Blind Trust Online:

Experimental Evidence from Baseball Cards

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Abstract

Before reaping transaction cost savings from the Internet, online sellers must credibly communicate the quality of their goods or their reliability of delivery. We use baseball cards as an example to address (1) whether consumers fully understand the risk of online trading, (2) the extent to which consumers employ seller reputation and professional grading to alleviate the risk they are exposed to, and (3) the impact of online trading on the retail market and supporting industries.

An experiment is carried out to obtain actual baseball cards from both online and retail markets whose quality is then professionally graded and compared to the prices paid by online buyers for goods with similar claims. Our findings indicate that some uninformed online buyers are misled by non-credible claims of quality; they pay higher prices but do not receive better quality and in fact are defrauded more often.

Although a combination of professional grading and reputation mechanisms appear to have the potential to solve the problem, they have only had limited success so far. Data on structural changes in the baseball card industry suggest the problems stemming from buyer misconception may have far-reaching consequences, extending beyond the immediate losses of defrauded consumers to influencing producer and supply decisions. Our findings also suggest that empirical studies using online price data should be careful of what assumptions they are making of online users and what behaviors of buyers and sellers are likely to drive the price data.

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1 Introduction

The Internet offers enormous transaction cost savings by making it easier for individual buyers to find agents selling products they want. However, it also imposes an information challenge for online sellers, who must somehow credibly communicate the quality of their goods and reliability of delivery. This has motivated two strands of literature: one using Internet shopping data to examine how online transaction cost savings affect online and offline prices (Brown and Goolsbee 2002, Scott Morton, Silva-Risso and Zettelmeyer 2001b), and a second using online price data to detect the extent to which consumers are willing to reward seller reputation as an indicator of product or service quality (Melnik and Alm 2002, Resnick and Zeckhauser 2001, Lucking-Reiley et al. 2000). Behind these studies is an implicit assumption that consumers have full information about the relative benefits and risks of the two markets and are capable of evaluating them. This paper presents experimental evidence that this assumption may not hold in every online market and a violation of this assumption may have detrimental consequences on the other sectors of the economy.

We focus on Internet auction, one of the fastest growing formats of e-commerce. According to the Federal Trade Commission (FTC), Internet auction fraud was ranked the second common category [2] of consumer complaints, accounting for 10% of the 204,334 complaints in 2001. Similarly, the Internet Fraud Complaint Center [3] reported Internet auction fraud in 42.8% of the 16,775 total Internet fraud complaints received in 2001, making it the most common offense that year.

To be more specific, the most common complaints about Internet auction are that "after sending the payment, buyers may receive an item that is less valuable than promised, or worse yet, nothing at all." [4] This implies three risks that buyers face online: the default risk that nothing is delivered; the counterfeit risk that delivered goods may not be authentic; and the deception risk that even authentic and delivered goods may be of lower quality than promised.[5] These complaints, especially those about the deception risk, suggest a possibility much more

[2] The number one category of consumer complaints is identity theft, which may be related to Internet auction fraud because credit card numbers are the only verifiable identity information required for eBay registration.

[3] A partnership between the FBI and the National White Collar Crime Center.

[4] According to a best-selling FTC brochure entitled *Top Ten Dot Cons*.

[5] Any one of the three problems may be classified as moral hazard or adverse selection, depending on when a seller decides to commit a fraudulent act. For example, default would be an adverse selection problem if the seller intended to default before the auction started, but it would be a moral hazard problem if the decision to default depended on the winning bid. Due to this ambiguity, we shall refer to all three as asymmetric information problems to avoid the timing connotations associated with moral hazard and adverse selection.

severe than the typical lemons problem[6]: buyers may have had incorrect beliefs regarding the total risks involved in online auction and therefore regretted their participation in the online auction.

To fully understand the risk of online auction and its potential long run consequences, we ask three research questions: first, to what extent do buyers understand the true risk of online auction and incorporate it in their willingness to pay? Second, how effectively have buyers employed seller reputation and professional grading to reduce the amount of risk they are exposed to? Third, how has online trading affected the retail market and the upstream industry that produces goods sold in both markets?

Three clean features of baseball cards make them an excellent example to address these questions. Because each type of baseball card is a homogenous good and card quality is the most important determinant of card value, any potential quality problem will be a serious concern for buyers of baseball cards online.[7] More importantly, a card owner may purchase professional grading services to verify card quality and identity. Given the widespread acceptance of professional grades, this is a credible third party signal of quality that solves the counterfeit, deception, and lemons problems for graded cards.

After observing the current retail and online markets of baseball cards for seven months, we discovered three inconsistent facts: first, the difference between online prices for a professionally graded high quality card and an ungraded copy greatly exceeded grading cost. This implies that any owner who really believed they had a high quality card would never keep it ungraded. Nevertheless, about 40% of the ungraded cards offered in the online market were claimed to be high quality. More surprisingly, online bidders are willing to pay 27-47% more for these high claims. This phenomenon is subject to two explanations: first, there may exist a separating equilibrium where sellers making claims of high quality are indeed selling relatively better cards, even if their claims are overstated. Second, these claims could actually be meaningless but naive online bidders don't realize the true risk underlying these claims.

We conducted a field experiment to directly distinguish these two explanations. Specifically, we purchased ungraded cards from both online and retail markets and sent them for professional grading. The online purchases were further divided into two groups so that the

[6]In a classical model of a lemons market, buyers realize the risk of receiving goods of poor quality and fully incorporate those risks into their willingness to pay. In that case, buyers would never regret their market participation decisions.

[7]The homogeneity also makes it extremely difficult for a buyer to return a purchased card because he cannot prove the card returned was the one actually purchased.

sellers of one group claimed systematically higher quality than the sellers in the second group. Comparing the two sub-samples of online purchases, we find that buyers were willing to reward the most fraudulent sellers for meaningless overstatement of quality. After ruling out price convexity and risk loving as potential explanations, this finding suggests that at least some buyers drastically underestimate the risk of trading online. Comparison of online and retail purchases reveals significant quality differences between the two markets, which confirms our expectation of more lemons in the ungraded online market even if the buyer misconception is eliminated.

The experimental approach obtains true card qualities from graders, which allows us to identify correlations between seller claims, seller reputations, and the true qualities of the cards those sellers offered. Reputable sellers turned out to be more honest both in claims of quality and reliability of delivery. The fact that buyers bought more often from reliable sellers shows that they understand part of the signal, but the higher prices paid to low reputation sellers with ridiculous claims implies their understanding is not complete. The underutilization of seller reputation may explain why the existing literature finds a weak correlation between final winning prices and seller ratings.

To better understand the effect of online trading on the retail market and supporting industries, we set up a theoretical framework incorporating both the beneficial transaction cost savings and the harmful information problems from online markets. The model predicts a specific pattern of market segmentation, in which cards of high quality are graded and traded online, cards of mediocre quality are ungraded and traded in retail, and cards of low quality are traded online as ungraded. Compared with a world before the rise of the Internet, the Internet should cause a growth of professional grading services and a shrinkage of the retail sector. We present evidence confirming each of the predictions. These links provide a means for buyer misconception in the online market to spill over to the other parts of the economy.

Results from this paper may extend well beyond baseball cards because all of the issues addressed here are likely to be present in online auction for a multitude of goods.[8] The most direct analogy is to the other collectibles such as stamps, coins, and antiques, all of which have similar industry features and professional grading services.[9] For industries that seem vastly dif-

[8]According to a May, 2, 2002 article in www.internetnews.com "FTC Settles Online Auction Fraud Case", the default and counterfeit problems arose in a number of eBay fraud lawsuits involving undelivered computers, counterfeit artwork and counterfeit sports memorabilia.

[9]For collectibles alone, the Internet is likely to generate huge effects on the 125 million casual coin collectors (according to the United States Mint 2000 annual report), the 6.83 million stamp savers and collectors (according to Linns Stamp News Online March 13, 2000 article "Internet Sales Changing U.S. Stamp Market") and the large number of sports card collectors indicated by the 889,000 circulation of Beckett sports card magazines and over

ferent from baseball cards, our informal observation suggests that they face similar informational problems in online trading and adopt similar mechanisms to address these problems. Take used cars as an example. eBay opened eBaymotors.com in April 2000 to sell used cars via the same auction mechanism used in the baseball card auctions. Although the utility an individual draws from owning a baseball card is quite different from the utility of possessing an automobile, both are viewed as consumption goods with resale values. For both goods, the discovery of quality requires in-person, physical examination of the items; and consequently, the search for desired items entails extensive shopping in the retail markets. The skepticism with which a baseball card buyer will approach a scanned picture on a card auction page may equally apply to used car buyers viewing digital images on used car auction pages.

In fact, the information concerns were so severe for used cars that in January 2002 eBay announced a special quality assurance program for automobiles, featuring escrow service at the expense of $22 and third party vehicle inspection at $99. The nature of vehicle inspection is comparable to professional grading of baseball cards since both require a third party expert to examine the good in person. We choose baseball cards over used cars because the value of an actively traded baseball card is much lower and therefore baseball cards have a much more established online market and a much more active demand for professional grading. The value of the goods and the prices of the professional grading services are not that important; the critical point is that online markets for used cars and baseball cards are using similar certification mechanisms to solve similar concerns about quality. In this sense, the phenomena we observe today for baseball cards may speak to the online markets of many other commodities in the future.

The rest of the paper proceeds as follows. Section 2 presents results from our market watch, followed by a theoretical model in section 3. Section 4 presents experimental evidence derived from a snapshot of current online markets, and Section 5 links seller reputation to the true quality of ungraded cards sold online. Section 6 presents evidence regarding the segamentation between the online and retail markets, as well as the retail shrinkage during 1990s. The role of professional grading is examined in Section 7 and the long run changes of card printing are documented in Section 8. Section 9 integrates these long run structural changes with the evidence found in the snapshot of current markets. This integration leads to policy recommendations.

$100 million annual sales of collectible sports products from the Topps, Inc. Baseball cards are better suited for our study because it is difficult to find any individual type of stamp or coin with sufficient trading volume in both graded and ungraded copies.

2 Market Watch

2.1 Market Overview

Each year, card companies design and print sets of cards depicting players and events from the previous season. Once the printing run of a particular set has been completed, the supply of each distinct card in the set is fixed.[10] The value of a particular card depends on its scarcity, the player depicted and the condition of the card. By card condition, we mean the physical condition of the edges, corners, surface and centering of the printing. To track card condition, people often use a 10-point scale. For example, flawless characteristics (even under microscopic inspection) will rate a perfect 10 while obvious defects to the naked eye like minor wear on the corners of the card might bring a corners grade to 7. The card's overall grade is computed off all four characteristics.

As Figure 1 describes, interest in cards as a valuable commodity grew dramatically during the 1980s. Consequently, Professional Sports Authenticator (PSA) began offering grading services in 1991. Beckett Grading Service (BGS) and Sportscard Guaranty Corporation (SGC) entered the professional grading market in 1999. As of 2002, PSA and BGS remain the largest and most respected of the existing 10-15 grading services. Because professional grading is voluntary and costs 6 to 20 dollars per card [11], this practice divides the market into two groups: graded cards and ungraded cards. For graded cards, buyers and sellers alike are willing to accept PSA or BGS grades as the "true" grade of a card's condition. Graded cards are encased in plastic and sealed with a sonic procedure that makes it virtually impossible to open and reseal the case without evidence of tampering. The casing indicates the grading service, grade received and a bar code with serial number that identifies the particular copy of the card. Anyone with Internet access can go to the grader's web site and verify the card's grade by serial number.

Traditionally, single baseball cards were traded through retail stores or local card shows. Virtually all retail stores are small independent family-run businesses involving very few employees. Acting as a middleman, a typical store owner buys single cards from customers, and sells them to other customers. Since there are only about 10 to 20 card stores in even major metropolitan areas, collectors sometimes turn to local card shows as an alternative. Local card shows are often held at shopping malls and convention centers, bringing anywhere from five to more than two hundred dealers to one location. Dealers at these shows pay a table fee, and

[10] The exact number of copies printed for a specific card is regarded as an industry secret.

[11] Depending on package size and turnaround time, but independent of the actual grades received.

buyers are often charged an admission fee.

Online trading of sports cards did not take off until 1998, when eBay provided the first standardized, user-friendly auction site where individual sellers and buyers could meet and transact conveniently. Ever since eBay went public on September 24, 1998, eBay has always been the most popular online place to trade single baseball cards. [12] Figure 1 summarizes this time line and contrasts it with the history of baseball cards.

For a listing fee as low as 30 cents and a final commission of 1.5 to 5.25%, anyone who wishes to sell a single baseball card can list an item under the eBay category "Sports/Trading Cards/Baseball-MLB." For a typical card with a winning bid of $100, the total seller fees amount to about $4, lower than the average 6.7% sales tax that would apply to a typical transaction in the retail markets. [13] The seller can describe the card condition in a brief title and one paragraph of text. He can also supplement the description by one or multiple scanned pictures. If it is a graded card, the picture will reveal the name of the grader and the serial number which identifies the exact card copy. However, if it is an ungraded card, it is impossible to prove that the card depicted is the one for sale. Even if it were the card for sale, poor scan quality reduces the informational value of the picture. While centering on the front may still be observable, a blurry scan makes it impossible to judge the condition of the card corners, edges and surfaces. Also, sellers rarely include a picture of the back of the card, which could be in a different condition from the front of the card. The other auction settings are standard, as described in Lucking-Reiley (2000), and Melnik and Alm (2002).

eBay has adopted several measures to combat fraud. First of all, eBay requires either a verifiable email address or a real credit card number for anyone who wishes to buy or sell in eBay. However, because identity theft is the most common form of fraud, it is obvious that a fraudulent seller could open multiple dummy accounts using stolen credit card numbers. Second, eBay has an entire division devoted to investigating fraud complaints. The Fraud Protection Program in eBay reimburses up to $200 per item for buyers who did not receive any delivery after 30 days of payment. However, unlike a physical auction house, eBay positions itself as a marketplace organizer and therefore does not guarantee the quality of goods actually delivered.[14]

[12] Based on our interviews with over 30 sports card stores and a phone survey of 1213 sports card stores listed in Yahoo! Yellowpages. Section 6 describes the survey in more detail.

[13] Source: Table 1 of Goolsbee (2000) which used the 110,000 household survey of online use conducted by Forrester Research, Inc.

[14] According to The Wall Street Journal as of January 18, 2001, 6 buyers who were sold counterfeit autographed sports memorabilia in eBay auctions filed a class-action lawsuit against eBay Inc. in April 2000. A San Diego judge dismissed the $100 million lawsuit, saying that the online auction company was not liable for the sale of

The third and probably the most widely used device to combat fraud is the eBay feedback forum. Every eBay user has a *Feedback Profile* made up of comments from other eBay users - an official "reputation." This profile consists of a numerical score next to the user id in the listing page as well as a separate page of detailed comments left by the individual's previous trading partners. The numerical score is the total number of distinct trading partners that have left positive feedbacks minus the total number of distinct partners that have left negative feedbacks. [15] Because an individual can open multiple accounts in eBay[16] and on average only 52.1% of transactions result in any feedback from buyers on sellers [17], the numerical rating is an imperfect measure of reputation. Even eBay acknowledges that a high numerical rating does not necessarily mean that an eBay member has a great reputation and encourages people to check the member's *Feedback Profile* for any negative remarks.

2.2 eBay Watch

To better understand the online market for baseball cards, we observed real eBay auctions for 7 months from April 2001 to December 2001. At first, we tracked Ken Griffey, Jr.'s 1989 Upper Deck card because it was the most actively traded single card on eBay and had by far the largest graded population of any card. To further enrich our sample, we interviewed 28 sports card store owners in the Baltimore-Washington-Virginia and Philadelphia-New Jersey Metropolitan Areas and attended a major regional card show in Ft. Washington, PA. Based on these interviews, we added another four popular rookie cards [18] that had at least 10,000 graded copies as of April 2001 and attracted sufficient interest in both retail and online markets. They are the 1982 Topps Cal Ripken #21, 1985 Topps Mark McGwire #401, 1993 SP Derek Jeter #279 (foil), and 1994 SP Alex Rodriguez #15 (foil). These five cards covered star players with a wide variety of characteristics and range in value from $30 to $120. While Ripken and McGwire have recently retired, Griffey is still in the middle of his career, and Jeter and Rodriguez are at the beginning of their careers.

phony sports memorabilia on its site.

[15] Note that it is possible for one individual to leave both positive and negative feedbacks on separate transactions with the same trading partner. eBay will count both and this will be canceled out in the net score for that trading partner.

[16] The multiple accounts created by the same individual are not linked to each other, unless the account owner instructs eBay to do so.

[17] According to Resnick and Zeckhauser(2001).

[18] The most valuable cards tend to be "rookie" cards of star players, the first card ever printed by a particular company of that player.

According to the interviews, we noticed two other interesting facts. First, an overwhelming majority of customers are adults and only pay attention to cards of near-mint 7 or better quality. Cards below near-mint quality are almost never willingly purchased. For this reason, we examined the PSA and BGS grading standards and ruled out all online auctions for ungraded cards that claimed 6 or below or mentioned at least one defect consistent with a PSA or BGS grade below 7.

Secondly, whether buying or selling, all trading parties refer to a standard price guide - Beckett Baseball Cards Monthly. For each single type of ungraded card, Beckett collects pricing information from about 110 card dealers throughout the country and publishes a high and low price reflecting current selling ranges for Near Mint-Mint (8) copies. The high price represents the full retail selling price and the low column represents the lowest price one could expect to find with extensive shopping. For graded cards, Beckett follows the same practice but lists price ranges by grading company and grade. [19]

Table 1 summarizes these market watch data after ruling out disqualified ungraded listings. First of all, 67% of the 1124 auctions were for graded cards, none of which were graded below 7. For both graded and ungraded cards, the likelihood of completing the auction [20] was about 81%. Among completed auctions, the winning price for graded cards was on average 101.5% of the Beckett low book price while for ungraded cards it was 105.9%.

Given the fact that no self claims of quality for ungraded cards can be verified online, we were surprised to find self claims on more than half of them. Of the 372 ungraded cards in our sample, 43 were self claimed gem mint (equivalent to 10), 105 claimed mint (9 or 9.5), 29 nearmint-mint (8 or 8.5), and 24 near mint (7 or 7.5). These claims, especially the 10s, were hardly credible. As shown in Figure 2, in May 2001, the average eBay price for a graded 10 Griffey was $1,450 while an ungraded Griffey with self claim 10 was only $94.26. Since grading costs no more than $20, any seller holding a Griffey he truly believed was a gem mint 10 would have it graded and make $1,335.74 in profit. Similar logic applies to any card mint 9 or better. Therefore it is obvious that sellers making such claims must be overstating the quality of the cards they are selling.

[19] In cases where trading volume is high enough, Beckett reports separate prices for PSA, BGS, and SGC, and group all the other companies as "Others". Although some card store owners have questioned Beckett's data collection process, they nevertheless use Beckett price as the benchmark. This is probably because the Beckett Guide is the only price guide typically available at retail stores. Several companies have attempted to enter this market but have not achieved much success due to the enormous popularity of the Beckett Guide.

[20] An auction is completed if it received at least one bid above any minimum or reserve price.

Table 2 suggests that cards claimed mint or better not only received larger numbers of bids but also resulted in higher winning prices in completed auctions. This correlation is even more striking if we regress the likelihood of completion, the number of bids, and the winning prices on self claims. After controlling for all the auction features, we find that buyers believed seller claims to a significant degree and rewarded them accordingly (Table 3). Relative to cards claimed below mint (7 to 8.5), eBay buyers were willing to pay an extra 27% for cards claimed mint (9 to 9.5) and 47% for cards claimed gem mint (10).

This suggests two puzzles. First, why did non-verifiable claims appear credible to buyers? Second, if buyers rewarded non-verifiable claims, why didn't every seller claim the highest quality? One possible explanation for the second puzzle is that some sellers bear higher costs of overstating quality, for example "honest" people may bear higher burdens of conscience and store owners may have to maintain a good online reputation for retail credibility. The following section incorporates this type of seller cost into a model that accounts for all the institutional details of baseball card tradings. In particular, we highlight the existence of grading services and the segmentation of retail and online markets.

3 Model

3.1 Assumptions

Consider a large number (N) of sellers, each endowed with a a random copy of quality q_j for the same card and an honesty parameter h_j. Both q_j and h_j are private information to the seller. All sellers put zero value on their card and would like to sell, regardless of their endowment's quality. Selling in retail markets involves transaction costs c_t, which is an increasing function of the card's true quality because it is harder to find buyers willing to pay full value for a high quality card. Selling in eBay involves zero transaction costs. Regardless of where a card is sold, it is assumed that there is no default and that the seller always delivers an authentic card. This highlights the effect of deception risk on the segmentation of markets. If we allow consumers to hold stable nonzero beliefs on the level of default risk, the pattern of market segmentation will remain the same but the exact threshold values separating the segments may differ.

There are M ($M > N$) risk-neutral buyers who all put positive value on the first copy of the card they buy and zero on any subsequent copies. [21] Specifically, each buyer has a taste

[21] Similar results arise if we allow individuals to be sellers and buyers simultaneously. Here sellers and buyers

for quality θ_i which is only observable to buyer i. Buying a copy of quality q at price p allows him to derives utility $U_i(q) = \theta_i * q - p$. Over the whole population, θ, h and q independently conform to publicly known distributions. Both sellers and buyers are price takers.

The game proceeds as follows. At stage 0, each seller receives a random endowment and observes its quality. At stage 1, each seller decides whether or not to send his card for grading. If he does, he pays a constant grading cost c_g and the grader seals his copy in a tamper-proof plastic case marked with a grade equal to the true quality. At stage 2, if the card has been graded, the owner can sell the card as graded or crack open the case and sell it as ungraded. If he does not send the card for grading, he can only sell it as ungraded.

Regardless of whether the card is graded or ungraded, the sale may occur in either retail or online markets. This defines four market segments – retail ungraded, online ungraded, retail graded and online graded. If a card is sold as graded, both the seller and the buyer observe the true quality. If a card is sold as ungraded in the retail market, both the seller and the buyer observe the true quality as well because the buyer can examine the card carefully before purchase. [22] In contrast to this, if a card is sold online as ungraded, the seller observes the quality and can make a non-verifiable claim of card condition. For simplicity, we assume self claims take on only two values: gem mint 10 or no claim. Making a claim incurs a conscience cost equal to h_j. Buyers observe nothing except those seller claims. Note that online ungraded is the only market segment that features asymmetric information for buyers and sellers, and therefore is the only segment where seller honesty matters.

The equilibrium satisfies three conditions: on the demand side, if buyer i decides to buy, he will buy a copy that maximizes his expected utility from purchase. On the supply side, seller j will sell his endowment in the market segment that gives him the highest return net of total cost associated with that segment. In particular, he will grade his copy if and only if the expected return from grading is no less than the expected return from not grading. If he decides to sell his copy in the online market as ungraded, he will make a claim if and only if the gains from doing so exceeds conscience cost h_j. In equilibrium, demand equals supply in all market segments. If two cards are offered in different market segments but appear identical to buyers, their buying prices must be equal.

are assumed to be separate groups of people, purely for simplicity.

[22] The perfect observability of card condition is a simplified assumption and not critical to the model. Similar results hold when we only allow individuals to receive a noisy but unbiased signal of the card's true quality.

3.2 Equilibrium Properties

All equilibria arising from this model will share a large set of properties but which equilibrium actually occurs depends on buyer perception of the true quality distribution in the online ungraded market. We first describe the set of properties common to all equilibria and then explore those properties that are sensitive to the assumptions on buyer beliefs. All predictions are also summarized graphically in Figure 3.

Properties Common to All Equilibria

First of all, buying price must be an increasing and convex function of buyer-expected card quality because buyers with stronger tastes for quality always prefer better quality. Second, all graded cards must be traded online. This is because once grading cost is sunk, there is no informational gain by paying c_t to sell in the retail market. Third, graded cards will never be cracked open because sellers observe the true quality of and therefore perfectly predict the returns to grading their endowments.

Ruling out the retail graded segment, the other three segments – online ungraded, retail ungraded and online graded – will be sorted by quality. Given h_j, c_t, c_g and price schedules in all segments, seller j's best strategy consists of two thresholds q^l and q^h. If the quality of his endowment exceeds q^h, he will have it graded and sell the graded copy online. If the endowment quality is between q^l and q^h, he will sell it as ungraded in the retail market. Otherwise, the copy will be sold online as ungraded, with or without a claim depending on h_j and online prices. Note that q^h is the same for all sellers because at q^h selling online as graded is equivalent to selling ungraded in the retail market, which implies $c_g = c_t(q^h)$ and does not depend on h_j. [23] The above discussion suggests three testable predictions:

Prediction 1 – Market Segmentation: Assuming away default risk, all graded cards should be traded online. Ungraded cards may be traded in online or retail markets, but the ungraded cards traded in retail markets will have systematically better quality than the ungraded cards traded online. This prediction explains the three blocks in Figure 3.

Prediction 2 – Retail Shrinkage: All graded and some ungraded cards shift from retail to online markets. As a result, the existing retail market shrinks. Figure 3 illustrates this prediction by the two arrows pinching the retail sector.

[23] Because c_t is an increasing function of q, it is more profitable to sell any card with quality above q^h in the online graded market.

Prediction 3 – Growth of Grading Services: Graded cards are traded online exclusively and their trading volume should increase after the emergence of widespread trading online. The model assumes perfect observation of quality in retail markets which implies zero demand for grading before online markets exist. In reality, evaluation of card quality depends on buyers and sellers' ability to judge card condition by the naked eye. If buyers and sellers in the retail market only receive a noisy but unbiased signal of quality, q^h exists even without the Internet because grading is valuable for resolving the uncertainty. [24] The Internet causes q^h to shift down, driving graded card population growth, especially at the lower end of the graded quality distribution. This is shown in Figure 3 by the expansion of the quality range over which cards are graded.

Properties Sensitive to Buyer Perception

Unlike q^h, the threshold q^l between retail ungraded and online ungraded segments depends on the extent to which buyers expect different qualities from different seller claims. Assuming rational expectations, if buyers ignore seller claims and making claims is costly, no seller will decide to make a claim. As a result, there would be only one price in the online ungraded segment. This is certainly inconsistent with our market watch data. If buyers negatively associate quality with claims, no seller would incur conscience cost h to make even less profit. The only case consistent with the market watch is if buyers expect higher quality from sellers who make claims. This is possible for the following reason.

Let p^e_{claim} and $p^e_{noclaim}$ represent the market prices for selling an ungraded card online with or without a claim, respectively. Conditional on selling in the online ungraded segment, seller j will make a claim if $p^e_{claim} - h_j > p^e_{noclaim}$. Thus, whether a seller makes a claim or not is independent of his q_j. However, the decision between selling an ungraded card in the online or retail segment depends on both q_j and h_j. Now let $p_r(q_j)$ be the retail ungraded price for q_j. At q^l_j, $p_r(q^l_j) - c_t(q^l_j) = max(p^e_{claim} - h_j, p^e_{noclaim})$. The left hand side is an increasing function of q_j. The right hand side is decreasing in h_j for those who are willing to make a claim and constant for those who are not. Obviously, $q^l_j(h_j)$ is non-increasing in h_j, implying that relatively dishonest sellers would be willing to sell in the online ungraded segment up to higher levels of q^l. Assuming h_j and q_j are independent, this suggests a fourth prediction:

Prediction 4 – Rational Expectations: online sellers who make claims are, on average, selling ungraded cards of higher quality than those who do not make claims. As shown in Figure 3, the ungraded quality range over which dishonest sellers are willing to offer online extends to

[24] The other equilibrium properties are unaffected by the addition of uncertainty to the model.

a higher level than that which is offered by honest sellers.

We designed a field experiment to directly test this hypothesis. If empirical evidence instead reveals a negative correlation between seller claims and true quality, buyers may have underestimated the degree to which sellers overstate quality. This not only raises q^l for anyone already making a claim, it will also encourage dishonest behavior from some sellers who would not make a claim under correct buyer perception.[25] Consequently, the online ungraded segment inefficiently transfers too many transactions out of the retail segment.

In addition to retail shrinkage, the other two predictions from the common properties still hold as long as we substitute the true quality sold online with the perceived quality in buyers' mind. Due to this robustness, the model is justified as long as empirical evidence supports the first three predictions. On the other hand, the fourth prediction allows us to detect whether individual buyers possess full information to pursue their best interests within such a model. If the first three predictions hold but the fourth fails, the problems stemming from buyer misconception may have far-reaching consequences, extending beyond the immediate losses of defrauded buyers in the online ungraded segment to inefficient allocation between retail and online markets.

Because the fourth prediction directly addresses our original question of why buyers were willing to pay more for non-verifiable claims, we design an experiment to test it first. We then test the other three predictions to reinforce our confidence in the theoretical framework and proceed to use the logic of this framework to transmit the experimental findings into other parts of the baseball card industry.

4 Detecting Buyer Misconception Online

4.1 Experimental Design

The main purpose of the experiment is to study how online auction buyers process and react to self claims of quality provided by sellers. Specifically, we purchased ungraded cards online in two groups so that the sellers of one group claimed systematically higher quality than the sellers in the second group. A direct measure of quality from professional grading services will determine if seller claims provide any useful information about the true quality. To ensure

[25] Spence(1977) and Epple and Raviv (1978) set up detailed models to explain why consumer misperception of product safety would encourage firms to underprovide safety features.

comparability between our market watch and experimental data, our online purchases targeted the same five cards. The combined evidence from uncontaminated market watch price data and experimentally determined true quality data will reveal whether or not buyers have interpreted such information correctly.

Each week from December 8, 2001 to March 18, 2002, we searched for active auctions as of the Saturday of that week and ranked the auctions by seller-described card condition. [26] The ranking process suggested that the typical supply of a particular type of ungraded single card consisted of three lumps: One group of sellers indicated specific defects about the cards they were selling; a second group claimed their cards were of grade 7 or 8 quality; the third group claimed their cards were of mint 9 or gem mint 10 quality.

After ruling out the disqualified auctions, we bid on the best-ranked and median-ranked cards. In case we lost either one, we bid on and purchased the card ranked immediately below it. Given the clustering of seller claims, the perceived difference between the primary and backup cards were negligible. To further guarantee that every copy we purchase would be sold regardless of our presence, we restricted our bidding to the last five minutes of the auction and did not bid on a card if it had not attracted any bid by the time we were ready to bid.

To ensure winning our targeted auctions, we deliberately overbid. However, we could not bid outrageous amounts because this might distort the market if someone realized we were employing this strategy and used a shill to bid us up. Therefore, we varied our bidding strategy by adding 10-15 dollars above the leading bid. Since eBay buyers tend to "snipe" towards the end of the auctions (Bajari and Hortacsu 2001), sometimes we were outbid by a very small amount in the last 5-10 seconds and we did not have time to "snipe" back. Due to this technical difficulty, we lost 14 cards, 6 of which were best ranked. Since all the lost bids were made up with backup auctions and the loss was quite balanced between the two rank groups, we believe sample selection is not a big issue. As shown below, professional grading suggests that the best card quality is very similar across the two groups. So even if we were subject to the winners' curse, it should not affect our conclusion regarding the *relative* quality differences between the two groups.

Because the Jeter and the Rodriguez were extremely hard to find in retail markets for

[26] For those cards that were claimed "nice" or "perfect" without any specific grade suggestion, we treated them as nearmint-mint (8) based on the fact that Beckett guides always quote same prices for an ungraded nearmint-mint card and a card graded 8. This practice was further confirmed by our market watch data, which suggested that the bidding frequency on these cards were between those claimed 7 and those claimed 9+ (Table 2 and Table 3).

the procedure outlined later in this paper, we stopped purchasing them online after February 3, 2002. For weeks after February 3, we doubled our online purchases for the other three cards. In total, we paid for 107 cards online and received 96 of them before April 2, 2002, the date when we sent our purchases to BGS for professional grading. Of the remaining 11 cards, 7 were received after April 2, 2002 and the other 4 were never received. These 7 late cards were graded in the second round. Because including or excluding these 7 late cards does not affect our conclusion in any significant way, all results reported in this paper are conditional on the cards graded in the first package.[27] We chose BGS over the other grading companies because BGS uses the most detailed grading scale (1 to 10 with half grade increments) and is the only major service that provides sub-grades by centering, corners, edges and surface.

4.2 Experimental Results

Table 4 presents the summary of true quality for the best-ranked and median-ranked cards. The first surprise is that the best-rank group had an average quality nearly a full grade lower than the median-rank group. Most of the difference is driven by the higher default and counterfeit rates in the best-rank group: of the 11 fraudulent transactions, 9 came from the best-rank group and all four defaults were best-ranked cards whose sellers claimed gem mint (10). In the model, we assume every seller delivers an authentic card and therefore only accounte for deception risk. Obviously, if we allow for defaulters and counterfeiters, they are the least honest people and would surely make the highest claim as long as consumers pay more for ungraded cards with higher claims. It is not surprising that the best ranked group produced the most cases of outright cheating. Figures 4 and 5 contrast the distribution of self claims versus true quality for both samples. Sellers of both groups overstated their card quality, but the greatest degree of dishonesty came from the best-rank group regardless of whether you are considering overstatement of quality or fraud. Figure 6 further shows that most defaults and counterfeits not only came from the best-ranked group, but in fact came from those who overclaimed the most. From Figure 6 it is clear that, on average, ungraded card buyers are best off purchasing cards with no claims and worst off purchasing cards with the highest claims.

[27] Of the 7 late cards, 3 were best-ranked and 4 were median-ranked. Including these 7 cards will reduce the likelihood of fake in our online purchases from 0.11 to 0.1028. Conditional on authentic deliveries, including these 7 cards will reduce the quality difference between retail and online purchases from 0.255 to 0.227 grade, which is still significant at 98% level. Some store owners are concerned that grading companies may give better grades to cards sent in large packages. In order to rule out any potential grading discrepency between the two rounds, we choose to exclude the 7 late cards from the reported tables. Should there be any grading bias, it should be the same for cards sent in the same package and therefore does not affect any comparison reported in this paper.

Conditional on transactions that resulted in a delivery of an authentic card, the average quality of the best-rank group is only 0.07 grades lower than the median-group. This difference is absolutely indistinguishable from zero. Pooling the two samples, we find negative but insignificant correlation between seller claims and true quality, further suggesting that any authentic cards delivered by sellers from either group were very similar.

4.3 Buyer Misconception or Something Else?

This finding disproves the rational explanation provided earlier. It seems that buyers were willing to reward the most fraudulent sellers for meaningless overstatements of quality. Before jumping to the conclusion of buyer misconception, we examine several alternative explanations. Buyers could still be fully informed and acting rationally if all buyers are identical, [28] their preferences are convex enough, the true quality of cards with high claims is more dispersed, andnnot all owners of truly high quality cards realize their cards are worth grading. In that case, a lower average quality for cards with high claims would not necessarily imply a lower expected value.

In fact, we did obtain a Mint 9 card from our best-ranked group, which suggests that either the seller was not experienced enough to judge the quality of the card or even experienced sellers cannot perfectly predict the grade a professional grader would assign to the card. In the model, it is assumed that sellers and retail buyers perfectly observe true card quality. When individuals are only allowed to observe a noisy but unbiased signal of card quality, this modified model generates the same conclusions. Our experiment confirms the possibility that buyers may have a non-zero chance of getting a high quality ungraded card online. This non-zero probability plus the convex price schedule may motivate the buyer behaviors that we observed in reality.

Suppose all buyers have identical preferences as convex as the price schedule. For all five cards in the experimental purchases, we noticed that the book price for grade 8 cards was equal to the book price for ungraded cards. Therefore, the higher expected value from buying a self claimed 10 could only come from the possibility of getting a card with true quality above 8. The prices for grade 8.5, 9, and 10 cards are about 1.5, 2.5 and 20 times the value of average ungraded cards. [29] Using this convex price schedule and the empirically observed true grade distributions

[28] Otherwise, as shown in the model, the price schedule will always be more convex than any individual's preferences when tastes are heterogeneous.

[29] Since the cards in our study are valued at $30 or more, grading fees are no more than 25% of the ungraded book price for any of them. If even an 8.5 drew a 50% price premium, it is obvious that anyone who really thought they held an 8.5, 9, or 10 would have it graded. Thus, any claims of grade 9 or above are likely to be exaggerations.

from online markets, we contrast the expected values of self claim mint or better against the rest. The high self claim group had average value 66.8% of Beckett low book price while the low self claim group had average value 77.5%. In spite of this lower expected value, buyers paid 27-47% more in the market watch data for cards whose sellers claimed mint or better. Therefore the price convexity cannot explain the negative correlation between self claims and price. Obviously, any preferences less convex than the price schedule cannot work either.

An example is more illustrative. In May 2001, a typical PSA 10 Griffey was sold online at price $1,450 and the average final price of ungraded Griffeys claiming gem mint 10 was $94.26. Consider two options for a risk neutral buyer: he may pay $1,450 and win a card that has already been graded as gem mint; or he may spend all $1,450 on ungraded Griffeys claiming gem mint, send all delivered copies for grading at a constant grading cost of $8 per copy and claim insurance for all undelivered copies from eBay.[30] In equilibrium, the two options must have equivalent expected value for a risk neutral buyer.

If buyers expected the same quality distribution from all cards claimed gem mint 10 cards as we discovered in our experiment, they must expect a combined default and counterfeit risk less than 0% (It turns out to be -42.7%). If buyers correctly believe the combined risk for Griffey is 38.9% as discovered in the experiment, they must have expected the ungraded cards for sale online had a quality distribution similar to all Griffeys PSA graded between January 1998 and December 2001. That distribution had 1.83% gem mint 10s, 30.78% mint 9s, and 49.69% near mint-mint 8s. Obviously, from the true quality distribution of our experimental sample, this is not a realistic assumption.

Another possibility is that all buyers in this market have identical utility functions more convex than the price schedule. Such risk loving buyers may derive psychological utility from the gambling aspect of buying ungraded cards and place high value on the small chance of receiving gem mint cards. However, these buyers would fully understand the risk they are taking and therefore would not complain to FTC for "receiv(ing) an item that is less valuable than promised, or worse yet, nothing at all." These complaints are like slot machine players in Las Vegas complaining to the casino for pulls that do not win. Furthermore, the presence of even one dishonest seller online could theoretically create many dishonest seller identities. If these risk-loving buyers are fully informed of the risk, they should understand that the ease of creating anonymous identities would drive down the probability of receiving a gem mint 10

[30] With a $25 deductible, the Fraud Protection Program in eBay reimburses up to $200 per item for buyers who did not receive any delivery after 30 days of payment. Therefore, for every default, the buyer can get $94.26-$25=$69.26 back from eBay.

down to zero. Therefore, any reward for non-verifiable high claims requires extreme convexities in preferences.

Ruling out price convexity and risk loving behavior as potential explanations, we conclude that buyers of high claim cards either underestimated the risk of online trading or were absurdly optimistic about the true quality distribution. There is no way to distinguish these two explanations, but both of them imply an overestimation of what sellers truly offered in the online ungraded market.

5 The Role of Seller Reputation

The experiment presents strong evidence that buyers may have distorted beliefs about the online ungraded market. One way to alleviate this misconception is to provide buyers with a means of determining which sellers are more honest. The most obvious candidate is the eBay seller rating system.

As shown in the model, buyer willingness to reward seller claims, no matter by misconception or not, may facilitate a separate equilibrium that differentiates honest and dishonest sellers based on conscience cost h. This logic is conditional on sellers who do deliver real cards. According to our experiment, buyer willingness to reward seller claims also attracts cheaters who either fail to deliver or deliver counterfeits. If we interpret h as the cost of losing future rents from an established seller reputation, these outright cheaters must place the least value on seller reputation.

Based on this interpretation, we expect two phenomena associated with seller ratings: first, sellers with high ratings are less likely to make unrealistic quality claims. Second, conditional on delivering real cards, sellers with high ratings have a lower threshold q^l and therefore on average sell *lower* quality ungraded cards than sellers with low ratings. Because reputable sellers are unwilling to earn profits from lying, they place higher value on the information advantage of the retail ungraded market and treat the online ungraded market simply as a place to dump lemons. The second predication stands in sharp contrast to the conventional argument that the more reputable sellers are more likely to sell high quality goods (Klein and Leffler (1981), Shapiro (1983)). The key difference is that the classic reputation theories never consider a situation in which sellers can choose between two markets but reputation only matters in one market.

This also explains a paradox in the existing literature on eBay ratings. A number of studies

have observed zero or weak correlation between eBay seller ratings and final winning prices but significant correlation between seller ratings and the likelihood of completing an auction. For example, Resnick and Zeckhauser (2001) used a sample of auctions on Rio MP3 players and a particular type of Beanie Baby and found that sellers with better reputation were more likely to sell their items but did not receive better prices. Melnik and Alm (2002) focused on U.S. Mint $5 Gold Coins and found a very small, but significant price reward for seller reputation. These two studies are consistent because Melnik and Alm (2002) used a tobit procedure and counted incomplete auctions as left-censored in price. Following the same tobit procedure, Lucking-Reiley et al (2000) found that both positive and negative feedbacks had expected effects on price, but the magnitudes were small. [31]

Our market watch data produces similar results to the existing literature. As reported in Table 5, we find a higher net rating increased the chance of making a sale, but did not increase the final winning price. To explain why reputation seems to affect likelihood of sale but not price, we return to the experimental approach, which allows a direct link between seller rating, seller claims and true quality. In particular, we examine whether or not good reputation signals honesty and quality, and if it does, whether or not buyers are able to effectively process this signal. Separate answers to these two questions are necessary for distinguishing the potential and actual strength of seller reputation.

Table 6 presents pairwise correlation between seller reputation and the claimed/actual qualities for our real purchases online. Seller reputation is measured in five ways: eBay net rating at time of transaction, the log of (eBay net rating plus one) [32], an indicator of whether or not the net rating was above the sample median, an indicator of whether or not the seller had any negative feedback, and the total number of negative feedback, all measured at the time of purchase. True quality is measured in four ways: the overall grade reported by BGS for the full sample, the subgrade for centering reported by BGS, an indicator of whether the card was "fake" or not, and the overall grade for non-fake cards only. [33] Claimed quality is measured by the original claim from the seller, an indicator of whether the seller claimed gem mint (10), and an indicator of whether the purchase was best-ranked or median-ranked.

[31] According to Lucking-Reiley et al (2000), 1% increase in a seller's positive feedback ratings only resulted in a 0.03% increase in the auction prices of U.S. collectible pennies. 1% increases in the negative ratings decreased the price by 0.11%. The differential effects may be attributable to the fact that only 2% of all eBay feedbacks were negative and the number of negative feedbacks, if any, is often limited to a single digit. In comparison, the number of positive feedbacks easily reaches hundreds or thousands.

[32] This is a standard variable definition used in all the existing literature of eBay reputation.

[33] The other three subgrades for corners, edges and surface did not have any significant correlation with any measures of seller reputation.

The correlation table reveals several interesting facts. First of all, the log of net rating is positively correlated with the overall BGS grades, but this correlation is solely attributable to the fact that sellers with higher ratings are less likely to default or send counterfeit cards. The negative correlation between seller ratings and seller claims suggests that sellers with higher ratings tend to overstate their quality to a less degree. Both of these findings are exactly in line with our prediction that sellers with higher ratings are less likely to lie. The conventional argument implies that buyers would have realized the credibility of the signal and bid higher on auctions with higher seller rating.

From the regression results based on market watch data (table 5), we saw that this was not the case. This is because the final price buyers are willing to pay for a card depends on several attributes of an auction, of which seller reputation is only one. From table 6, the overall BGS grade for non-fake ungraded cards was weakly negatively correlated with the log of net rating. At the very least, genuine ungraded cards from sellers with higher ratings are no better than genuine cards being delivered by low rated sellers. If, as we predicted, higher rated sellers are selling cards of systematically lower true quality, the positive price effects from reliable delivery and the negative price effects from lower average quality may wash each other out.

Another factor that may explain the zero correlation between final winning price and seller rating is buyer misconception regarding seller claims of quality. Buyers were paying significantly higher prices for cards claimed mint or better, which we know from the experiment are least likely to be sold by the most reputable sellers.[34] Since reputable sellers are much less likely to make bold claims, this indicates that buyers must have incorrect beliefs about either the value of seller reputation as a signal of reliable delivery or the degree to which dishonest sellers overstate their quality.

The underutilization of seller reputation may be attributable to two drawbacks of the eBay rating system: any eBay seller can costlessly switch his anonymous identity, and buyers may not have the full incentive to report the result of transaction in a truthful and timely manner. [35] These two factors make it possible for fraudulent sellers to take advantage of the eBay feedback system to mislead potential buyers.

One of the four sellers who did not deliver in our real purchases provides a good example. That seller completed delivery for seven auctions to receive positive feedback, establishing a

[34] A similar phenomenon occurred in our real purchases. We were forced to pay much higher price for cards with good centering and high self claims, especially those claimed 10 from the best-rank group.

[35] Friedman and Resnick (1999) and Resnick and Zeckhauser (2001) provide more detailed discussion on these two arguments.

good seller reputation. He then waited more than three weeks to allow the eBay database to purge those completed transactions, preventing any future buyers from observing the value of the items he sold. After the eBay database erased the transaction records, 25 of the next 27 auctions he put on eBay resulted in fraud, leading to an explosion of complaints from buyers. All of these auctions occurred within one week, after which the seller abandoned the seller id that today according to eBay is "not a registered user."

Another seller who sent us a counterfeit card followed a similar strategy. That seller set up a web site to make himself look like a dealer and claimed he had been in the sports card business for 10 years. In his feedback file, he built up a net rating of 128 positives before a run of 31 negatives at the end resulting from fraud cases. We could only verify the last 10 feedbacks, which were all negatives, because he made his feedback file private and abandoned the seller id.

These fraudulent sellers may only account for a small proportion of trading activity, but their behavior introduces a great deal of noise into the seller reputation system. Although sellers with better reputation are statistically more honest and less likely to commit fraud, buyers must draw enough observations to reach this conclusion. Given the fact that a seller receiving many complaints can easily switch to a new eBay identity, uninformed newcomers may never have access to the complaints to update their beliefs about that seller. Uninformed users will bid naively high on items with bold claims of quality which we have shown are most likely offered by cheaters. The winners of auctions for ungraded cards claimed gem mint 10 had an average eBay rating of 81.45, which is less than the average eBay rating 159.6 for winners of ungraded cards claimed neither 9 or 10. However, this difference is not statistically significant due to small samples.[36] Comparing graded and ungraded cards, winners of auctions for graded cards had an average eBay rating of 221.4, which is 81.4 higher than the average eBay ratings for buyers of ungraded cards. This difference is significant at the 99.9% level, suggesting that many experienced buyers prefer to buy graded cards online, probably due to their lack of confidence in the online ungraded market.

So far we have identified two problems: buyers reward unverifiable and dishonest claims of quality, and they have difficulty processing a valuable signal that may help them avoid being defrauded. The existence of these two problems rejects the fourth prediction of the model. However, as stated in section 3, this rejection does not invalidate the rest of the model. We now turn to the other three predictions in order.

[36] The t statistic is 1.22 with p-value at 22.55% for a two-tail test.

6 Market Segmentation and Retail Shrinkage

This section tests the first two predictions of our theoretical model. According to the first prediction, all graded cards and the lower end of ungraded cards should go online, while the higher end of ungraded cards are traded in retail. This prediction can be decomposed into two parts: first, ungraded cards traded in retail have better quality than ungraded cards traded online. This is typically referred to as the "lemons problem" should there be no buyer misconception. Second, the majority of graded cards should be traded online rather than in retail. As elaborated in section 3, if there is no default risk for graded cards, no graded card should be traded in retail. Otherwise, a small fraction of graded cards may exist in retail. We will refer to this second part as a prediction on the volume of graded cards. Because most graded cards and some ungraded cards shift from retail to online, our theoretical model also predicts a shrinkage of the retail market.

This section first presents experimental evidence regarding the lemons problem and then describes a telephone survey of sports card stores to compare the volume of graded cards traded online and offline. The telephone survey, as well as the list of sports card shows from historical Beckett guides, address the shrinkage of retail market.

6.1 Detecting the Lemons Problem from Experiment

If we could somehow remedy buyer misconception and reputation failure by educating buyers, buyers will take full account of default and counterfeit risks. Some overstating may also exist but as long as every buyer was fully informed, the only remaining problem would be the lemons problem. As the model predicts, the lemons problem would not lead to a complete breakdown of the online market because substantial transaction cost savings may still make it appealing to trade online.

To obtain an approximation of the lemons problem that would persist even after solving all misconception problems, we purchased a sample of ungraded cards from the retail markets and compared it with our online purchases. Specifically, we considered all cards from accessible retail stores or local card shows in 11 metropolitan areas. All cards were purchased unless they failed to meet the same standards as our online purchases. These areas were picked to represent both cities with and without Major League Baseball franchises. We used Yahoo! yellowpage

listings to identify sports card stores in each of these 11 markets. In Philadelphia [37], Baltimore, and areas surrounding Washington D.C., we personally visited every retail store that carried any one of our five targeted cards plus the regional sports card show in Ft. Washington, PA during March 1-3, 2002.

Purchases from Chicago, San Jose, Denver, Dallas, Los Angeles, San Diego, Tucson and Detroit were completed by male agents, age 25-35, who held at least a master's degree from a U.S. graduate school and were not active collectors at the time of purchase. To make sure every agent had the same minimum level of knowledge about baseball card markets, we sent a 21-page buyer instruction guide. This package provided step-by-step directions on locating and evaluating cards as well as procedures for negotiating prices with store owners. We also devoted sections to educate our agents on the basics of baseball cards and grading criteria that PSA and BGS use to evaluate cards. To further clarify grading criteria, sample cards from the same sets as our targeted five cards were included with a magnifying glass and our comments on card defects. Follow-up phone calls to our agents were made to ensure the buying instructions were well understood and followed. Agents shipped all purchases to us using methods recommended by Beckett. Overall, we obtained 126 cards from the retail markets. The online and retail purchasing strategies were adjusted to ensure that the two sample compositions were very similar. Like our online purchases, the cards from the retail markets were sent for BGS grading as well. To further guarantee unbiased grades from BGS, the retail and online purchases were sent in one package and the sources of cards were not revealed to BGS. We further divided the package into 24 small groups to enable us to track the exact identity and source of each card.

Note that the different buying strategies in online and retail markets may introduce some sample selection bias. However, the systematical method by which we bought cards online has been shown to only overstate the sampling of fraudulent auctions. Once we condition on authentic and delivered cards, the true quality is totally uncorrelated with seller claims. Therefore, even if we may have over sampled cards with high seller claims, the average quality of authentic and delivered cards is still representative of all real ungraded cards that would be sold in the current online markets. In the absence of undelivered and counterfeit cards, the quality difference from our online and retail purchases will provide an approximation of the lemons problem.

Figure 7 depicts the true quality distributions for both our retail and online purchases. As expected, the overall grade distribution of online purchases has more weight at the lower end. The second half of Table 4 presents more detailed summary statistics from our retail purchases.

[37] including surrounding suburbs in Pennsylvania and New Jersey

Because our agents may not have incentive to search the local retail market as intensively as we did, they may have purchased systematically lower quality of cards. This would tend to bias our retail card quality downwards and therefore our approach will provide a conservative estimate of the lemons problem. Based on the full sample of real purchases, the card quality is 0.82 grades lower in eBay than in retail markets. which is statistically significant at the 99.9% confidence level. This estimate includes not only the lemons problem, but also the default and counterfeit risks.

Excluding the 11 undelivered or counterfeit cards from eBay purchases and 4 counterfeits from the retail markets, the quality difference drops to 0.255 grades and is still significant at the 98% level. This second estimate is solely an estimate of the lemons problem. We further test if this difference is attributable to outliers by examining the medians and the whole distribution instead of means. Results are similar, strongly confirming that the eBay and retail card qualities are systematically different. Given the fact that our retail purchases may involve an agency problem, a regression of true quality on an agent dummy and a full set of card identity dummies suggests that the lemons problem may be as large as 0.329 grades [38] if we had made all retail purchases by ourselves.

To evaluate the lemons problem, it is necessary to map quality into price. Unfortunately, Beckett does not report prices for graded cards below 7 because "lower grade cards from the modern era draw little, if any, premium above non-graded cards in the same condition and are rarely seen in circulation." [39] For ungraded cards, Beckett quote full and low retail prices, both for the equivalents of NM-MT (8) condition. For ungraded cards below the NM-MT quality, Beckett provides guidelines for determining their prices from the book quotes. For example, for any card printed during 1981 to 1989 in Excellent (5) condition, Beckett recommends using 15-25% of book prices. Beckett provides a slightly different price schedule for cards printed after 1990, recognizing that older cards are less likely to be in good conditions and were made out of inferior materials. We use the middle point of each range as the true discount value for each condition and produce an overall price schedule weighted to match the composition of our samples. Figure 8 depicts the price schedule calculated in this manner. Given the average quality of authentic cards is 7.586 (0.768) in retail and 7.331 (0.836) in online markets, we find the 0.255 quality difference accounts for 13.3% of low book price and is significant at the 98% confidence level.

[38] With standard error equal to 0.12 grades, this estimate is significant at the 98% level.

[39] This is consistent with the theoretical prediction that only high quality cards should be graded and all cards below the grading threshold are traded as ungraded.

6.2 Volume of Graded Cards

The market watch in section 2 already demonstrated the fact that two thirds of cards traded online are graded cards. We now present evidence of graded cards traded in retail.

To locate sports card stores, we used the Yahoo! Yellow pages listings for all 27 U.S. metropolitan areas with Major League Baseball franchises. Yahoo! Yellow pages obtains business listings from BellSouth and InfoUSA. A leader in the business information industry, InfoUSA claims to have databases of 14 million businesses compiled from 5000 white/yellow pages and hundreds of other sources. InfoUSA is also the only company of this kind that verifies every entry in the database by telephone at the time of the first listing. Although it is free for any business entity to list itself in InfoUSA database, significant effort is required to be unlisted. Since InfoUSA went public in 1997 and Yahoo! went public in 1996, we believe the listings in Yahoo! Yellow pages were a comprehensive cumulative database that contained a majority of all sports cards stores in business anytime after 1997. For completeness, we also called listings from areas without MLB franchises such as Alabama, North Carolina, South Carolina, Southern Maryland (other than Baltimore) and Northern Virginia.

A telephone survey of all sports card stores with listings was conducted to capture the identity and age of sports card stores still in business, the prevelance of stores dealing in graded cards, and the involvement of stores in online trading. Of the 1387 listings, we ruled out 174 that are obviously not sports card stores, such as "Flower4u". Of the remaining 1213 listings, another 216 turned out to be businesses other than sports card stores. The remaining 997 entries consisted of 455 (46%) that were still in operation, 542 (52%) that did not answer and were presumably out of business, and 17 (2%) who dealt with sports cards only through the Internet or by mail order.

Of the 455 sports card stores still in business, we asked each one if they had a graded 1990 Leaf Sammy Sosa rookie card in their store.[40] Just 25 stores even had one, and only 7 of those 25 shops had two or three. Regardless of whether they carried a graded Sosa card, we asked each shop if graded cards were sold there at all. 448 out of the 455 stores answered this question, and 64.73% said they dealt in very few or no graded cards. Only 8.26% responded that they had at least one display case of graded cards in their stores.

[40]The 1990 Leaf Sammy Sosa is a popular rookie card, with at least 20 listings traded on eBay every week. We asked about the Sosa instead of any of the five cards under study because we did not want to give store owners an impression of a demand increase for any of the five cards and therefore contaminate the market indirectly.

303 of the 455 stores did not participate in online trading at all. Combined with the facts that two thirds of the cards in our online auction market watch were graded and there existed more than 1.2 million graded cards by mid-1999, this means that most stores were not participating in the very market where thousands of graded cards are sold. Thus, it is not surprising that very few stores engage in substantial trading of graded cards.

6.3 Retail Shrinkage

Our interviews of local store owners reveal many anedoctal stories suggesting a sharp decline of sports card stores during 1990s. As shown above, this phenomenon is confirmed in our telephone survey. Ruling out the Yahoo! store listings that are not sports card stores, we find that 53.4% of the 997 stores have gone out of business since 1996, much higher than the 31.7% termination rate for all small businesses from 1996 to 2000 as reported by the Small Business Administration.[41] This suggests that the termination rate of sports card stores cannot be fully explained by the typical entry and exit frequencies of small businesses.

Another obvious alternative explanation for the decline of sports card stores is a decline of the popularity of baseball, as local retail store owners unanimously agreed that about half of all retail stores opened since the baseball strike in 1994 have closed for business. However, the official attendance statistics from Major League Baseball as depicted in Figure 9 suggests slow but steady growth in average attendance from 1995 to 2001.

The steady growth of baseball popularity is inconsistent with the age distribution of the 414 surviving sports card stores who reported years of operation in our phone survey (Figure 10). To elaborate, the large number of stores that have been in operation from 9-12 years is indicative of the strong popularity of baseball prior to the strike. The dropoff of stores aged 5-8 years could be due to a lower number of new startups following the strike. However, if the popularity of baseball has experienced steady recovery since 1995, we would expect there to be a higher number of new stores opening in recent years. Assuming a constant survival rate, there should be a higher number of surviving stores 0-4 years old than 5-8 years old. Figure 10 shows the exact opposite trend, with fewer stores ages 0-4 despite the higher recent popularity of the sport.

[41] According to *Small Business Economic Indicators 2000* at http://www.sba.gov/advo/stats/sbei00.pdf, there are 8,414,906 small business firms in the U.S. that ever existed some time from 1996 to 2000, among which 5,750,600 survived by the end of 2000. This implies the 31.7% termination rate.

Similar time patterns apply to card shows. Using the monthly show calendars reported in the back of the Beckett guides from 1987 to 2001, Figure 11 tracks the number of card shows held nationwide each month. The period of strongest performance in retail markets in the form of card shows is during 1990 to 1993, corresponding to the large number of retail stores aged 9-12 years. Similarly, the number of card shows per month experienced a sharp and sizable drop immediately following the player strike in July 1994 and continued to decline along with retail stores through 2001.

The decline of both types of retail markets for baseball cards is certainly inconsistent with the steady growth of baseball popularity. One possible explanation is the introduction and expansion of online trading, benchmarked in Figure 11 by the dates of incorporation and stock IPO of eBay. Following the strike, the number of card shows per month remained relatively stable for about one year until eBay appeared and began growing in mid-late 1996. It is clear that during the period of rapid eBay growth between the benchmark dates, the decline of card shows accelerated. Recently, the number of cards shows per month become relatively stable, as the industry structure may have completed its adjustment to the appearance of online trading.

7 Growth of Professional Grading

As our model predicts, the transaction cost savings online should generate two changes in the demand for professional grading: first, the graded card population should grow substantially after the arrival of the Internet; second, the Internet causes a relative increase in the lower end of the quality distribution of graded cards.

To test the first prediction, Figure 12 tracks the growth of PSA's graded populations for sports cards from 1995 to 1999 as reported in PSA's parent company's prospectus. [42] Prior to 1999, PSA was the only professional grader in the market, therefore this history captures the growth of grading activity for the entire market before and after the rise of online trading in 1998. This figure shows that the volume of new grading activity in sports cards remains relatively low until after 1998, experiencing a nearly five-fold increase from 1998 to 1999. This may even understate the growth in grading activity because competitors BGS and SGC opened for business in 1999.

Figure 13 further clarifies the timing coincidence of online trading and professional sports

[42] PSA is a subsidiary of Collectors Universe, a public company traded under the symbol CLCT since October 1999.

card grading growth. The date of eBay's Initial Public Offering is used as a benchmark date measuring the prevalence of online trading. It seems that grading population growth rose slowly with the introduction of eBay in 1995, accelerated as eBay approached its IPO, and further accelerated following the date eBay became a public corporation.[43] The slight slowdown of PSA grading activities in the third quarter of 1999 may be explained by the entrance of BGS and SGC as competitors. The above phenomena are certainly unexplainable by the slight increase of PSA grading cost over time.

To test the second prediction, we compare the distribution of grades in the cumulative PSA population in 1997 and 2001. Information on the 1997 PSA population was taken from a Grading Population Report published by PSA in January 1998. Population information for 2001 was obtained from PSA's online population database on December 15, 2001. For both of these time periods we recorded the grade distribution for all 194 cards with at least 100 graded copies in the January 1998 report [44]. In rare incidences, PSA provides qualified grades, which are difficult to convert into unqualified grades. [45] For this reason, cards with qualified grades are excluded from the analysis of the distribution shift.

To take advantage of the fact that we tracked a matched sample of distributions for each of 194 cards over time, we perform a t-test of equal means for each card. For 187 of the 194 card distributions, the test rejects the hypothesis of equal means in 1997 and 2001. A Wilcoxon rank-sum test rejects the hypothesis of identical distributions for 189 of the 194 cards. Equal medians are rejected for 183 of the 194 cards as well. [46] These results overwhelmingly suggest that there is a significant shift of grade distributions toward lower quality over time. Figure 14 shows graphically the shift in distribution for the 1989 Upper Deck Ken Griffey, Jr. card, the most frequently graded card in the PSA population. [47]

[43] eBay was established in 1995. According to its prospectus filed in August 1998, eBay net revenues were $372,000 for the entire year of 1996, and grew to $1.67 million in the first half of 1997 and $4.09 million in the second half of 1997. In the six month leading up to its public initial offering, the net revenues reached $14.9 million.

[44] The sole exception is the 1993 SP Derek Jeter, which only had 75 graded copies in 1997.

[45] Instead of lowering the grade of a card with one relatively significant flaw, PSA will sometimes assign the higher grade with a qualifier. For example, if a card meets all of the requirements for grade 9 except in centering, PSA may give that card a grade 9 plus an OC qualifier indicating the card is not as well centered as a grade 9 card usually is. These qualifiers account for roughly 7% of the current population. Including or excluding these qualifiers produce very similar results.

[46] All three of these tests were run as one tailed tests at the 95% confidence level.

[47] There were 43,455 graded copies of 1989 Upper Deck Ken Griffey Jr. as of March 17, 2002 as opposed to just 1,861 in 1997.

We consulted local store owners and obtained two alternative explanations for the downward shift of the PSA grading population. First, the for-profit professional grader may be stricter for newly submitted copies of cards that already have a large graded population. Second, over time the professional grader may become stricter at the high end, regardless of the existing graded population. Both policies would tend to hold down the number of cards with high grades, increasing the market value of any card with a high grade. This may be desirable for a for-profit grader if the extremely high value of cards with the best grades is what attracts greater demand for grading services in the future.

We test the first alternative explanation by regressing the t-statistics we derived from the comparison of equal mean grade from 1997 to 2001 on population size as of 1997 for each of the 194 cards. While the population does have a weak negative effect on the t-statistics, the effect only contributes 10% of the average t-statistics. The remainder of the t-statistics is attributable to the time difference. The second alternative explanation is addressed by excluding the top quartile of the grade distribution for each of the 194 cards. We find the remaining three quartiles still exhibit a significant decline in the mean grade for 95% of the 194 cards, rejecting the second alternative explanation. Further robustness tests are carried out to account for the fact that PSA was the only grader in 1997 but not the only grader in 2001. We supplement the PSA grading population with the BGS and SGC grading populations for each of the 194 cards in March 2002. These modifications do not change any of the conclusions.

Overall, the above evidence suggests that the simultaneous explosion of demand for grading services and the growth of online trading at the same time is not a coincidence. One explanation is that professional grading allowed owners of relatively high quality cards to take advantage of the transaction cost savings while avoiding the counterfeit, deception and lemons risk. This is perfectly consistent with the observation that two thirds of the online auctions completed during our market watch period involved graded cards.

However, professional grading also increases card value and therefore may encourage fraudulent sellers to list fake auctions for graded cards, increasing the default risk for graded cards. We found an underestimation of the default risk by buyers of ungraded cards in the experiment. If buyers of graded cards also underestimate the default risk, then buyer misconception may lead to an overdemand for graded cards and in turn induce overgrading by sellers. Since the model predicts that all graded cards should be traded online, any overgrading would directly translate to further shrinkage of the retail sector.

8 Long Run Effects on Card Printing

The model we consider in this paper represents the balance between online and retail markets for all copies of a single type of card. Since online markets expand at the expense of retail markets, card producers should make card designs well suited to online trading, which is exactly what is observed in reality.

The most striking change in the sports card industry was the shift of product lines towards insert cards. Normally, card companies print sheets of cardboard that they cut and sell as "packs" of 10 to 15 random cards to final consumers. Companies may produce a limited number of special types of cards and randomly insert them into packs of normal cards. Some of these insert cards may use fancy manufacturing processes such as foil embossing, holographic or prismatic surfacing, or even gold leafing. Other insert cards may feature an autograph, a swatch of cloth from a game worn jersey or a wood shaving from a player's bat. In addition to these special features, the value of insert cards is also driven by their extreme rarity and how easily a lucky pack buyer can find someone to sell his insert card to. [48]

Based on these features, we now provide a logic that links the growth of insert card types to the rise of online trading. Before eBay, search costs in the retail market are relatively high, restricting the liquidity of the market. The illiquid market reduces the expected value of buying a pack and also discourages the printing companies from printing high value insert cards. After eBay, the increased liquidity of the online market allows an individual who draws an insert card to find a buyer more easily, raising the expected value of buying a pack. High value in the online market is further assured by the existence of professional grading, which allows the insert card owner to avoid questions of authenticity. As a consequence, the printing company will be able to capture all of these gains by printing more insert cards and then increasing the price of a pack in the primary market. To avoid depressing the secondary market value of insert cards, which depend on scarcity, the printer will produce many unique insert card designs and restrict the quantity of each design. This strategy will be pursued until the marginal gains from secondary market rent extraction equals the marginal losses from lower primary market sales.

This logic is confirmed by the explosion of the types of insert cards introduced since the growth of online trading in eBay. As shown in Table 7, from 1990 to 1996, the combined total of insert card types per year from all 5 card printers was stable and between 5 and 18. Then

[48] For example, insert cards are usually limited to several hundred copies. In some extreme cases, cards are serial numbered and limited to single digit production runs. In comparison, ordinary non-insert card print runs are usually in the hundreds of thousands.

in 1997 and 1998 during the early growth of eBay, insert card types per year jumped to 33 and then 46. Following eBay's IPO, insert card types increased to 110 in 1999, 164 in 2000, and finally 724 in 2001. Today, every printer advertises the types of inserts contained in a set as the main feature of the set and Beckett frequently features stories of lucky collectors who happen to draw the rarest of insert cards.

Two examples are illustrative of this phenomenon. One local shop owner in Dale City, VA told us that a customer received a Grover Cleveland Alexander autographed card whose production was limited to one copy. The customer went online immediately and sold the card for $13,000. [49] Another shop owner in Halethorpe, MD informed us that about 20% of his business was conducted online, and these were almost exclusively sales of insert cards on eBay.

9 Conclusion

In summary, baseball cards markets provide us three pieces of evidence: (1) In the current online market, at least some buyers drastically underestimate the risk of trading online. (2) Some buyers have difficulty interpreting the signals from seller reputation. As a result, at least some buyers unwillingly reward fraudulent sellers and may prevent honest sellers from realizing the full benefits of a good reputation. (3) In the long run, supporting industries such as professional grading and card printing have undergone significant shifts toward online trading, all at the expense of retail markets.

These three phenomena combined justify the model as described in section 3, and the logic in the model reveals a disturbing possibility: the harm of buyer misconception in the online market may not be confined to the loss from defrauded buyers. Erroneous market signals based on buyer misconception may broadcast throughout the market and affect the long run decisions of all economic agents in the market. In that case, the misconception of buyers in the online market may have some indirect but detrimental effects on agents who do not even participate in the online market.

Consider a retail store owner whose primary asset is his honesty. He has the greatest incentive to remain honest online because any dishonest behavior he engages in online may be observed by his retail customers. In comparison, an online-only seller does not have a local retail reputation to be ruined and therefore bears fewer burdens when he is dishonest. Buyers with

[49] See Beckett Baseball Cards Monthly, March 2002 on p.108 "One of One Fine Day." The article mentions the sale price, but not that it was sold online.

misconceptions about the online ungraded market may leave the retail segment, buying high claimed ungraded cards online instead. Because reputation concerns prevent our store owner from making claims, any transaction related to these types of buyers represents a pure loss.

Even worse, the incorrect demand signals may induce overreaction from supporting industries such as professional grading and card printers. Given the fact that both BGS and SGC jumped into the grading business right after eBay went public and at least 10 more grading services were established afterwards, this is certainly plausible. If buyers systematically underestimate the fraud risk online, professional grading and card printers will make long run investments to cater to the online market. These investments will increase the appeal of trading online, drawing even more buyers out of the retail market. Every iteration of the interaction will further contract the retail market and channel funds into suboptimal investment decisions.

Although this is a hypothetical worst-case scenario, it warns us that these information problems must be dealt with before significant online trading occurs in industries where the stakes are higher. The fact that online markets for baseball cards have matured more rapidly than markets such as used cars makes this an excellent preview of what to expect when those other markets catch up.

Another alarming conjecture is that the bubble arising from buyer misconception may mislead not only naive buyers but also sophisticated intellectuals. Suppose a policy maker believes that online buyers have formed rational expectation about the amount of risk they are exposed to and online sellers have competed away any arbitrage opportunity. Under those beliefs, he may have concluded that the online market works well, given the fact that buyers are willing to pay more for high seller claims, most feedbacks of the current eBay users are positive, and the eBay membership has grown from 5.6 million in 1999 to 46.1 million in 2002. These seemingly encouraging phenomena could all be distorted by buyer misconception.

To remedy the existing buyer misconception and prevent further harm stemming from the misconception, we recommend three policies. First, a complete set of property rights must be clearly defined so all parties involved in online auctions – buyers, sellers, auction sites, and credit card companies – have well specified responsibilities. In a recent litigation involving online auction fraud, even lawyers felt confused about liability rules. [50] Buyers who do not understand

[50] According to CNN news as of November 7, 2000, seven plaintiffs who purchased fake sports memorabilia on eBay filed a lawsuit against eBay in April 2000. eBay used the Communications Decency Act of 1996 to defend itself as a marketplace and therefore avoided all the liability requirements that accompany a typical auctioneer. However, even Eric Goldman, a former attorney for eBay and now the general counsel for consumer revew site Epinions.com, admitted that "I, as someone who holds themselves out as an expert on this topic, cannot tell you

their legal rights cannot be expected to take full account of the risks involved. This is why a second policy should strive to educate all parties of clearly-defined property rights so they can protect themselves. The efforts of the FTC and IFCC in making Internet buyers more aware of the fraud risk online are good first steps. However, the number of consumer complaints reported to these agencies may suffer from severe underreporting and therefore understate the real magnitude of the problem. Extra efforts must be made to educate people about the pervasiveness of the problem, especially the possibility that people who do not even participate in online trading may be indirectly hurt by Internet frauds.

Third, while legal enforcement protects property rights, some informal market institutions fall outside the realm of legislation. A well functioning reputation system is still valuable for ensuring reasonable behaviors beyond what can be legally enforced, such as honesty in claims of quality. Loopholes for evading the responsibility of one's actions in the current reputation system must be closed, particularly the ability of users to shed a past history of bad behaviors the way a lizard sheds its skin. Some entity, either public or private, must take the responsibility for verifying user identities and ensuring reputations follow people around online. Only then will users consider the consequences of their actions.

EBay has made the first effort towards this direction in June 2002 by introducing so called "ID Verify." At the expense of $5 per eBay account, this program allows eBay users to establish proof of identity and hopefully obtain more trust from trading partners. The effectiveness of this program relies on the extent to which buyers understand the true risk prevailing in the current online market. We are also glad to see some car dealers who sell used cars in eBaymotors.com start to provide store front photos, store addresses and store phone numbers so that buyers can verify their real identities and therefore link their retail and online reputations. Unfortunately, this practice is probably only applicable to commodities of extremely high values. For ungraded baseball cards, many online sellers do claim dealership, but this claim is much less credible given the fact that any collector with a room (or even a basement), several counters, and a large number of sports cards may truthfully claim himself as a retail dealer. As shown in our experiment, the low investment in sports card dealership does not prevent cheating in the online trading of baseball cards. Because the value of most commodities traded on eBay is much closer to the value of baseball cards than to the value of automobiles, we suspect that claims of dealership won't solve the information problem for most online auctions.

Results from this paper also produce a reason for researchers to take special care when

with certainty if a Web site is covered under this statute (i.e. the Communications Decency Act)... That should strike you as odd."

studying Internet commerce. Although the Internet provides easy access to tremendous amount of price data, price data alone could be very misleading, especially when the transacted goods possess a quality dimension. At least in the auction setting, price data may be indicative of the quality perception of the most uninformed buyers. Consequently, researchers must be cautious in applying established theories to online auctions, as most theories assume rational expectation and full awareness of risk.

Although we are convinced that some form of buyer misconception must exist in current online auctions, it is unclear what buyers are misjudging and why they are not able to correct their beliefs through experience or education. It is equally unclear why, given the anonymity online, not enough sellers exploit these naive buyers and compete away the price premium found for high claims of quality. Conlisk (2001) argues that "tricksters" must make an investment in learning the tricks of cheating. Given heterogenous costs of learning, some individuals choose to become tricksters and cheat, while others either make partial investment to become "avoiders" or remain naive as "suckers." This theory explains why only a proportion of individuals are willing to cheat, but does not explain why one trickster would not open an infinitely number of eBay accounts and cheat in each one of them. Future work identifying the causes of these online behaviors will help policymakers combat the growing Internet fraud and ensure a safe trading environment in online auctions.

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Table 1: Summary of eBay data downloaded between April 2001 and December 8, 2001

Variable	Full Sample					Completed Transactions	
	OBS	Mean	Std Dev	Min	Max	OBS	Mean
Final Price	1124	179.0	510.0	0	13500	776	165.5
Full Book Price	950	379.6	677.6	50	2500	776	370.6
Low Book Price	950	226.3	412.6	25	1500	776	221.3
82 Topps Cal Ripken	1124	0.03	0.18	0	1	776	0.03
85 Topps Mark McGwire	1124	0.12	0.33	0	1	776	0.1
89 Upper Deck Ken Griffey	1124	0.69	0.46	0	1	776	0.72
93 SP Derek Jeter	1124	0.09	0.29	0	1	776	0.09
94 SP Alex Rodriguez	1124	0.06	0.24	0	1	776	0.06
Dummy=1 if the transaction is incomplete	1124	0.19	0.39	0	1	776	0
Number of Bids	1124	9.65	7.30	0	37	776	11.1
Shipping cost	929	4.06	2.68	0	25	659	3.95
Dummy=1 if no shipping information	1124	0.17	0.38	0	1	776	0.15
Length of auction (days)	1124	5.66	2.25	0	10	776	5.61
Dummy=1 if auction ends in weekend	1124	0.42	0.49	0	1	776	0.41
Dummy=1 if auction ends in prime time	1124	0.26	0.44	0	1	776	0.25
Dummy=1 if accept Master or Visa Card	973	0.24	0.43	0	1	674	0.23
Dummy=1 if accept Amer. Ex or Discover	973	0.1	0.3	0	1	674	0.1
Dummy=1 if accept money order	973	0.98	0.13	0	1	674	0.99
Dummy=1 if accept personal check	973	0.65	0.48	0	1	674	0.68
Dummy=1 if accept Paypal alike	973	0.31	0.46	0	1	674	0.34
Dummy=1 if accept cash	973	0.01	0.09	0	1	674	0.01
Dummy=1 if no payment method information	1124	0.13	0.34	0	1	776	0.13
Dummy=1 if dealer	1124	0.28	0.43	0	1	776	0.29
Dummy=1 if has a buy_it_now price	1124	0.11	0.32	0	1	776	0.03
Dummy=1 if has a reserve price	1124	0.14	0.35	0	1	776	0.09
Dummy=1 if post a legible scanned picture	1124	0.72	0.45	0	1	776	0.72
Dummy=1 if post an illegible scanned picture	1124	0.11	0.31	0	1	776	0.12
Dummy=1 if no scanned picture	1124	0.18	0.38	0	1	776	0.16
Dummy=1 if graded	1124	0.67	0.47	0	1	776	0.65
Dummy=1 if graded 7	1124	0.07	0.26	0	1	776	0.06
Dummy=1 if graded 8	1124	0.26	0.44	0	1	776	0.29
Dummy=1 if graded 9	1124	0.14	0.35	0	1	776	0.16
Dummy=1 if graded between 9 and 10	1124	0.07	0.25	0	1	776	0.02
Dummy=1 if graded 10	1124	0.12	0.33	0	1	776	0.12
Seller estimated grade for ungraded cards only	201	8.86	0.89	7	10	143	8.91
Dummy=1 if does not have self-reported grade (ungraded cards only)	372	0.46	0.5	0	1	269	0.47
Dummy=1 if report serial number (graded cards only)	752	0.68	0.47	0	1	507	0.68
Seller reputation: net ratings	1064	612.6	999.4	-1	8440	730	638
Natural Logarithm of Net Rating +1	1064	5.26	1.80	0	9.04	730	5.34
Seller reputation: dummy=1 if there has been any negative feedback	1070	0.37	0.48	0	1	730	0.38
Seller reputation: the number of negative feedback	1070	1.51	4.00	0	46	730	1.51
Missing negative ratings	1124	0.05	0.22	0	1	776	0.06

Table 2: Average Number of Bids and Average Final Price of Ungraded Card Auctions by Seller Self Claims

Seller Claim	Number of Listings	Average Number of Bids	Number of Listings Resulting in Sale	Completion Rate	Average Bids on Completed Auctions	Average Final Price
10	43	10.33	36	0.84	12.11	90.60
9 or 9.5	105	8.25	82	0.78	9.72	70.01
8 or 8.5	29	5.76	24	0.83	6.96	49.13
7 or 7.5	24	7.54	18	0.75	9.55	46.47
No Claim	171	8.29	143	0.84	9.00	54.16
Total	372		303			

Table 3: Effect of Self Claims on Completion, Number of Bids, and Final Price

Dep. Var.	=1 if complete the auction Probit		Number of Bids Tobit		ln (winning price / low book price) OLS	
Self Grade	0.22 *		0.77		0.22 ***	
	(0.13)		(0.57)		(0.03)	
Self 9		0.38		0.36		0.27 ***
		(0.31)		(1.19)		(0.07)
Self 10		0.87 **		2.44 *		0.47 ***
		(0.36)		(1.43)		(0.08)
Misself Grade	2.13 *	0.55 **	7.03	0.91	1.78 ***	0.11 *
	(1.18)	(0.27)	(5.15)	(1.08)	(0.27)	(0.06)
Obs	1124	1124	1124	1124	776	776
R-Square	0.4557	0.4583	0.0549	0.0551	0.336	0.3306

Notes: We control for grading, reputation, a full set of card identity dummies, payment methods, auction features including reserve and Buy It Now options, whether the listing provided a scanned picture, if the seller appeared to be a dealer, whether the auction ended on a weekend, length of auction, and if the auction ended in primetime. These control variables are constructed in line with Melnik and Alm (2002).

Table 4: Professional Grading of Real Purchases

Data: Real Purchases made between December 9, 2001 and March 18, 2002

	eBay				Retail				eBay - Retail	
	Best	Median	Best - Median		Ourselves	Agent	Ourselves - Agent			
Average BGS Grade (Full Sample)	6.057	7.053	-0.997	**	7.667	6.992	0.675	***		
	(2.888)	(1.675)			(0.591)	(2.088)				
N	53	47			66	60				
Number of fake	9	2			0	4				
Undelivered	4	0			0	0				
Counterfeits	5	2			0	4				
Likelihood of fake	0.17	0.043	0.127	**	0	0.067	-0.067	**		
Average BGS Grade (Non-fake)	7.295	7.367	-0.071							
	(0.917)	(0.757)								
Average BGS Grade		6.525				7.345			-0.82	***
		(2.436)				(1.534)				
N		100				126				
Number of fake		11				4				
Likelihood of fake		0.11				0.032			0.078	***
Average BGS Grade (Non-fake)		7.331				7.586			0.255	**
		(0.836)				(0.768)			(0.113)	

Note: "Fake" denotes auctions that resulted in delivery of a counterfeit card or no delivery at all by the seller. Standard Deviations in parentheses.

Table 5: Seller Reputation Effects based on eBay transactions downloaded between April 2001 and Dec. 8, 2001

Dependent Variable	Dummy = 1 if the transaction is completed		ln(Final Price/Low Book Price)	
Model / Sample	Probit / Full Sample		OLS / Completed Auctions Only	
Grading				
Graded	-0.155	-0.048	-0.063 **	-0.078
	(0.128)	(0.329)	(0.030)	(0.096)
Seller Reputation				
ln (net rating +1)	0.112 ***	0.163 ***	-0.014	-0.015
	(0.038)	(0.056)	(0.011)	(0.014)
Has negative feedback(s)	-0.144	-0.607 ***	-0.016	-0.028
	(0.128)	(0.227)	(0.037)	(0.052)
Missing seller ratings	-0.102	-0.139	0.051	0.051
	(0.267)	(0.275)	(0.069)	(0.071)
Seller Reputation * Grading				
ln (net rating +1) * Graded		-0.080		0.017
		(0.069)		(0.018)
Has negative * Graded		0.706 ***		0.018
		(0.274)		(0.071)
OBS	1124	1124	776	776
R-Square	0.453	0.459	0.132	0.132

Notes: A transaction is labeled "completed" if at least one buyer bid on the auction and the auction has no reserve price, or if the auction's reserve price is met. A seller is "highly rated" if his net rating at the time of transaction is over 750. Missing seller rating =1 if the seller is no longer a registered user at the time of data entry, or if the seller has too many new feedbacks between the time of transaction and the time of data entry so that our research assistant cannot precisely recovered ratings at the time of the transaction. Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$ and * $p<0.10$.

Table 6: Pairwise Correlation of Seller Reputation, Transaction Price and True Quality

Data: Real Purchases made between Dec. 9, 2001 and Mar. 18, 2002.

	Net ratings	ln (Net Rating +1)	Net ratings above sample median	Has Negative Feedback	# of Negative Feedbacks	Final Price
Overall BGS Grade (Full Sample)	0.0561	0.2101 **	0.1406	-0.0075	0.0041	-0.0459
p-values	0.5875	0.0399	0.1697	0.9419	0.9685	0.6554
Indicator of "Fake"	-0.0437	-0.2259 **	-0.193 *	0.0105	-0.0303	0.0385
p-values	0.6723	0.0269	0.0582	0.9188	0.7683	0.7082
Overall BGS Grade (Non-Fake cards only)	0.0481	-0.0112	-0.1328	0.0077	-0.0756	-0.0295
p-values	0.66	0.9186	0.2202	0.9438	0.4865	0.7864
BGS Grade for centering	-0.0642	-0.1776	-0.0642	-0.0274	-0.0486	0.3241 ***
p-values	0.5573	0.1018	0.5545	0.8013	0.6546	0.0022
Self Claim	-0.3416 ***	-0.3524 ***	-0.2522 **	-0.1247	-0.18 *	0.4398 ***
p-values	0.0014	0.0009	0.0191	0.2527	0.0972	0
Indicator of Self Claim = 10	-0.1977	-0.3343 ***	-0.2151 **	0.0044	-0.1123	0.4749 ***
p-values	0.051	0.0008	0.0325	0.9652	0.2685	0
Indicator of Best-Rank	-0.0644	-0.1425	-0.0616	0.0629	-0.0243	0.3273 ***
p-values	0.5334	0.166	0.549	0.5407	0.8131	0.0011

Notes: *** if p<0.01, ** if p<0.05 and * if p<0.10. Test is two tailed.

Table 7: Explosion of Insert Cards from 1983 to 2001

Year	Total Number of Sets Offered by All Printers	Total Number of Regular Sets	Total Number of Insert Card Subsets
1983	4	4	0
1986	9	6	3
1989	19	13	6
1992	28	16	12
1995	26	21	5
1996	44	26	18
1997	61	28	33
1998	82	36	46
1999	153	43	110
2000	230	66	164
2001	801	77	724

Figure 1: Timelines

	Printing, trading and grading of baseball cards	The Internet
1952	Topps bubble gum company became the first and the only dedicated card printer.	
1960s	Card collection was viewed as kid activity although a large number of baby boomers kept the hobby after adolescence.	In 1969, the first wide-area network connected four universities under ARPANET.
Early 1970s	A few card dealers began to set up retail shops and card shows started to emerge in large cities.	
1981	Two new printers, Donruss and Fleer, appeared. Error and variation cards became the first kind of rare cards. Collectors realized that baseball cards could be traded as valuable commodities.	
1984-1986	Donruss and Fleer began to limit production and distribution to create a perceived scarcity of sets. Beckett Baseball Cards Monthly was first published in 1984.	In the mid 1980s, the Internet was born as a loose collection of networks under ARPANET.
1989	New printer Upper Deck issued the first high quality set.	
1990	Upper Deck introduced insert cards.	
1991-1993	Professional Sports Authenticator (PSA) started providing professional grading services for baseball cards in 1991.	World Wide Web (WWW) was born in 1991 and graphical browsing of WWW became feasible in 1993.
1994	MLB players strike canceled baseball season.	
1995-1997	All printers combined produced 18 types of insert cards in 1996. After 7 years of operation, the PSA graded population of 194 popular baseball cards reached 40,723 by the end of 1997.	Internet access became widely available to the public. Netscape went public on August 8, 1995. Yahoo! went public on April 12, 1996.
1998	The number of types of insert cards reached 46.	eBay went public on September, 24, 1998.
1999	Insert card types increased to 110. The parent company of PSA went public.	
2001	Insert card types exploded to 724. For the same 194 popular baseball cards, the PSA grading population increased to 316,292 copies by the end of 2001.	

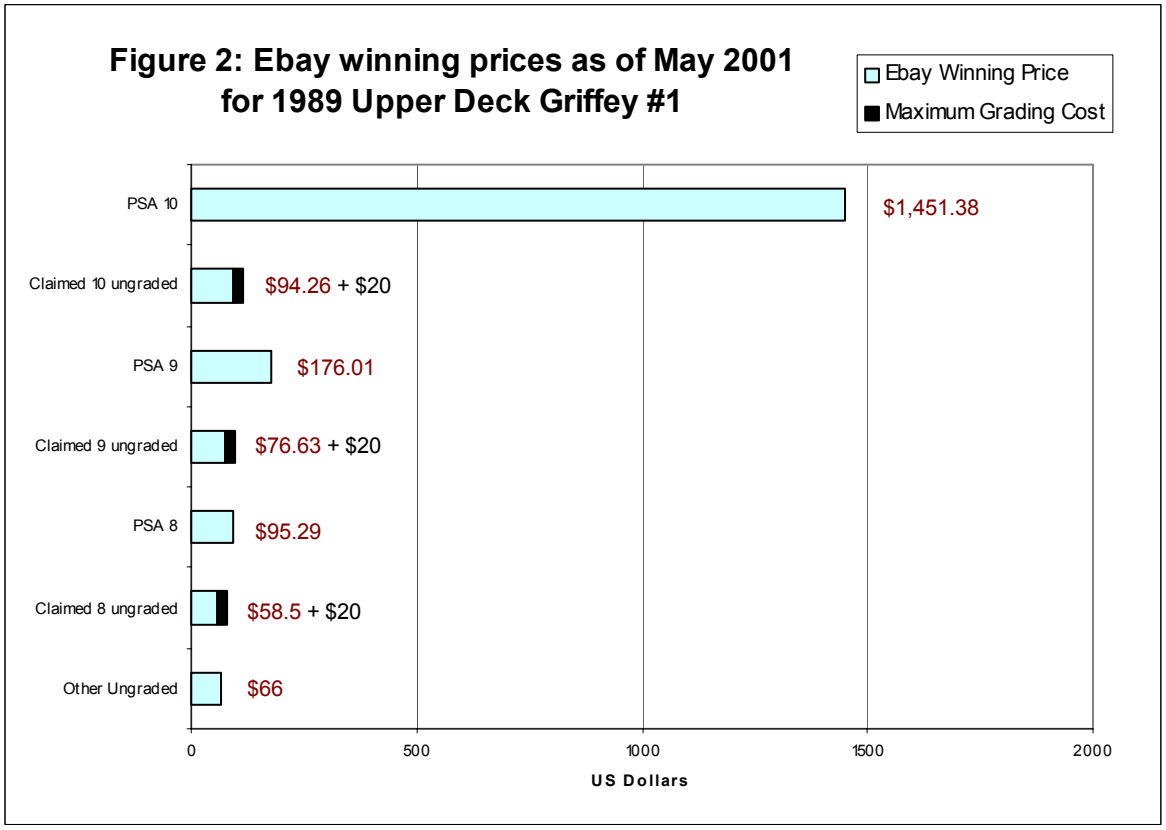
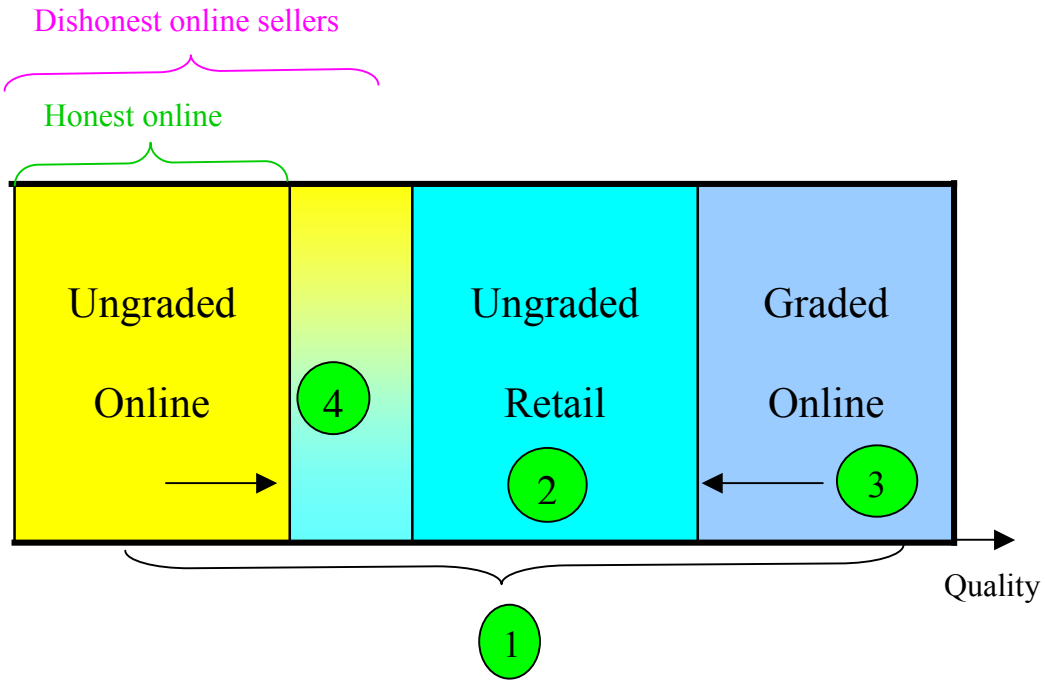


Figure 3: Predictions from the Model



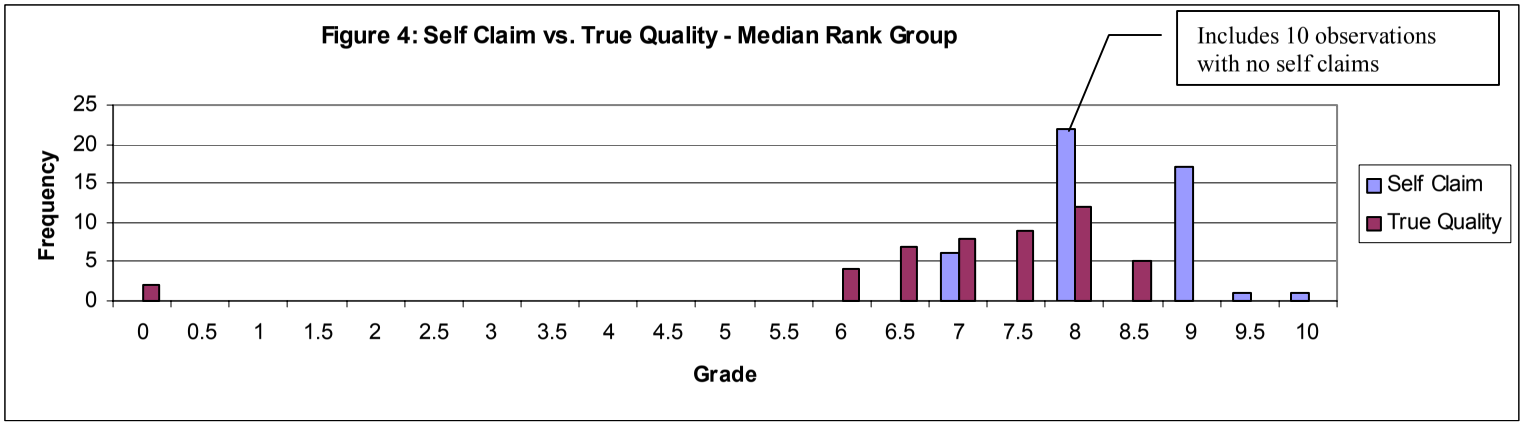


Figure 4: Self Claim vs. True Quality - Median Rank Group
Includes 10 observations with no self claims
Frequency
25
20
15
10
5
0
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10
Grade
Self Claim
True Quality

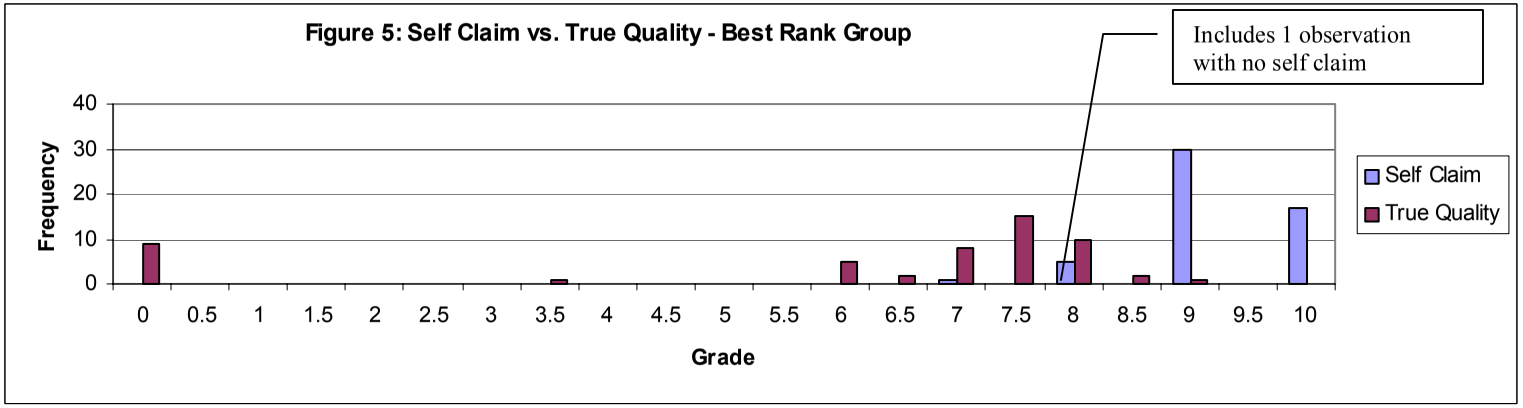


Figure 5: Self Claim vs. True Quality - Best Rank Group
Includes 1 observation with no self claim
Frequency
40
30
20
10
0
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10
Grade
Self Claim
True Quality

Figure 6: Distribution of True Quality by Self-claim – Experimental Evidence

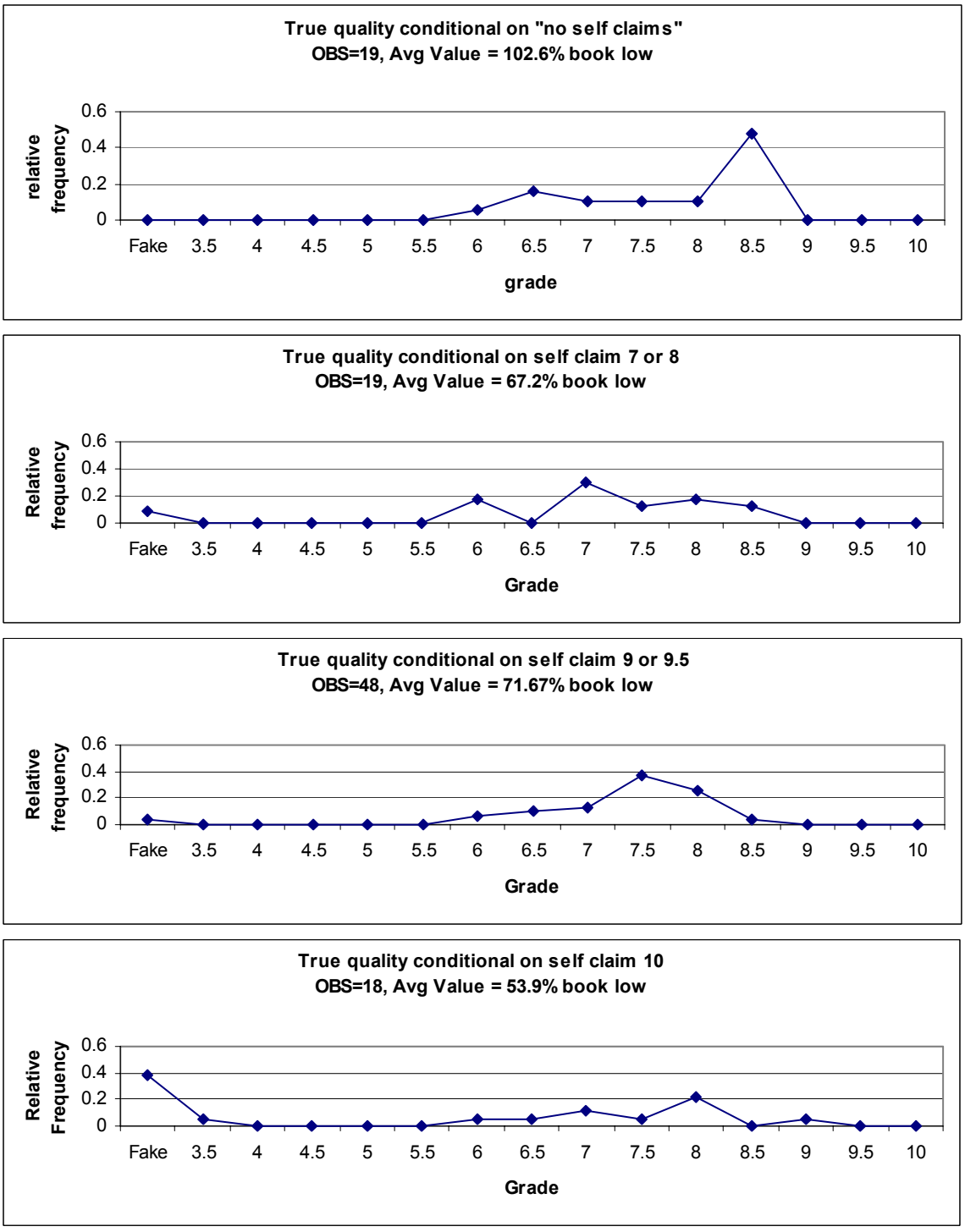


Figure 7: Grade Distribution of Real Purchases

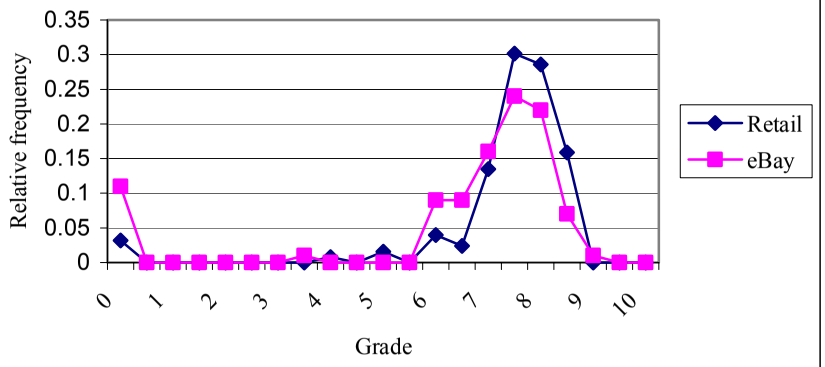


Figure 8: Beckett Guidelines for Ungraded Price Schedule by Card Condition

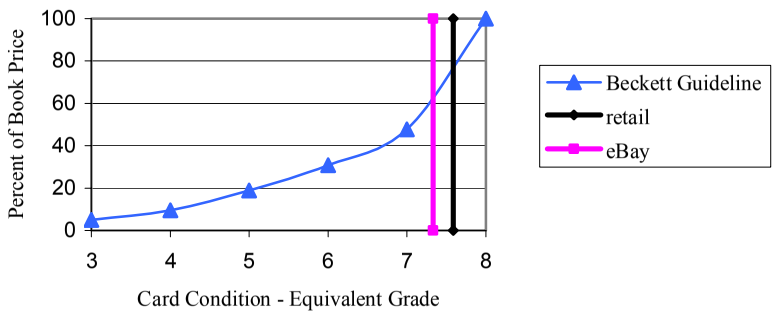


Figure 9

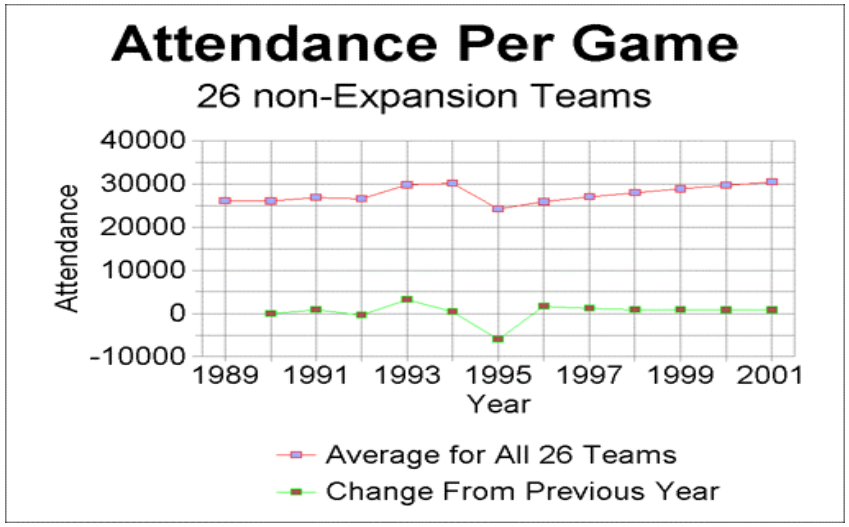


Figure 10: Age Distribution of Surviving Sports Card Stores in the Retail Markets

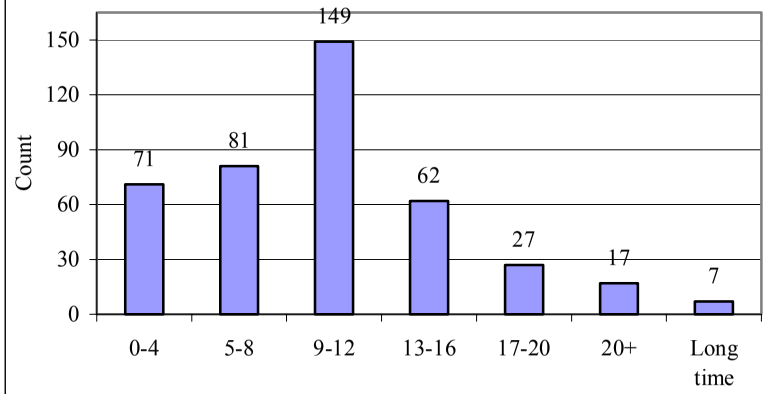


Figure 11: Number of Card Shows Per Month

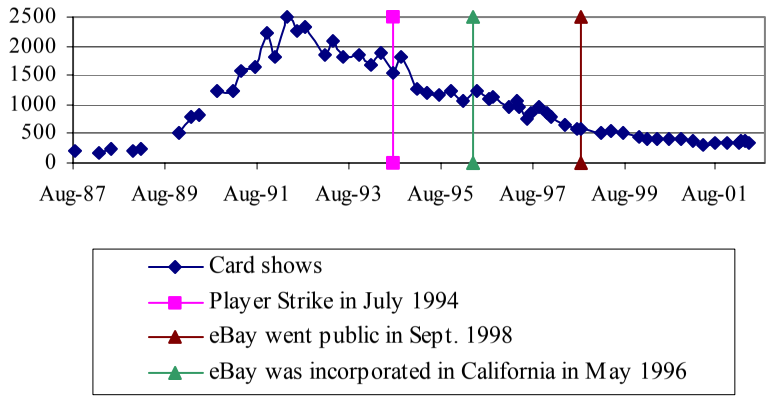


Figure 12: The number of sports cards PSA graded by year

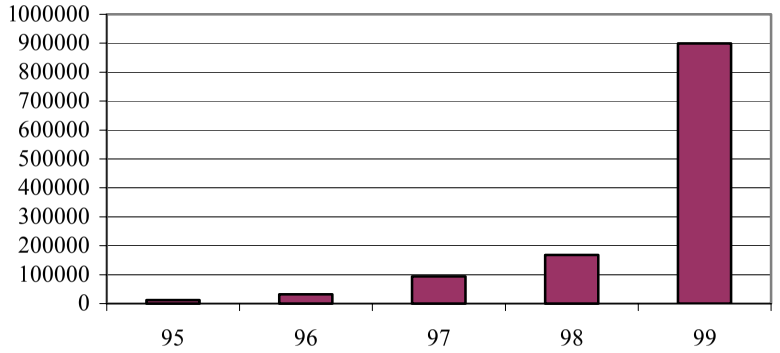


Figure 13: The number of sports cards PSA graded by quarter

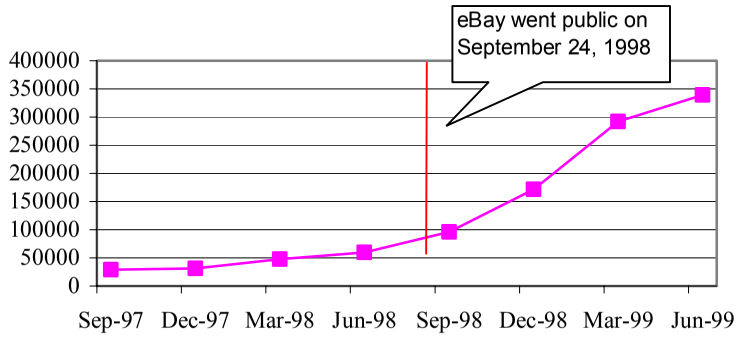


Figure 14: Distribution of PSA Grades - 89 Upper Deck Griffey