0.272	-0.197	-0.157
Kurtosis	-0.019	0.559	-0.468	0.020	-0.393	-0.071
# of Observations	2,842	2,857	19,793	2,353	5,217	638
Wald-Value	0.264	62.34	231.35	29.05	67.31	2.75

summarize the following findings from the log-normality tests: (1) Sellers in total did not demonstrate a log-normal distribution of transaction volumes. However, sellers with a sell-dominant profile did exhibit a log-normal distribution. (2) The distribution of bidder transaction volumes failed to pass the log-normality test on all accounts (i.e., it did not matter if bidders were viewed in total or by sell-dominant or buy-dominant profiles). (3) Winner transaction volumes, in total, were approximately log-normally distributed. Winners with sell-dominant also showed a log-normal distribution.

We also look at the growth of transaction volumes for sellers after one year. On average, sellers more than doubled their transaction volumes from 302.93 to 608.48 within one year. Figure 20 lists the feedback score growth in number (absolute value), and Figure 21 shows the feedback growth in rate (relative value). The primary impression is that sellers with high feedback scores had more feedback ratings (more transactions) than sellers with low feedback scores. The feedback score growth rate shows a smooth spread distribution with several spikes for sellers with transaction volumes in the intervals of 0-25, 350-550, and 900-1,400. In general, sellers with the highest scores had relatively low growth rates.

We also show the growth patterns based on membership lengths in Figure 22 and Figure 23. The figures tell us that sellers with longer membership had more transaction volumes. However, sellers with shorter membership had higher growth rates in transaction volumes. One explanation is that even sellers with longer membership had higher existing transaction volumes, which dragged the growth down given the same amount of increased scores.

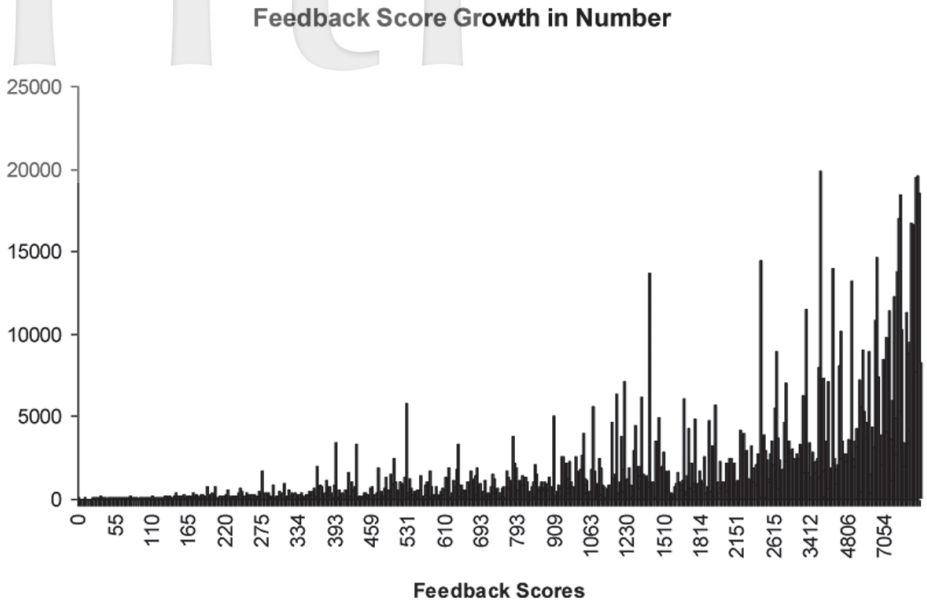

Figure 20 Growth in Number

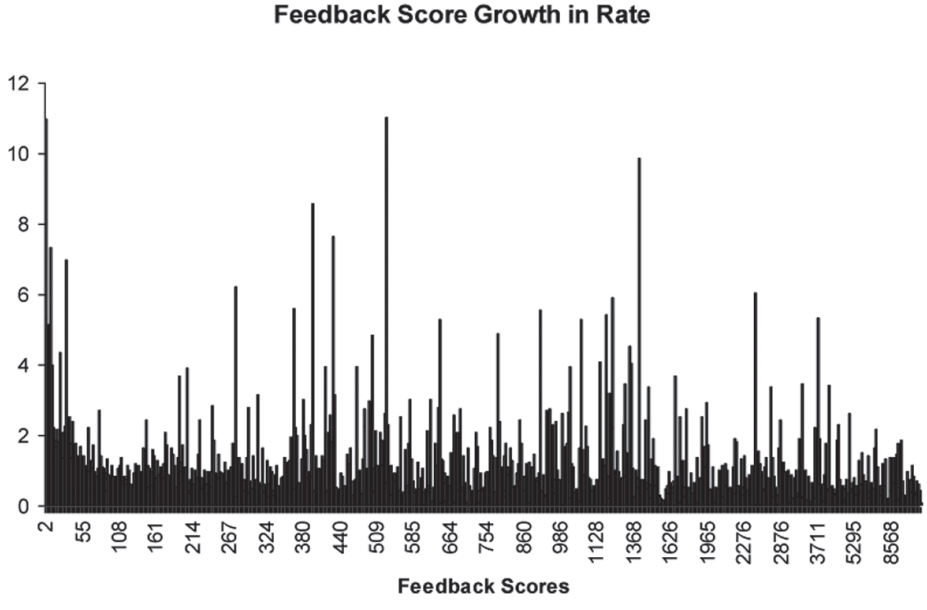

Figure 21 Growth in Rate

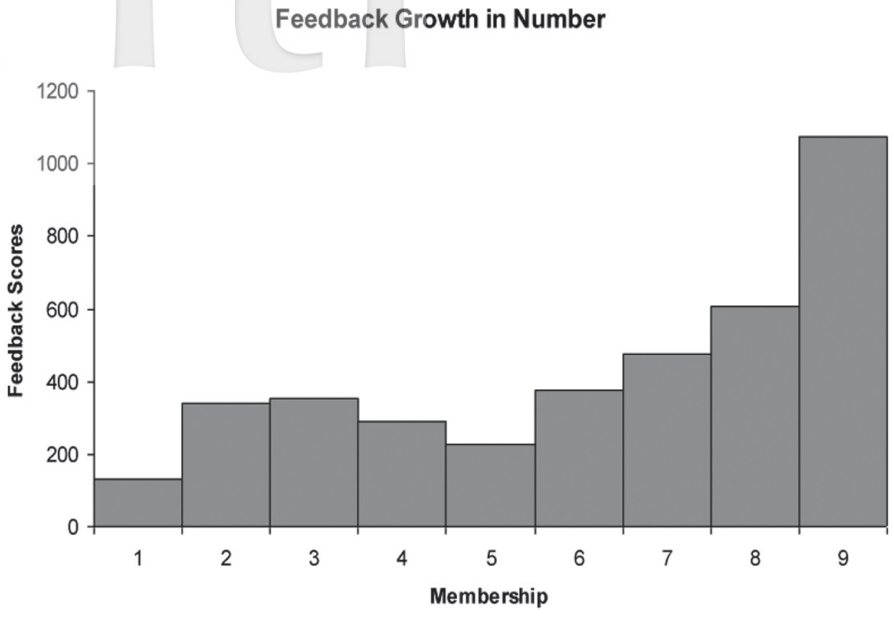

Figure 22 Growth in Number

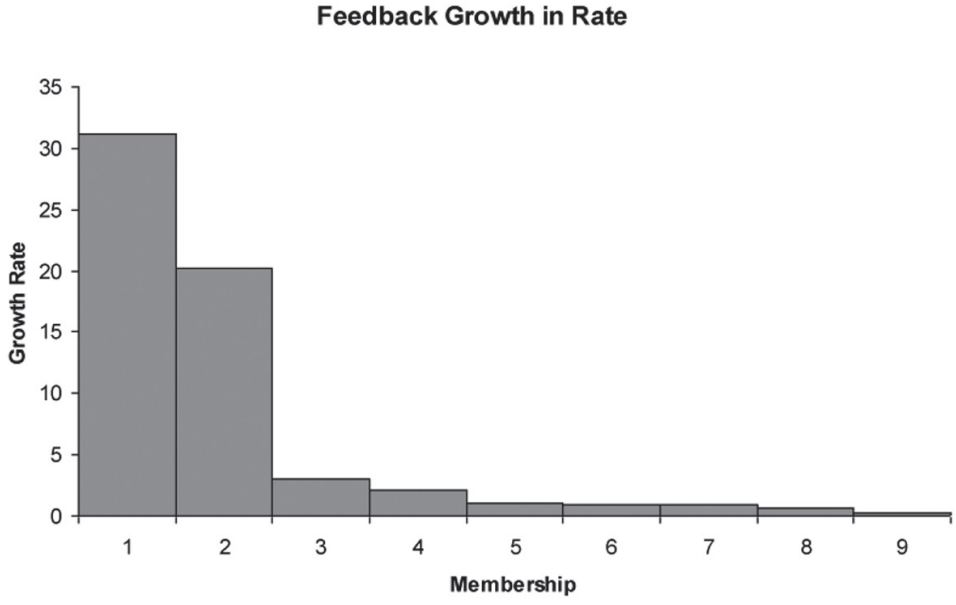

Figure 23 Growth in Rate

Gibrat's Law means that the log-normal distributions suggest firm's proportionate growth rate. That is, the expected value of the increment of firm's size over a period of time is proportional to the current size of the firm. In other words, firm growth rate is irrelevant to size. We examine the change of sellers' total feedbacks scores after a one year period. To uncover the growth pattern of seller transaction volumes, we ran the following regression: $\ln (Y (t_1)) = a + b \ln (Y (t_0))$, where $Y (t_0)$ is the feedback score at time t_0, and $Y (t_1)$ is the reputation score at time t_1. In the spirit of *Gibrat's Law*, we hypothesize b to be equal to 1, which reflects a proportionate growth. Table 10 shows the regression results. Based on the values of the coefficient estimates in a confidence interval of 95% significance, the regression results fail to support a hypothesis of a proportionate growth for three cases: sellers as whole, sellers with sell-dominant, and sellers with buy-dominant. The estimated coefficients of b for three cases are significantly below 1, which suggests that the sellers with low transaction volumes (also means that previously transacted less) grew faster than those established sellers with more transactions (along with higher transaction volumes). These findings at individual product market (micro) level are consistent with the research by Lin et al. (2006) at the entire market (macro) level, which sheds light on the limitation of *Gibrat's Law.*

Table 10 Regression Results

		Coefficients	t-value	P-value	Lower 95%	Upper 95%
Sellers	C	1.296	57.857	0	1.252	1.340
	b	0.851	157.587	0	0.841	0.862
	R^2	0.820	Adj. R^2	0.820	N	5,451
Sellers	C	1.398	41.444	0	1.332	1.464
Sell-D	b	0.860	119.857	0	0.846	0.874
	R^2	0.843	Adj. R^2	0.843	N	2,672
Sellers	C	1.427	45.739	0	1.366	1.488
Buy-D	b	0.770	87.181	0	0.753	0.787
	R^2	0.732	Adj. R^2	0.732	N	2,779

7. Theoretical contributions

In this study, we use Xbox game consoles data on eBay to analyze the market structure of online auctions in 2006-2007. By investigating three dimensions of market structure, we fill certain gaps in existing research on market structure:

First, existing studies do not provide information about eBay users' membership length. This study helps provide a complete picture of the demographics of market

participants with the analysis of membership lengths. The membership lengths combined with other measures such as feedback scores can be used to judge whether one eBay user is active and/or experienced.

Second, existing studies do not differentiate between eBay bidders and winners, even if winners are relatively important to sellers because they are willing to pay the highest prices and finally buy the items. The differentiation in this study helps us better understand the differences among bidders and winners; and

Third, we test the HHI index and *Gibrat's Law* in online auction market at the individual product (micro) level by using a relatively large sample size. Combining with existing studies that test HHI index and *Gibrat's Law* at the entire market (macro) level, this study helps enrich existing theories regarding market concentration and firm evolution.

8. Managerial implications

Understanding the characteristics of market participants and the extent of competition is of vital importance to potential entrepreneurs and traders before they decide to use the channel of online auctions. In this study, we study the market structure in 2006-2007. We believe that the market structure is stable for a long time. The findings in this study can also be used to understand the current market structure. In this study, we find many eBay users had low transaction volumes as indicated by their feedback scores. Sellers had more transaction volumes than buyers have. Sellers also typically had a longer membership than buyers. Thus, it appears that buyers had less eBay experience than sellers, and buyers were less active than sellers. Given many buyers are less experienced or inactive, sellers should carefully list their products with detailed description and instruction. In the online market, sellers need to help buyers evaluate the products, and earn their confidence and trust. At the same time, eBay, the online auction house, should also provide a variety of help and services to buyers, especially new buyers.

We also find that the Xbox game console market on eBay was very competitive. The online auction market such as eBay shows easy entry for potential sellers without high market barriers, and potential buyers might benefit lower prices from the competitive market. On the other side, sellers are under a lot of competitive pressure to survive and grow in this market. They need to study efficient and effective selling strategies. It is critical for sellers, especially newcomers, to earn competitive advantages in this online market. How to achieve these advantages is a valuable topic, but beyond the scope of this study.

We also find that eBay users' transaction volumes did not follow a log-normal distribution, which suggests that sellers with higher transaction volumes grow slower than sellers with lower transaction volumes. This suggests that it is relatively easy to start a business on eBay but achieving consistent and sustainable growth is a great challenge to sellers. Sellers need to boost their sales by winning buyers' trust and applying different marketing strategies. As they grow, sellers need to use more and more efficient and effective selling strategies to keep growing, such as becoming an eBay power seller, earning truthfulness certificates from third parties, building a good reputation, and utilizing marketing promotions.

Finally, our research also has managerial implications to buyers and online auction houses. Analysis of bidders and winners helps buyers better understand who are real competitors. The knowledge of sellers' demographics helps buyers choose the right counterparts. For example, new buyers with trust concerns towards sellers might choose eBay power sellers to bid or buy as they seem to be more truthful to inexperienced buyers. Knowledge of market structure also helps the online auction house understand the market. Thus, eBay can better serve market participants by providing tools and services that enhance trust and facilitate transactions.

9. Conclusion and limitations of the study

Using Xbox game console market data at eBay in 2006-2007, we offer insights into the market structure of online auction, particularly, the characteristics of users, the extent of market competition, and growth of transaction volumes over time. We find that many eBay users had low transaction volumes as measured by feedback scores. Sellers had more transaction volumes and longer memberships than buyers. This implies that sellers, as well as eBay, the online auction house, need to provide as much information about the products being auctioned, and a variety of services to win buyers, especially inexperienced buyers. We also find that the Xbox game console market was very competitive. To survive and succeed in this market, earning competitive advantages is very critical. We also find that sellers with higher transaction volumes grew slower than sellers with lower transaction volumes. It is relatively easy to start a business at eBay, but achieving sustainable growth poses a great challenge to sellers. Sellers need to use more and more efficient and effective selling strategies along with other marketing efforts. We discuss the theoretical contributions to the literature and managerial implications to sellers, buyers and online auction house.

There are some limitations in this study. It is possible for one seller or buyer to use different eBay user names, but we have no way of identifying them in an online

environment. Therefore, market share concentration for a single user may exceed the range noted earlier. Another limitation is that we only use data for Xbox game consoles. Our findings might be extended to similar products such as the Sony PlayStation and Nintendo game consoles, but replication studies using different products -- both within and outside the electronic game category -- can offer new insights into online market structure. Future research should examine the drivers of positive feedback scores as this appears to be critical for long-term success in the online B2C and C2C marketplace. Lastly, future studies should investigate the current market structure, and compare it with the historical one to check the market evolvement.

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About the authors

Yanbin Tu is an Associate Professor of Marketing in Department of Marketing, School of Business at Robert Morris University in Pennsylvania. He earned his Doctorate Degree from the University of Connecticut. Prior to teaching, he worked for the Bank of Shanghai in China. His research interests cover e-commerce, interactive marketing, database marketing, customer relationship management, and financial services marketing. His work has appeared in *International Journal of Electronic Commerce, International Journal of Internet Marketing and Advertising, International Journal of Electronic Business, International Journal of Technology Marketing*, and *Communications of the ACM*.

Steven R. Clinton is an Associate Professor and Department Head in Marketing at Robert Morris University. He received his Ph.D. Degree (Major: Marketing; Minor: Logistics) from Michigan State University in 1998. His research interests include international supply chain organization, customer service in logistics, and logistics strategy. He has published in *Journal of Business Logistics, Transportation Journal, International Journal of Physical Distribution and Logistics Management, Journal of Production and Inventory Management*, and *International Marketing Review* as well as numerous conference proceedings.

Adora Holstein is an Associate Professor of Economics in Department of Economics and Legal Studies, School of Business at Robert Morris University in Pennsylvania. She earned her Ph.D. in Economics from Pennsylvania State University in 1987. Her research interests

are in industrial organization, public policy in the health care and finance industries, and international trade and investments. She has published in the *Global Journal of Business Research*, *International Business and Economics Research Journal*, *Pennsylvania Economic Review*, and several proceedings of national and international academic business conferences.