

# Consumer Frauds and the Uninformed: Evidence from An Online Field Experiment <sup>1</sup>

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## Abstract

Economists accept consumer frauds as an equilibrium outcome of information costs. This paper empirically investigates what information is costly to obtain, what contributes to information costs, and the effectiveness of certain institutions in reducing these information costs.

We focus on one of the most complained about consumer markets – Internet auctions. In a field experiment, we obtain actual baseball cards from both online and retail markets whose quality are then professionally graded and compared to the prices paid by online buyers for goods with similar claims. The experiment allows us to obtain a key variable - true quality - on top of price and seller ratings used in the existing literature.

Our findings indicate that some naive buyers in the online ungraded market are misled by non-credible claims of quality. Using accepted industry standard prices and our empirically determined quality distributions, we show that auctions with claims of quality cannot possibly be worth what those naive buyers pay in expected value. They pay higher prices but do not receive better quality and in fact are defrauded more often. Online seller reputation is found to be effective for minimizing fraud risk by identifying good-faith sellers. But conditional on completed auctions, even reputable sellers do not provide better quality. More disturbingly, the price increase from making non-credible claims more than compensates for the lower likelihood of sale for sellers with low reputations.

We attribute the naivete to misleading signals in the online ungraded market and two loopholes in the eBay rating system, namely universal rating and costless switching of anonymous identities. These loopholes reduce the precision and accessibility of seller information, and therefore make it difficult for naive buyers to learn. We also point out that naive buyers could impose several negative externalities on the other good-faith players in the market.

# 1 Introduction

Many market failures are attributed to the lack of buyer information. For example, Akerlof (1970) models a market where buyers do not know the quality offered by specific sellers. This leads to insufficient trade or even a shutdown of the market. In Darby and Karni (1973), consumer frauds may exist in equilibrium as a result of information costs. These seminal papers motivate a lot of theories on informed and uninformed buyers, but the empirical research has lagged behind: what information is costly for buyers to get? What contributes to the information costs? And what institutions are more able to reduce the information costs? We address these questions in one of the most consumer complained markets – Internet auctions.

Most of the literature examining buyer information limits them to being *sophisticated*: buyers may not know the quality sold by a particular seller, but they do know the distribution of quality offered in the market.<sup>1</sup> Under this assumption, buyers may receive a quality lower than expected ex post, but would never regret the purchase ex ante. Note that buyer sophistication is different from buyer rationality: sophistication concerns the knowledge of the buyer, while rationality refers to his ability to maximize certain objectives using that knowledge. Here we assume rationality but question the assumption of buyer sophistication. We present evidence that some buyers misunderstand the true meaning of seller advertising, possessing incorrect beliefs on the distribution of quality in the market. In this sense, they are unsophisticated.<sup>2</sup> As shown later, the presence of buyer naivete has roots in market imperfections, and the synergy between buyer naivete and market imperfections may have profound impacts on the whole market.

The evidence was gathered in two steps. First, a seven-month eBay watch revealed a stunning fact: 23-54% higher prices were paid to sellers claiming to be selling high quality cards (as opposed to modest or no claims). This would be reasonable if sellers making grand claims actually delivered better cards or provided more reliable service. We checked this in the second step. Immediately following the market watch, we purchased ungraded cards with the same types of claims and had them professionally evaluated. These cards were systematically purchased so half of the sample came from high claims sellers and the other half from modest or no-claim sellers. In a reverse of the theory, sellers making the best claims were more likely to default

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<sup>1</sup>This assumption is explicit in Akerlof (1970), Shapiro (1983), and many follow-up papers summarized in Tirole (1988).

<sup>2</sup>It is possible for a buyer to be unsophisticated but fully rational: that buyer simply has no prior knowledge but is able to incorporate information gleaned from the market into his beliefs. If this new information is correct, he may become sophisticated over time. Section 6 considers this possibility and what happens when he learns using incorrect information.

(no delivery) or send counterfeits. Even conditional on actual deliveries of authentic cards, the quality from high claims sellers was indistinguishable from the quality with more modest claims. Some buyers, therefore, naively pay higher prices for cards with no quality advantage and suffer a delivery service disadvantage.

These findings are consistent with the literature in all but one assumption. Once one removes the assumption that buyers must only be uncertain about firm level characteristics, our findings become intuitively obvious. Information costs may exist at many levels: the firm-specific, market-specific, nation-specific, and so on. Sophisticated buyers (who know market-level but not firm-level information) are simply more informed than naive buyers (who know neither market nor firm-level information). Though the term "uninformed" may need to be redefined, the fundamental theory of information costs driving equilibrium fraud is precisely the one that emerges from this study.

The online market is further contrasted with the retail market: we purchased the same type of ungraded cards in retail stores at the same time and had them professionally evaluated in the same package (without revealing the origin to the graders). Two findings emerge: first, if we exclude the fraudulent observations, the average online quality is slightly worse than its retail counterpart, suggesting a statistically significant but small lemons problem. Second, the fraud rate was significantly higher in the online sample. Quality from authentic deliveries by online sellers making high claims, online sellers making modest or no claims, and retail sellers turn out to be very close to each other; the major difference between the three is their relative fraud risk. The online-retail difference is not surprising given that non-delivery is impossible in face to face retail markets and inspection before purchase may provide some defense against counterfeiting. But the difference between high-claim and low-claim online sellers needs more examination.

Does the eBay rating system help lower the online risks? Unlike most empirical studies that infer the effectiveness of online seller ratings from price data only<sup>3</sup>, we have a rare opportunity to link seller ratings, prices, and seller claims with true quality. We find that seller ratings correctly signal the reliability of delivery, but conditional on authentic deliveries card quality from reputable sellers are no better than that from less reputable sellers. We also find that the lower likelihood of sale in association with lower seller reputation can be easily overcome

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<sup>3</sup>Most existing studies on eBay seller ratings do not observe true quality (see Resnick and Zeckhauser (2002) for a detailed summary of this literature). To the best of our knowledge, the only exception is Resnick *et al* (2003) where they conducted a controlled experiment allowing the same (honest) seller to sell similar items under different eBay identities. This experiment, by definition, does not address default and counterfeit risks associated with seller ratings.

by making an incredible claim of superior quality. Since reputable sellers are *less* likely to make outrageous claims, if naive buyers understood what incredible seller claims actually signal (higher average rates of fraud, no increase in average quality), even seller reputation alone could be very effective in helping them avoid fraud. This suggests that the key problem is not the lack of signals, rather it is the confusion that results from mixing good signals like the eBay seller rating with misinterpretations of bad signals like seller claims.

Our experiment reveals two reputation loopholes that could contribute to that confusion. First, eBay ratings are universal. It is easy to build up an eBay rating by buying cheap items and use that reputation to sell expensive items. To make matters worse, eBay allows costless switching between anonymous identities.<sup>4</sup> In the experiment we encountered two fraudulent sellers who intentionally built up positive ratings, committed a series of defaults, received over 20 complaints, and abandoned the accounts afterwards. Because the cheater can switch to a clean slate, warnings from today's sophisticated buyers cannot reach new buyers entering tomorrow. Both loopholes reduce the precision and accessibility of seller information, making it harder for new unsophisticated buyers to learn the right lessons.

The bad synergy of buyer naiveness and reputation loopholes clearly harms the naive buyers directly, but it may also harm others in the market. At the end of this paper, we discuss three negative externalities the bad synergy may have on the honest sellers, the existing sophisticated buyers, and the incoming unsophisticated buyers. In principle, these negative externalities are similar to the positive externalities that informed buyers would exert on uninformed (but sophisticated) buyers in the existing theories.<sup>5</sup>

The rest of the paper is organized as follows. Section 2 explains why baseball cards are especially suitable for this study. Section 3 presents empirical findings from our market watch, followed by experimental design in Section 4 and experimental results in Section 5. Section 6 discusses the implications from our empirical findings, in an attempt to understand the origin and consequences of buyer naiveness. Section 7 concludes.

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<sup>4</sup>Although eBay saves feedback comments indefinitely, users cannot view the auction being commented on after 90 days have passed. Random inspection reveals that very few comments mention the item in the comment itself.

<sup>5</sup>An extensive theoretical literature examines market efficiency allowing a mixture of informed and uninformed buyers. While the missing information could be either price or quality, most papers conclude that informed buyers motivate sellers to commit to low price and high quality thus exerting positive externalities on uninformed buyers. This conclusion is based on the assumption that uninformed buyers are sophisticated enough to understand the true distribution of price or quality. See Diamond (1971), Stahl (1989), Rob (1985), Salop and Stiglitz (1977), and Dana (1994) for imperfect information on price. See Wolinsky (1983), Wolinsky (1986), Robert and Stahl (1993), Bagwell and Riordan (1991) and Linnemer (2002) for imperfect information on product quality.

## 2 Baseball Cards and eBay

Three features of baseball cards make them an excellent example. First, each type of baseball card is a homogeneous good and card quality is the most important determinant of card value. Second, industry accepted professional grading services exist to verify card quality, identity, and authenticity. This allowed us to directly observe quality and seller performance. Finally, online auction is one of the most complained about markets for consumer frauds, and quality concerns pertaining to online ungraded baseball cards are likely to be present for a multitude of goods. We now present institutions in support of these arguments.

Homogeneity of baseball cards originates from production. Each year, card companies design and print sets of cards depicting players and events from the previous season. Once the print run of a particular set ends, the supply of each distinct card in the set is fixed.<sup>6</sup> 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. People often use a 10-point scale to track card condition. 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 lower a corners grade to 7. The card's overall grade is computed off all four characteristics.

Card flaws are often hard to detect by the naked eye. In retail markets, buyers often use a magnifying glass to carefully examine card condition before purchase. One may also refer to independent, professional grading for a more accurate measure of quality. Because professional grading is voluntary and costs 6 to 20 dollars per card<sup>7</sup>, this practice divides the market into two groups: graded cards and ungraded cards. 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. Figure 1 shows one example of ungraded 1989 Upper Deck #1 Ken Griffey Jr. rookie card and one example of PSA graded 1985 Topps #401 Mark McGuire rookie card.

Single baseball cards can be traded online or offline. Offline outlets include retail stores, and local card shows, both involving substantial transaction cost in finding trade partners. Such transaction costs are significantly reduced in online auction.<sup>8</sup> eBay offers the first standardized,

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<sup>6</sup>The exact number of copies printed for a specific card is regarded as an industry secret.

<sup>7</sup>Depending on package size and turnaround time, but independent of the actual grades received.

<sup>8</sup>For a typical card with a winning bid of \$100, the total seller fees amount to about \$4, lower than the average

user-friendly auction site where individual sellers and buyers could meet and transact conveniently. Ever since eBay went public in 1998, eBay has always been the most popular online place to trade single baseball cards.<sup>9</sup>

Despite transaction cost savings, online trading intensifies the information asymmetry between buyers and sellers, especially for ungraded cards. An online 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 sometimes do not 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). Figure 2-1 shows an example of eBay auction page listed by *eddie27g*, which we bid on in the field experiment.

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. It is widely agreed that the retail transaction prices are closer to the low end than to the high end. For graded cards, Beckett lists price ranges by grading company and grade. Card value is convex in grade: for example, the July-2001 low price for Griffey Jr. rookie card is \$60 for PSA8, \$150 for PSA9, and \$1200 for PSA10. The book price allows us to control for market differences across cards and across time.

Online auction is one of the most complained about markets for consumer frauds. According to the Federal Trade Commission (FTC), Internet auction fraud was ranked as the second most common category of consumer complaint, accounting for 10% of the 204,334 Internet related complaints in 2001. For three years in a row, Internet fraud was the most frequent offense reported to the FBI's Internet fraud unit. More alarmingly, total reported losses involved in Internet auction frauds tripled from \$17 million in 2002 to \$54 million in 2003.

Quality concerns stated above for baseball cards apply to a multitude of goods in online auction. The most direct analogy is to the other collectibles such as stamps, coins, and antiques, 6.7% sales tax that would apply to a typical transaction in the retail markets (Goolsbee 2000).

<sup>9</sup>Based on our interviews with over 30 sports card stores and a phone survey of 1213 sports card stores listed in Yahoo! Yellowpages. See Jin and Kato (2004) for more details about the survey.

all of which have similar industry features and professional grading services. It is also common to observe seller claims of quality in other top ten trading categories, such as used cars, consumer electronics, books, clothing, accessories, toys, and jewelry. In fact, the most common complaints about Internet auctions are that "after sending the payment, buyers may receive an item that is less valuable than promised, or worse yet, nothing at all."<sup>10</sup>

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.<sup>11</sup>

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.<sup>12</sup> Because an individual can open multiple accounts in eBay<sup>13</sup> and on average 52.1% of transactions result in any feedback from buyers on sellers<sup>14</sup>, the numerical rating is an imperfect measure of reputation. Figure 2-2 presents the feedback file of *eddie27g* before we bid.

Numerous papers use auction records alone, including price and auction features, to examine the effect of eBay's user feedback rating system. Resnick *et al* (2003) surveyed the existing 12 studies on this topic and found that the literature has not reached a consensus on the price

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<sup>10</sup>See the FTC brochure *Top Ten Dot Cons*. Recent eBay fraud lawsuits have involved undelivered computers, counterfeit artwork and counterfeit sports memorabilia.

<sup>11</sup>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 phony sports memorabilia on its site.

<sup>12</sup>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.

<sup>13</sup>The multiple accounts created by the same individual are not linked to each other, unless the account owner instructs eBay to do so.

<sup>14</sup>According to Resnick and Zeckhauser(2002).

effect: some found zero price premiums for sold items (Eaton 2002), some found tiny price premiums pooling completed and non-completed auctions (Melnik and Alm 2002, Lucking-Reiley et al 2000), and some found more significant effect through lab or field experiments (Ba and Pavlou (2002), Resnick *et al.* (2003)). In contrast, most studies found some expected effects of seller reputation on the likelihood of sale, where sale is equivalent to auction completion.

### 3 Evidence from Market Watch

As shown in Jin and Kato (2004), baseball card trading in equilibrium takes place in three market segments: the best qualities are graded and traded online, mediocre ones stay ungraded in retail, and the worst lemons go online ungraded.<sup>15</sup> Because either professional grading or physical examination alleviates information asymmetry, consumer frauds are most likely to occur in the online ungraded sector. Therefore, we focus on the online ungraded sector and take retail ungraded and online graded sectors as two reference groups.

To better understand the online market, we observed real eBay auctions for 7 months from April 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. Based on store owner interviews, we added another four rookie cards<sup>16</sup> that had at least 10,000 graded copies as of April 2001 and attracted sufficient interest in both retail and online markets. They were 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. Nevertheless, all five are established names. Their card values are much more stable than other modern cards, and they all have well defined book prices for us to control for any fluctuation in market value. From retail store interviews, we noticed that an overwhelming majority of customers are adults and only pay attention to cards of near-mint 7 or better quality. For this reason, we disqualified all online auctions for ungraded cards that claimed 6 or below or mentioned at least one defect consistent with a professional grade below 7.

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<sup>15</sup>The fourth segment— retail graded — cannot survive, as it incurs higher transaction cost but has no information advantage over the online graded sector unless default risk is severe.

<sup>16</sup>The most valuable cards tend to be “rookie” cards of star players, the first card ever printed by a particular company of that player.

Table 1 summarizes these market watch data. 67% of the 1124 auctions were for graded cards. Among graded cards, 88% were graded 8 or above. This is consistent with the fact that the guide book always lists ungraded and PSA8 (graded) cards at the same low price.<sup>17</sup> For both graded and ungraded cards, the likelihood of completing the auction was about 81%, where we define an auction is completed if it received at least one bid above any minimum or reserve price. Among completed auctions, eBay prices closely track Beckett low book prices<sup>18</sup>, and as we expect, the average winning price is much higher for graded cards (Table 2).<sup>19</sup>

For ungraded cards, there could be two potential signals of card quality: seller ratings and seller claims. Seller claims are abundant, although none of them is verifiable online. 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). The other 171 did not make any quality claim. The high-end claims, especially the 10s, were hardly credible. As shown in Figure 3, 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, it is obvious that sellers making such claims must be overstating the quality of the cards they are selling. Similar logic applies to mint 9 or better.

Note that non-verifiable seller claim is a phenomenon unique to the online ungraded sector. During our visits to retail stores, card dealers were very reluctant to make any quality claim about their ungraded cards. When we insisted, they would say "7 or 8", which is not informative given that collectors rarely look at cards below 7 and cards that are significantly better than 8 should have been graded. The lack of seller claims offline makes seller claims online suspicious. Despite the suspicion, online buyers are very willing to reward seller claims: the winning prices of cards claimed Gem Mint (10) was on average 28.6% higher than the prices of cards claimed Mint (9), and 75.7% higher than the prices of cards claimed below 9 or nothing.

A second signal of ungraded card quality is eBay seller ratings. Table 2 presents a sharp difference of eBay ratings between high-claim and low-or-no-claim cards. On the supply side, sellers that claimed 9 or better quality for ungraded cards on average had net ratings around 300, while sellers that made moderate or no claims had net ratings around 700-2000. This difference is statistically significant at 99% level. On the demand side, buyers of graded cards seemed more experienced than buyers of ungraded cards (221.70 vs. 140.03, significantly different with

<sup>17</sup>Book prices for ungraded cards are meant for ungraded cards that seem of quality 8. About 12% graded cards offered in the online markets are graded below 8. One explanation is that these sellers are not experienced enough to tell the difference between 7 and 8.

<sup>18</sup>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%

<sup>19</sup>The price dispersion is also higher for graded cards, because card value is convex of the actual grade.

99% confidence). Within ungraded cards, buyers of cards claimed gem mint on average had an eBay ratings of 81.45, while that number for the other ungraded cards is around 140 to 240. This seemingly large difference is not statistically significant, because the range of seller ratings is huge. However, the buyer rating for cards claimed 10 is significantly lower, if we include all the other cards in the comparison group.

Table 3 presents regression results on the same eBay watch data. Defining an auction as observation unit, we focus on two dependent variables: whether an auction was completed, and the log of the winning price of the auction if it was completed (normalized by corresponding Beckett low book price). The first regression is based on the full sample of 1124 auctions, and entails probit. The second regression is conditional on 778 auctions that were completed and had corresponding Beckett Book prices. We use the Heckman two step procedure to control for the potential selection generated by this sampling criteria.

The key independent variables are whether the card is graded, self claimed grade if it is ungraded, net seller ratings, and whether the seller has any negative ratings. Both regressions control for a full set of card identity dummies, payment methods, shipping options, length of auction, whether the auction ended on weekend, whether the auction ended in prime time, where there was a public or secret reserve price, whether there was a Buy-it-Now option, whether there was at least one scan picture, whether the picture was clear or blurred, and whether the seller claimed to be a card dealer. In each regression, we adopt two specifications: the first treats seller claim of ungraded card quality as a continuous variable, while the second decomposes seller claim into four categories: 10, 9 or 9.5, below 9, or no claim.

Regression results confirm what we found in the raw data: buyers are very willing to reward non-verifiable seller claims in the ungraded market. In the first specification, all else equal, claiming one extra grade for the listed ungraded card will make the auction 4.63% more likely to be completed, and if it is completed, raises the winning price by 21.6%. In the second specification, compared to the omitted group (i.e. claimed below 9), claiming 10 made the auction 9.18% more likely to be completed. Claiming 9 also had a positive (but insignificant) effect on auction completion. Conditional on completed auctions, relative to cards claimed below 9, the winning prices were 23.4% higher for cards claimed 9 and 53.9% higher for cards claimed 10. For ungraded cards with no claims, the price premium was much more moderate (14.6%) and insignificant.

For seller ratings, we find two interesting facts: first, for both graded and ungraded cards, seller ratings are effective in improving the likelihood of auction completion, but ineffective in raising the winning prices conditional on completed auctions. Moreover, the effects of seller

ratings on the completion likelihood differ significantly between graded and ungraded cards: the probit coefficient of log seller ratings for ungraded cards (0.178) is twice as big as that for graded cards (0.084). And the existence of negative ratings had a big negative impact on ungraded cards, but zero effect on graded cards. These findings confirm the argument that the information problems are more severe for ungraded cards and seller ratings are more helpful in alleviating the problem for ungraded cards.

Note that, for ungraded cards, the effects of seller claims are stronger than those of seller ratings. In the first specification, doubling the net seller ratings increases the likelihood of auction completion by 3.32%, which is lower than the marginal effect of claiming one extra grade in quality (4.63%). In the second specification, the marginal effect of claiming Gem Mint (10) on completion rate (9.18%) is greater than that of tripling the net seller ratings. Given that buyers are willing to pay 23.4-53.9% more for a claim of 9+ but zero for seller ratings, it is obvious a non-reputable seller making high quality claims receives more than a reputable seller not making high claims.

As a robustness check, we run a tobit regression of winning prices, pooling completed and incomplete auctions and assuming left censoring at minimum bids. While not reported in tables, we find that claiming 10 has a positive effect on winning prices, but seller ratings have zero impact. In an unreported specification, we add in the interactions of seller claims and seller ratings, all of which were insignificant. This contradicts the intuition that claims made by reputable sellers should be more credible. We also estimate the effects of seller claims and seller ratings on the number of bidders: both effects are positive, but only the effect of seller ratings is statistically significant.

To summarize, some empirical evidences are consistent with theories, but some are not. On the consistent side, prices are higher for graded than for ungraded cards, prices increase by grades, and reputation effects are stronger for ungraded than for graded cards. They suggest that both reputation and professional grading play positive roles in alleviating asymmetry information in the online markets. On the inconsistent side, the data raise questions about the online ungraded market: (1) Why did online buyers believe non-verifiable seller claims and reward seller claims even more than seller ratings? (2) Given buyers are willing to pay more for high claims, why didn't every seller claim the highest quality? (3) Why did seller claims appear often in the online ungraded market, but hardly exist in the retail market? (4) If online buyers appreciated both seller ratings and seller claims, why do the two signals not reinforce each other? In fact, why were reputable online sellers *less* likely to make claims of mint or gem mint? (5) Given the huge premium found for high claims of ungraded card quality, why did experienced buyers tend to avoid ungraded cards, especially those with extremely high claims?

These puzzles are difficult to explain using only eBay watch data, because they are missing a key variable – true quality. In practice, true quality could have several components: the quality of the seller in terms of prompt delivery, the authenticity of the delivered goods, the actual quality of the delivered goods, etc. Without reliable data on these quality measures, eBay watch data can only tell us what buyers *believe*. To discover whether buyer beliefs coincide with what really happened, we design the following field experiment.

## 4 Experimental Design

We purchase ungraded cards from both retail and online markets, and send them for professional grading. This gives us a direct and objective measure of true card quality. Since seller claims play an important role in eBay auctions, we purchase ungraded cards online in two groups so that the sellers of one group claim systematically higher quality than the sellers in the second group. The purchasing and grading procedures are designed to mimic actual practices in both markets. We focus on the same types of cards as in the market watch, and to avoid any changes in card value due to players' performance, we restrict our purchases to the off season of baseball from December 8, 2001 to March 18, 2002. Since serious collectors only pay attention to cards of Near Mint 7 or better quality, we target cards that appear to have "collectible quality" given the information available at the time of purchase.<sup>20</sup>

**Online Purchases** 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. 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 the same prices for an ungraded NearMint-Mint card and a card graded 8.<sup>21</sup> The ranking process suggested that the typical supply of a particular type of ungraded single card consisted of three groups: One group of sellers indicated specific defects about the cards they were selling; a second group claimed their cards were of moderate quality or made no claims; the third group claimed their cards were of extremely high quality (Mint 9 or Gem Mint 10 depending on card type). We focus on the latter two groups (the first group is disqualified).

Specifically, we bid on the best-ranked and median-ranked cards after ruling out the dis-

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<sup>20</sup>Specifically, for retail purchases, we examine the PSA and BGS grading standards and disqualified any cards that had at least one defect consistent with a PSA or BGS grade below 7. For online purchases, we rule out all online auctions that mention specific defects that would have disqualified them from our retail purchases.

<sup>21</sup>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+.

qualified auctions. In case we lost either one, we bid on 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 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.<sup>22</sup>

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 it 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 (Roth and Ockenfels(forthcoming), Bajari and Hortacsu (2003a)), 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 highest reported professional grade is 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.

We stress that the separation of best- and median-ranked cards serve two purposes: first, it allows us to observe variation in seller claims. Second, by bidding on the best- and median-ranked copies of the same card in the same week, we entail a pairwise comparison that controls for any card-specific or time-specific variations in consumer tastes or seller claims. For example, over 40,000 copies of Griffey have been graded 10, so the best claim for an ungraded Griffey is always 10 or 9.5. Subsequently, the median claim is often as high as 9. On the other hand, no 10 exists for Jeter, so the best claim for an ungraded Jeter is about 9 and the moderate claim lingers around 8. This forces us to design the sample by *relative* rather than absolute differences in seller claims.

**Retail Purchases** Recall that retail sellers are reluctant to make any meaningful claims on ungraded cards, and therefore it is impossible to replicate our online purchasing strategy in

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<sup>22</sup>As stated in eBay policies, a completed auction constitutes a legally binding contract. It is possible that sellers and auction winners may communicate after the auction ends and mutually agree to terminate the contract. There is no data for or against this conjecture. Even if it exists, our findings will be unbiased as long as claims are not systematically correlated with contract termination. An extreme case would be to assume that the only other bidders we observe in auctions with high claims are actually shills. If we were truly the only non-shill bidder, then some cards we purchased would not have otherwise been sold. But, since listing an item is costly, sellers using shill identities must expect that someone will eventually spring their trap. Therefore, it is reasonable to assume that real bidders exist and these items will be sold sooner or later.

the retail market. Instead, we consider all cards from accessible retail stores or local card shows in 11 metropolitan areas. All cards were purchased if they were not disqualified by the above rule. 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, Baltimore, and areas surrounding Washington D.C., we personally visited every retail store plus the regional sports card show in Ft. Washington, PA during March 1-3, 2002.

Purchases from the other 8 areas<sup>23</sup> 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, including 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 the two biggest graders (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 were made to ensure the instructions were well understood and followed. Agents shipped all purchases to us using methods recommended by Beckett.

**Grading** Overall, we obtained 126 cards from the retail markets, and paid for 107 cards online. Because the Jeter and the Rodriguez were hard to find in retail markets, we stopped purchasing them online after February 3, 2002. For weeks afterwards, 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.<sup>24</sup>

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<sup>23</sup>Chicago, San Jose, Denver, Dallas, Los Angeles, San Diego, Tucson and Detroit.

<sup>24</sup>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 discrepancy 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. 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

## 5 Experimental Results

We now present two sets of experimental results: one on true quality and its correlation with seller claims, and one on reputation and quality.

### 5.1 Experimental Results On Quality

Table 4 summarizes the card quality from the experiment. The first two columns report summary statistics for the best- and median-ranked cards within online purchases. Because the best- and median-ranked cards are paired up by card type and purchase week, column 3 reports their difference based on the *pairwise* comparison. In practice, the number of best-rank cards is slightly larger because several best-rank cards were sold in a package of multiple copies (of same card same claim).<sup>25</sup> The pairwise comparison is conducted by controlling for card-week fixed effects. Columns 4 to 6 compare all online cards with retail purchases. We now discuss them separately.

**Online purchases** Despite being forced to pay an extra \$24.50 (or 51.4%) for each best-ranked card, we find the best-rank group produced no better quality than the median-rank group. Considering only authentic cards successfully delivered, the card quality from the two rank groups is extremely close. The real difference between the two groups is the higher default and counterfeit rates that accompanied high seller claims: of the 11 fraudulent transactions, 9 came from the best-rank group and all 4 defaults were best-rank cards whose sellers claimed gem mint (10). It appears that the price premiums are not securing any quality benefit for the purchasers, who in fact are more frequently defrauded. A more detailed statistic is the absolute difference between seller claims and true card quality. If we denote undelivered or counterfeit cards as zero grade, the best-rank group overclaimed more than 3 grades, doubling that of the median-rank group. Conditional on authentic deliveries, overclaims from the best-rank group are still 0.84 grade higher. This is a dramatic difference given that a card of grade 7 is valued 50% less than a 8 and 70% less than a 9.

**Alternative explanations** Before jumping to the conclusion of buyer naiveness, we examine a couple of alternative explanations. Buyers could still be fully sophisticated and acting rationally if their preferences are convex enough, the true quality of cards with high claims is

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surface. In a separate study, Jin, Kato and List (2004) compare the grading practice of PSA, BGS and SGC. We find that BGS provides the most consistent grading among the three.

<sup>25</sup>It does not change our conclusion if we treat one package of multiple copies as one observation. All frauds in our sample occurred in single-card sales.

more dispersed, and not all owners of truly high quality cards realize their cards are worth grading. 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. 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.

To consider this alternative explanation, we need to compute expected values instead of expected quality. Note that consumers with heterogeneous tastes for quality will sort themselves in purchasing products of heterogeneous qualities. As a result, the price schedule should be more convex than the preference of any buyer in the online ungraded market.<sup>26</sup> Therefore, it is sufficient to take the price schedule as a conservative measure of preference convexity. At the bottom of Table 4, we translate card grade into Beckett low price and calculate the average card value in each rank group.<sup>27</sup> Regardless of whether we include defaults and counterfeits, the average card value is not significantly higher in the best-ranked group. This conflicts with the enormous price premiums that buyers were willing to pay for high claims in the eBay watch data.

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 Griffey's 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 Griffey's 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.<sup>28</sup> In equilibrium, the two options must have equivalent expected value for a risk neutral buyer.

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<sup>26</sup>In theory, an individual's preference could be more convex than the price schedule at the very high end, but these individuals value a 10 more than the market price and should enter the graded rather than the ungraded market.

<sup>27</sup>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." Instead, Beckett quote full and low retail prices of ungraded cards 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 condition and were made out of inferior materials. We use the middle point of each range as the true discount value for each condition.

<sup>28</sup>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.

If buyers expected the same quality distribution from all cards claimed gem mint 10 cards as we discovered in our experiment, they must have expected 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 Griffey's 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 buyers' utility function is 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. For this explanation to hold, these buyers cannot just be eBay lovers, as they could have derived the same thrill from winning a bid in either the median-ranked or the best-ranked group. Rather, they must believe that the probability of getting high quality cards, however small it is, is higher in the best-ranked group. If they are fully informed of the risk, they must also understand that the presence of even one dishonest seller online could theoretically create many dishonest seller identities. The ease of creating anonymous identities on eBay would drive down the probability of receiving a Gem Mint 10 down to zero. Therefore, any reward for non-verifiable high claims requires extreme convexity in preferences.

**Online vs. Retail Purchases** The last three columns of Table 4 compare online and offline purchases. In theory, retail spot markets harbor no default risk, but could face a positive counterfeit risk if counterfeits are hard to identify by the naked eye. Our experiment confirms this intuition: 4 out of 126 retail purchases are counterfeits, which is lower than the counterfeit risk in the best-ranked online group (5 out of 49 deliveries) and that in median-ranked online group (2 out of 47). But neither difference is statistically significant, probably because the retail market does not provide much information advantage in identifying counterfeits. However, if we pool defaults and counterfeits, the retail market is certainly safer than the best-ranked group in the online ungraded market.

Focusing on good faith sellers, we find the retail market offers 0.26 grades better in quality (significant at the 98% level) and \$2.05 more in card value (insignificant)<sup>29</sup> We further test if

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<sup>29</sup>Our online sampling method may introduce a selection problem because we oversample sellers with extremely high claims. However, since seller claims imply no quality difference except for the default/counterfeit risk, our quality comparison between online and retail markets only focus on good faith sellers that send us authentic deliveries. This circumvents the selection problem in the online sample. For more details on this issue, see Jin and Kato (2004).

this difference is attributable to outliers by examining the medians and the whole distribution instead of means. Results are similar, confirming a small lemons problem at the eBay ungraded market.<sup>30</sup> Overall, the online-retail comparison suggests that the major problem for the online buyers is the increased risk of receiving counterfeits or nothing at all.

## 5.2 Experimental Results On Seller Reputation

Seller reputation is one of the market mechanisms that potentially alleviate the information asymmetry between online buyers and sellers. However, most reputation theories assume buyers are sophisticated and seller identities are perfectly trackable. As shown above, the first assumption is questionable in online auctions of ungraded cards. The second assumption does not hold either, as eBay allows any player to costlessly switch his/her anonymous identities. These features raise a question regarding the extent to which traditional reputation theories are applicable to online auctions. In the field experiment we are able to relate seller reputation to true seller quality thus examining the roots of reputation theories: if reputation holds in any meaningful way, we should observe a positive correlation between seller reputation and seller performance.

Table 5.1 summarizes log of seller net rating by a number of subsamples. First of all, reputable sellers are less likely to default or deliver counterfeit copies, suggesting that reputation is a meaningful signal for default and counterfeit risks. Based on this result, it is not surprising online buyers in our eBay watch data were more willing to bid on items offered by reputable sellers. More interestingly, seller reputation also differs by the magnitude of self claims. Although the average seller ratings appear quite similar in best- and median-ranked groups, sellers claiming mint or better were on average less reputable than the other sellers. Recall that the highest claiming sellers were responsible for most of the outright cheating. This explains why seller ratings and seller claims were negatively correlated in the eBay watch data. While seller rating is a good signal of seller performance (in terms of default and counterfeit risks), claiming 9 or 10 is in fact the strongest negative signal of dishonesty. Unfortunately, not every online buyers understood the true signaling effect of high claims. That is probably why in our eBay watch data experienced buyers tend to avoid ungraded cards, especially those with extremely high claims. Such buyer selection, if it exists, also implies that high claiming sellers mainly target inexperienced buyers.

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<sup>30</sup>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 if we had made all retail purchases by ourselves.

Table 5.2 reports regression results on seller ratings and seller claims. There are three dependent variables: whether the online purchase is a default or counterfeit, the true card quality (defaults and counterfeits are coded zero), and log of the prices we paid as percentage of Beckett low book. The key independent variables are seller self grade (as a continuous variable), whether the seller claimed mint or better (as a binary variable), log of seller net ratings, and whether the seller has any negative feedback. All control for card type and purchase time.

Regression results are consistent with data summaries: reputable sellers are less likely to commit default or deliver counterfeit, but conditional on authentic deliveries, card quality is not correlated to seller ratings at all. This explains a puzzle in the eBay watch data (and the existing literature): buyers are more willing to buy items from reputable sellers because they want to reduce the risk of default and counterfeit. But conditional on completed auctions, buyers are not willing to pay more to reputable sellers because their authentic deliveries aren't of better quality. A second finding is that seller claims means nothing once we control for seller reputation. Nevertheless, we were forced to pay more for seller claims, just like the winners in our eBay watch data. This points to buyer naiveness with regard to seller claims.

Note that negative feedbacks do not imply any difference in default/counterfeit risks or card quality. We believe this is due to a unique features of Internet auction: any eBay seller can costlessly switch his anonymous identity. This implies that some sellers *choose* to continue with negative feedbacks because the negatives do not harm them too much. As a result, we can only observe the impact of negative feedbacks on this selected group.

Costless switch of seller identity also makes it possible for fraudulent sellers to game the eBay feedback system. One of the four sellers who did not deliver in our real purchases provides a good example. That seller – *eddie27g* – completed delivery for seven auctions to receive positive feedback, establishing a good seller reputation (Figure 2-2). 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 (Figure 2-3). 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. 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. This probably explains why there are less than 1% negative feedbacks in the whole eBay system (Resnick and Zeckhauser 2002), especially if we only count registered users.

## 6 Discussion

To summarize, we have some mixed findings regarding the operation of online markets. On the positive side, buyers understand the importance of professional grading and treat ungraded cards as relatively inferior goods. Buyers also value reputation and correctly associate reputable sellers with lower default and counterfeit risks. As theory predicts, the retail market allows buyers to obtain more information about card quality before purchase and that information advantage does push the online ungraded market towards lemons. These market features also prevent empty claims of superior quality to appear in the retail or graded markets.

On the negative side, some naive buyers drastically underestimate the risk of trading ungraded cards online. Specifically, they are willing to reward the most fraudulent sellers for meaningless overstatements of quality. Although seller ratings constitute a valid signal against default and counterfeit risk, they do not imply better card quality condition on authentic delivery. More disturbingly, if we interpret lower probability of sale as the cost of establishing reputation, it can be easily overcome by making an outright claim of quality. In fact, we find reputable sellers are less likely to claim superior quality in the ungraded market.

These findings, especially the negative ones, do not fit in the classic monotone relationships between price, advertising, reputation and actual quality. If buyer naiveness is the fundamental reason, it raises three immediate questions: how serious is the problem? Why does the naivete exist in the way we observe? And what impact would naive buyers have on the other players in the market? This section answers these questions one by one.

### 6.1 Size of the problem

In our eBay watch data, 35% of transactions were on ungraded cards, and 40% of these ungraded cards had seller claims of mint or better. In our online experimental sample, 66% claimed mint

or plus and 11% were fraudulent. Of the 11 defaults/counterfeits, 9 had claimed mint plus. Assuming no fraud on graded cards, these numbers imply roughly 3% default/counterfeit risk and 11% empty-claiming risk in the whole online market of baseball cards<sup>31</sup>. Since the retail market is not free of counterfeits, the online fraud rate seems to imply a trivial problem. One may argue that uninformed buyers underestimating risk is an inevitable phenomenon in a new market, eventually buyers would learn their lesson, and the market would converge to a desirable long-run equilibrium.

We argue the problem goes beyond these percentages. Suppose there are three types of buyers: "lemmings," "sheep," and "rabbits." Like rodents who willingly jump off cliffs and drown, our lemmings are unsophisticated from birth to death and naturally fall for empty claims. They have extremely high costs of learning and always have bounded rationality. In comparison, sheep follow the herd. They may begin unsophisticated but believe that markets on average function well and use the most ready-to-use signals to rationally infer what they cannot observe through personal experience. Unlike lemmings and sheep, rabbits have done extensive market research and are fully informed of the actual distribution of seller types, even if they may not know the type of each specific seller and they recognize which ready-to-use market signals are misleading. By this classification, most existing theories about adverse selection and reputation assume all buyers are already both sophisticated and fully rational, and therefore focus on a rabbit-only world.

In reality, both lemmings and sheep would appear as naive buyers if sheep follow market signals driven by lemmings. In the online ungraded market, the most ready-to-use signals are price, seller ratings, and seller claims. The most obvious facts are price and sales likelihood increasing with seller claim, sales likelihood increasing with seller ratings, and over 99% of seller feedbacks being positive. Believing the market functions well, even rational sheep would conclude there is an extremely low risk of fraud and that higher claims mean better quality. In this sense, even if lemmings account for a very small percentage of the buyer population, they misguide the market by sending wrong signals to sheep. Unfortunately we only see ex post market outcomes, so it is impossible to determine just how many naive buyers started out as sheep; they all appear to behave like lemmings in the end.

## 6.2 Why does the naivete exist?

There are two ways to explain why the online ungraded market exhibits the level of naivete we observe. In the first explanation, all naive buyers are lemmings. In the alternative explanation,

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<sup>31</sup> $35\% * (40\% * 9/66 + 60\% * 2/34) = 3.14\%$ , and  $35\% * 40\% - 3.14\% = 10.86\%$

some naive buyers are sheep and the market institutions make it difficult for sheep to become rabbits. Since lemmings are unsavable by definition, we focus on the second explanation. Recall that in the online ungraded market, buyers cannot examine cards before purchase, have no information from independent professional grading and therefore must resort to seller reputation to cope with the information problem. For this reason, our discussion focuses on seller reputation.

Ebay ratings differ from a typical reputation system in two ways: first, eBay ratings are universal. Every feedback is counted equally, regardless of the amount of the transaction and the individual's buying or selling position in previous trades. As a result, it is easy to build up an eBay rating by buying cheap items and use that reputation to sell expensive items. This reduces the precision of eBay ratings as a measure of seller type.

Another consequence of universal ratings is that eBay ratings can only convey the information universal across all previous transactions, i.e. whether the individual had honored completed auctions by paying the full amount as a buyer or delivering the good on sale as a seller. In practice, eBay saves feedback comments indefinitely but users cannot view the auction being commented on after 90 days have passed. Random inspection reveals that very few comments mention the item in the comment itself. Since the actual quality of delivered items is not always comparable across categories, a previous buyer's complaint of mediocre item quality is at most a noisy measure of what quality the seller would deliver in the future. By this design, it is not surprising that in our data seller ratings are a good indicator of authentic delivery, but do not correlate with the actual quality conditional on authentic delivery. The wide use of professional grading online also suggests that eBay reputation is less effective than professional grading in handling information pertaining to the actual quality of delivered items.

The second unique feature is that eBay allows costless switching between anonymous identities. A cheater can abandon the identity that receives the negative feedback and switch to a clean slate. A cheater can also open multiple accounts and create positive feedbacks between them. Though it may be difficult to generate 1000 positive feedbacks in this way, the possibility of self-producing positive feedbacks plus the escape from negative ratings make cheaters mingle with new honest sellers in the low end of positive ratings. As a result, positive ratings contain much noisier information about seller types than they could have been.

A number of theories have examined situations where past behavior does not stick when a player changes its anonymous identity (Friedman and Resnick 2001) or starts a new relationship (Ghosh and Ray 1996, Kranton 1996, and Watson 1999). They all find that some initial costs are needed to encourage players to behave under current identities. These costs can be a slow start in developing a long run relationship, newcomers receiving poor treatment from established

players, or, like in our context, lower likelihood of sale for less reputable sellers. These theories imply that loopholes in eBay rating system do not invalidate seller reputation. Rather they make it more difficult for the reputation system to function.

Specifically, the noise in eBay’s reputation system translates into information costs for buyers. Because it is costless to shed bad history, lessons learned by one naive buyer today cannot reach the other naive buyers in the same market, nor can they reach new buyers entering tomorrow. Consequently, both current and future buyers have difficulty updating their beliefs, not only about whether a specific seller is honest, but also about the actual distribution of dishonesty. It is the latter that makes the naivete persist over time, even if most naive buyers are sheep and actively process whatever information is available to them.

### 6.3 Consequences of buyer naiveness

We now consider the potential harm that buyer naiveness could have on the other good-faith players in the online ungraded market.

Suppose any online seller ( $j$ ) of ungraded cards can make a non-verifiable claim of card condition. For simplicity, we assume self claims take on only two values: mint plus or no claim. Making a claim incurs a conscience cost  $h_j$ . More generally, one can interpret  $h_j$  as a cost of losing future revenues if buyers find out the truth. Some sellers value their reputation more than others, which generates heterogeneity in  $h_j$ . Buyers observe nothing except seller claims and seller ratings accumulated up to the time of auction.

Based on our market watch, Figure 4 depicts two consumer-willingness-to-pay curves as functions of seller ratings, one for items claiming mint or better, one for the other items. By willingness to pay, we mean the probability of completing an auction multiplied by the winning price conditional on completion. To keep notations simple, the two curves are referred to as "high-claim WTP" and "no-claim WTP." Empirically, seller claims and seller ratings have little interacting effects, so the high-claim WTP is essentially a vertical shift of the no-claim WTP.

These WTP curves have different meanings for different buyers: rabbits understand all the pitfalls in seller claims, so they only act upon the no-claim curve. But sheep and lemmings put some faith in seller claims and act upon both curves. More specifically, even though the market attracts infinite number of cheaters claiming superior quality, naive buyers *do not know* high claim sellers are cheaters. In their naive mind, conditional on seller ratings, high claim sellers sell better quality than low-or-no-claim sellers. Since high quality cards are in short

supply, naive buyers will fall for seller claims and bid up to their willingness to pay for the misconceived quality. Also note that cheaters can profit more by empty claims, so they won't bother to accumulate extremely high ratings before playing the trick. In the data we observe sellers claiming mint or better have significantly lower ratings than the other sellers. To capture this phenomenon in Figure 4, the high-claim WTP curve is dashed beyond certain seller ratings ( $r'$ ) while the no-claim WTP curve is always a real line.

Naive buyers impose three negative externalities. Choosing between the high-claim and no-claim WTP curves, lemmings and sheep won't bid on the no-claim curve unless the value of seller ratings overweighs the misconceived value of seller claims. This threshold, labeled as  $r''$ , is much higher than maximum ratings a dishonest seller would accumulate ( $r'$ ). As a result, honest sellers whose ratings are lower than  $r''$  suffer from a demand stealing effect. This is the first negative externality naive buyers impose on honest sellers.

Furthermore, the loss of naive buyers makes it difficult for low reputation honest sellers to reach  $r''$ . This motivates honest sellers to consider alternative markets such as retail or graded markets. More specifically, according to Jin and Kato (2004), an honest seller exiting the online ungraded sector will first withdraw his best quality cards and most likely withdraw them to the retail ungraded sector. This implies that honest sellers benefit less from online transaction cost savings and the average quality supplied in the online ungraded sector is worse. As a result, some rabbits exit online ungraded sector as well, incurring either a higher transaction cost in the traditional retail market or professional grading costs in the online graded market. This logic is consistent with two empirical findings: first, buyers with higher eBay ratings, who are more likely rabbits, tend to shop more in the graded market than in the ungraded market. Second, sellers with higher eBay ratings are less likely to make claims and more likely to deliver authentic items; however conditional on authentic delivery, the delivered quality is as poor as those from less reputable sellers.

Rabbits fleeing the online ungraded market also increase the percentage of naive buyers in that market, which implies that the signals available from the online ungraded market are even more likely driven by lemmings and sheep. This reinforces the misleading signals in the online ungraded market and gives rise to a third externality: naive buyers, who mistakenly overestimate the quality available at the online ungraded sector, may turn away from traditional retail and online graded sectors, which in turn reduces the demand that honest sellers may have in these better-protected markets.

## 7 Conclusion

Using online auction as an example, we link consumer frauds to lack of information. Theoretical models usually assume uninformed buyers are sophisticated enough to possess the true distribution of quality in the market. Our empirical findings imply that at least some buyers are so poorly informed that they lack even this general information. Such naivete may distort important market signals, and therefore harm other market players. In our example, rational sheep do not need to be gullible enough to fall for traps set by cheaters; they only need to believe higher prices signal better quality when in fact prices are driven by naive lemmings.

We stress that the entire market does not need to be irrational or naive, and in fact many institutions in the online baseball card market appear to be effective. For example, buyers interpret seller reputation as a signal of reliability, alert rabbits move to the safer graded market, and prices reflect a large quality difference between graded and ungraded cards. However, regardless of how many lemmings exist, the point is that lemmings may cause market distortions completely out of proportion to the size of their presence in the population.

This phenomenon of naive lemmings leading sheep off a cliff is a general one that can be observed in many markets. Here we highlight parallels between the eBay baseball card market and two larger, more traditional markets: financial instruments and dietary supplements.

In the world of investment banking, the SEC describes a process known as "Pump and Dump" which is very similar to our model of cheaters, lemmings, and sheep. In that scheme, cheaters buy shares of a cheap stock and then hype up its future prospects to naive buyers. The lemmings believe the hype and drive up short-term demand for that pumped up stock. Sheep then observe the price of the stock increasing, trust the market signal is based on solid fundamentals and join the herd of lemmings. The fraudulent cause of the run-up is eventually exposed when the market "corrects" itself, but the cheaters will have long since sold off their cheaply purchased shares for a nice profit. Though the SEC mentions Internet message boards and telemarketing as a low cost pumping method available to fraudsters, such deceit has been exposed at a much larger scale. On April 28, 2003, ten major investment banks paid \$1.4 billion to settle allegations that those firms misrepresented the quality of stocks to financial analysis customers.<sup>32</sup> If our logic is applicable, the harm to consumers could go far beyond: even non-

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<sup>32</sup>"The investigation was based on internal e-mails in which the firms' financial analysts privately derided stocks they were touting to the public. . . . Regulators alleged (they) published fraudulent and misleading research that promoted banking clients and harmed investors while ignoring strong criticism from inside the company about the quality of research." ABCNews.com, "Historic Settlement: 10 Wall Street Firms Agree to Pay 1.4 Billion in Bias Settlement."

client sheep may have been misled by stock market shifts driven by naive lemmings (or sheep) who took advice at the penalized firms.

In another example, the 1994 Dietary Supplement Health and Education Act (DSHEA) loosened FDA regulations on dietary supplements. Unlike drug manufacturers who cannot market their products until they are proven to be safe and effective, diet pill makers can market any dietary supplement and the FDA cannot take regulatory action unless it proves *ex post* the supplement is unsafe. Under such rules, diet pill makers make non-credible claims of product quality similar to what we observed in the online sportscard market.<sup>33</sup> For example, makers of ephedra-based dietary supplements cited non-verifiable clinical studies to claim effective weight loss. These claims have never been substantiated in researches conducted by the FDA and other institutions.<sup>34</sup>

Before the FDA finally banned ephedra-based diet pills on Dec. 30, 2003 (due to consumer complaints), the market had an annual sale of \$6.8 billion, accommodating 12 million consumers.<sup>35</sup> It is hard to believe that all 12 million American consumers were naive lemmings; at least some of them were sheep following the market, believing large sales volumes represented some consumers' endorsement of the products' effectiveness. The resulting harm from ephedra-based diet pills to consumers can be divided into direct and indirect losses. On the one hand, ephedra may or may not cause health problems; there is some suggestive evidence of harmful side effects from ephedra use. On the other hand, consumers who put their faith in a product of dubious effectiveness may forego safer and more effective means of weight loss such as exercise and a balanced diet. This is similar to the negative externality that naive buyers exert on honest sellers in online sportscard market.

The essential solution to the problem of naive buyers is to provide them with accurate

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<sup>33</sup>"In these cases, the marketers both overstated the benefits and understated the risks of using the products," said Howard Beales, Director of the FTC's Bureau of Consumer Protection." Source: "FTC Charges Direct Marketers of Ephedra Weight Loss Products With Making Deceptive Efficacy and Safety Claims" accessed at <http://www.ftc.gov/opa/2003/07/ephedra.htm> on February 4, 2004.

<sup>34</sup>Sources: Shekelle P, Morton, S., Maglione M, et al. Ephedra and Ephedrine for Weight Loss and Athletic Performance Enhancement: Clinical Efficacy and Side Effects. Evidence Report/Technology Assessment No. 76 (Prepared by Southern California Evidence-based Practice Center, RAND, under Contract No 290-97-0001, Task Order No. 9). AHRQ Publication No. 03-E022. Rockville, MD: Agency for Healthcare Research and Quality February 2003.

<sup>35</sup>All numbers are for 1999 only, which are the most recent measures to our best knowledge. "Dietary Supplements for Weight Loss: Limited Federal Oversight Has Focused More on Marketing than on Safety" (Testimony, 07/31/2002, GAO-02-985T) accessed at <http://fn.cfs.purdue.edu/fsq/WhatsNew/GAOSupplements02.pdf> on February 4, 2004, and "Evidence On The Safety And Effectiveness Of Ephedra: Implications For Regulation," accessed at <http://www.fda.gov/bbs/topics/NEWS/ephedra/whitepaper.html#four> on February 4, 2004.

information about general market conditions like quality distributions. There are two ways to accomplish this. First, some public or private agency could uncover the truth and disseminate it. Second, we could design institutions to ensure that the signals generated by the market reflect the truth. Current institutions are partially successful at accomplishing these goals. In the online sportscard market, eBay's reputation system appears to effectively identify reliable sellers while third party card grading is accepted by the market as a credible sign of quality and authenticity. In financial and diet pill markets, government agencies police fraudulent sellers and educate consumers to avoid empty claims. However, limitations in the institution design, such as reputation loopholes, prevent them from solving the information problem completely. Why the limitations exist and how to fix them certainly warrant future research.

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**Figure 1: Example of Ungraded and Graded Baseball Cards**

Ungraded – 1989 Upper Deck #1 Ken Griffey Jr. (Rookie)



Graded – 1985 Topps #401 Mark McGwire (Rookie)



Next four pages:

Figure 2-1: eBay example – completed auction record (seller *eddie27g*)

Figure 2-2: eBay feedback file at the time of auction (seller *eddie27g*)

Figure 2-3: eBay feedback file one month after the auction (seller *eddie27g*)

# Ken Griffey Jr 89' Upper Deck ROOKIE Card!!!!

Item # 1059488214

Sports:Trading Cards:Baseball-MLB:Rookies:1980-Now:Non-Graded



Currently **\$67.13**

Quantity **1**

Time left **Auction has ended.**

First bid **\$0.99**

# of bids **15 bid history**

Location **Sac-PLEASE CHECK OUT MY OTHER HOT AUCTIONS!!!**

Country/Region **USA/Sacramento**



Started Jan-06-02 13:41:51 PST

Ends Jan-13-02 13:41:51 PST

[mail this auction to a friend](#)

[request a gift alert](#)

(to seller)  
(to bidder)

Seller (Rating) **eddie27g (7)**

[view comments in seller's Feedback Profile](#) | [view seller's other auctions](#) | [ask seller a question](#) |

[Checkout summary](#)

If you are the seller or a high bidder - [now what?](#)

High bid **080875 (22) ★**

Payment **Money Order/Cashiers Checks. Personal Checks. Other. See item description for payment methods accepted**

Shipping **Buyer pays fixed shipping charges. Seller ships internationally (worldwide). See item description for shipping charges.**

Item Revised To review [revisions](#) made to this item by the seller, [click here](#) .

Seller Services [Checkout summary](#) | [Relist this item](#)  
[Make a Personal Offer](#)

Seller assumes all responsibility for listing this item. You should contact the seller to resolve any questions before bidding. Auction currency is U.S. dollars ( \$ ) unless otherwise noted.

## Description

This is it, a Ken Griffey Jr 89' Upper Deck ROOKIE Card #1. This auction consists of the card only, which has been checked and is in excellent condition with 4 perfect corners, perfect edges, perfect centering, and a completely unscratched surface. Satisfaction is Guaranteed! There is No Reserve on this Auction, so Bid High and Bid Often. I accept Cash, Check, and Money Order. Insured Shipping is \$1.00 & I will ship World-Wide! Good Luck and Congratulations to the Lucky Winner of this Pristine Card.

On Jan-09-02 at 14:26:07 PST, seller added the following information:

This Card is Absolutely Perfect!!! It is in GEM MINT Condition & Will Grade out VeRy HiGh; Probably a Pristine or Gem Mint "10"!!!! A Gem Mint 10 is Worth \$4,000.00!!! The Lucky Winner of this Perfect Card Will Be One Rich Man or Woman, So GOOD LUCK!!!!

00 105

Free **Honesty** Counters powered by Andale!

### Feedback Summary

7 **positives**. 7 are from unique users.

0 neutrals.

0 **negatives**. 0 are from unique users.

[See all feedback reviews](#) for eddie27g.


**eddie27g ( 7 )**

Member since: Monday, Sep 17, 2001 Location: United States

#### Summary of Most Recent Reviews

	Past 7 days	Past month	Past 6 mo.
Positive	0	7	0
Neutral	0	0	0
Negative	0	0	0
<b>Total</b>	<b>0</b>	<b>7</b>	<b>0</b>
Bid Retractions	0	0	0

[View eddie27g's Items for Sale](#) | [ID History](#) | [Feedback About Others](#)

### Feedback Reviews for eddie27g

[Feedback Help](#) | [FAQ](#)

[leave feedback](#)  
for eddie27g

If you are eddie27g :  
[Respond to comments](#)

eddie27g was the **Seller = S**  
eddie27g was the **Buyer = B**

**Left by**

**Date**

**Item#**

**S/B**

[pendragon80](#) ( 23 ★ )

Jan-04-02 16:31:16 PST

1494837147

S

**Praise** : FAST!! Item in excellent condition, very satisfied! Thanks!

[thismanwillmeltyou](#) ( 340 ★ )

Jan-03-02 15:57:16 PST

1307823670

S

**Praise** : Top Ebayer...recommend

[jewels14kk](#) ( 150 ★ )

Dec-29-01 16:49:15 PST

1307820632

S

**Praise** : Great seller, Great item! Great effort, Thank YOU!

[thow97@aol.com](#) ( 74 ★ )

Dec-29-01 14:41:22 PST

1307816195

S

**Praise** : Great ebay seller. Game got here 1 day before Xmas THANKS A+++++

[spiderman216](#) ( 24 ★ )

Dec-28-01 06:01:58 PST

1494834716

S

**Praise** : Good product, received in 12 days! Recommended seller.

[goddenk](#) ( 15 ★ )

Dec-27-01 23:50:09 PST

1307816988

S

**Praise** : Bid on, paid, and received all in 12 days! Happy son! Thanks.

[1vegasbabyvegas](#) ( 65 ★ )

Dec-16-01 23:45:44 PST

1307812615

S

**Praise** : item works great, great seller fastest trasaction A+++++

**Left by**

**Date**

**Item#**

**S/B**

Feedback 1 - 7 of 7

How many feedback comments do you want on each page?

25  50  100  200

View feedback

This feedback is ordered most-recent first. Each comment is attributed to its author who takes full responsibility for the comment. If you have any questions or concerns about a particular comment, please contact the author by clicking on the author's [User ID](#).





Search tips
 Search titles and descriptions

Feedback Summary

Not a Registered User

9 positives. 9 are from unique users.

0 neutrals.

24 negatives. 11 are from unique users.

See all feedback reviews for eddie27g.

ebay ID card eddie27g (-2)
Member since: Monday, Sep 17, 2001 Location: United States
Summary of Most Recent Reviews
Table with 4 columns: Review Type, Past 7 days, Past month, Past 6 mo.

View eddie27g's Items for Sale | ID History | Feedback About Others

Feedback Reviews for eddie27g

Feedback Help | FAQ

leave feedback for eddie27g

If you are eddie27g : Respond to comments

eddie27g was the Seller = S
eddie27g was the Buyer = B

Table with 5 columns: Left by, Date, Item#, S/B, and Complaint/Feedback text. Contains multiple rows of user feedback and transaction details.

<b>Complaint</b> : I tried to contact 3 Xs, Seller did not make attempt to respond... <a href="#">ackccrance</a> ( 1523 ★ )	Feb-04-02 04:28:28 PST	1059513420	S
<b>Complaint</b> : Emailed 4 times-never responded-never got card!!! All of this for .25 cents???? <a href="#">cswionte</a> ( 1456 ★ )	Feb-03-02 17:30:07 PST	1059478537	S
<b>Praise</b> : Smooth transaction--thanks! <a href="#">jacob2162001</a> ( 26 ★ )	Feb-03-02 17:18:32 PST	1063994894	S
<b>Complaint</b> : Emailed several times no response, never got card <a href="#">heywood13</a> ( 1 )	Feb-02-02 17:45:45 PST	1059469673	S
<b>Complaint</b> : Never cashed check, never responded to e-mails. Cost \$30 to stop check payment. <a href="#">wjones10@aol.com</a> ( 100 ★ )	Jan-28-02 19:13:52 PST	1063989693	S
<b>Complaint</b> : would not respond to emails (tried 5 times) <a href="#">wjones10@aol.com</a> ( 100 ★ )	Jan-28-02 19:12:37 PST	1062955011	S
<b>Complaint</b> : would not respond to emails (tried 5 times) <a href="#">wjones10@aol.com</a> ( 100 ★ )	Jan-28-02 19:11:41 PST	1063988507	S
<b>Complaint</b> : would not respond to emaild (tried 5 times) <a href="#">wjones10@aol.com</a> ( 100 ★ )	Jan-28-02 19:10:35 PST	1063986393	S
<b>Complaint</b> : would not respond to email (tried 5 times) <a href="#">wjones10@aol.com</a> ( 100 ★ )	Jan-28-02 19:09:19 PST	1063986005	S
<b>Complaint</b> : would not respond to email (tried 5 times) <a href="#">wjones10@aol.com</a> ( 100 ★ )	Jan-28-02 19:07:53 PST	1063985535	S
<b>Complaint</b> : would not respond to email (after 5 times) <a href="#">wjones10@aol.com</a> ( 100 ★ )	Jan-28-02 19:06:51 PST	1063984759	S
<b>Complaint</b> : would not respond to email(after 5 tries)			
<b>Left by</b>	<b>Date</b>	<b>Item#</b>	<b>S/B</b>

[ 1 ] 2 (next page)

Feedback 1 - 25 of 33

How many feedback comments do you want on each page?

25  50  100  200

[View feedback](#)

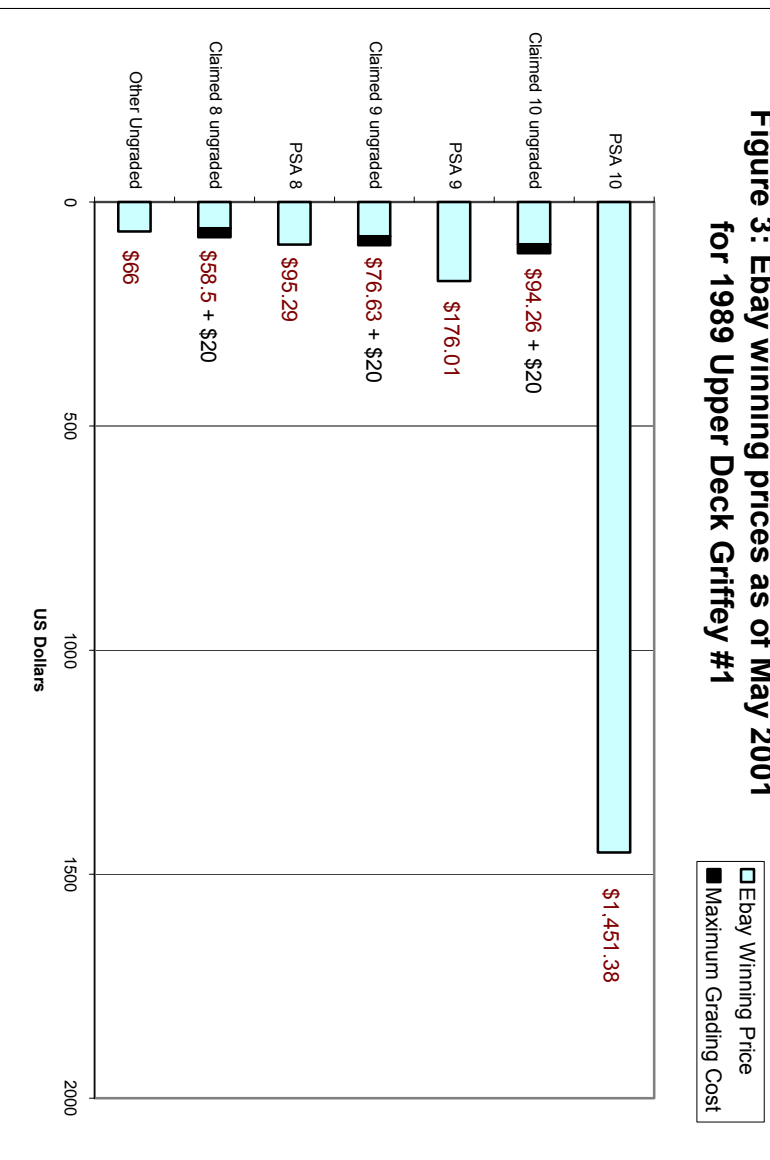
This feedback is ordered most-recent first. Each comment is attributed to its author who takes full responsibility for the comment. If you have any questions or concerns about a particular comment, please contact the author by clicking on the author's [User ID](#).

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**Figure 3: Ebay winning prices as of May 2001  
for 1989 Upper Deck Griffey #1**



**Figure 4:**

$$WTP = \text{Prob}(\text{sale}) * (\text{Price}|\text{Sale})$$

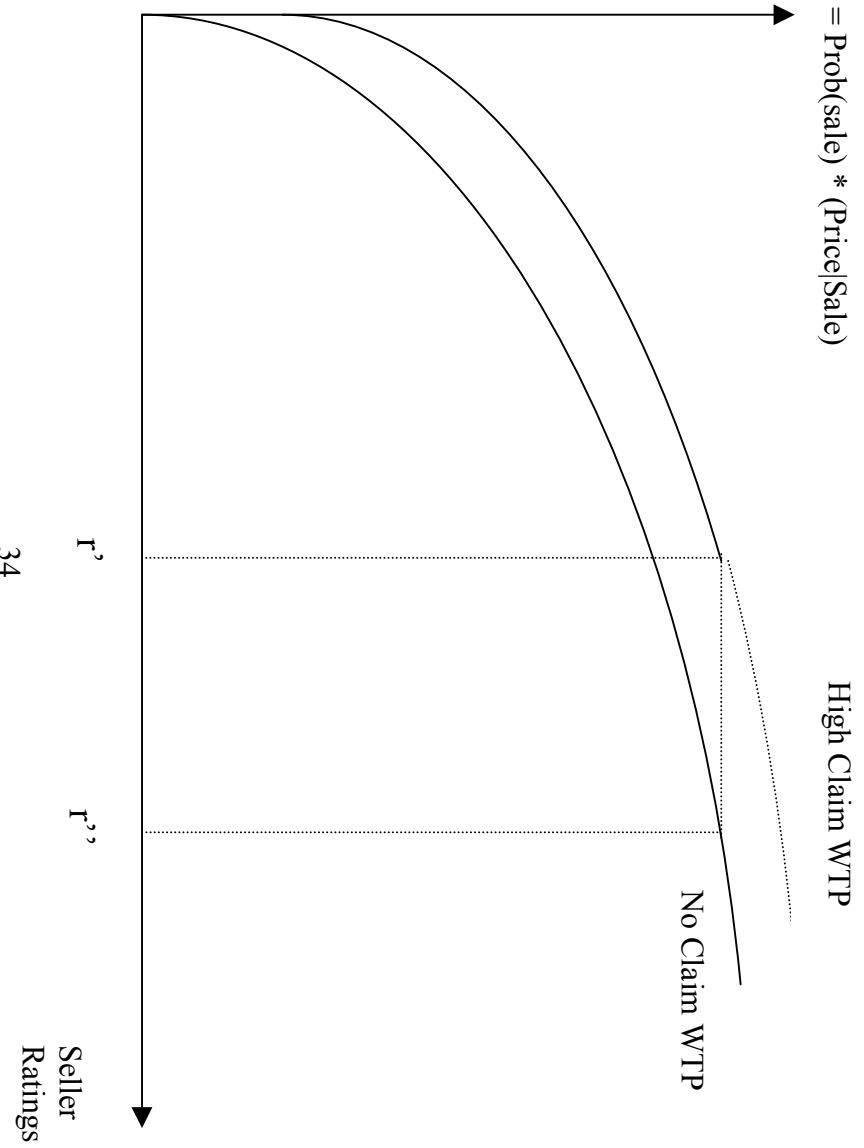


Table 1 : Summary of eBay watch data

Variable	Full Sample					Completed Transactions	
	OBS	Mean	Std Dev	Min	Max	OBS	Mean
Final Price	1124	179	510	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	7.3	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 cards (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	1.8	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	0	46	730	1.51
Missing negative ratings	1124	0.05	0.22	0	1	776	0.06

Note: Some variables have missing values for some observations, either because the variables are not applicable (e.g. seller claims only apply to ungraded cards), or because they are missing in the listing page (e.g. not all ungraded card sellers made quality claims).

Table 2: eBay watch data - summary of auction completeness and winning prices

		Full Sample			Completed Transactions		
		OBS	Auction completed?	Net seller rating	OBS	Winning price (\$)	Winner's net buyer rating
Graded	Near Mint or below (<8)	88	72.73%	382.63	64	51.02	207.19
	Near Mint-Mint (8 or 8.5)	290	83.79%	706.89	243	75.47	266.45
	Mint (9 or 9.5)	237	82.70%	739.24	196	166.03	200.20
	Gem Mint (10)	137	78.10%	874.79	107	690.23	166.64
	Total	752	81.25%	709.73	610	209.84	221.70
				(1088.63)	(362.16)	(366.77)	
Ungraded	No Claim	171	83.63%	757.05	143	54.16	135.69
	Claimed Near Mint (7 or 7.5)	24	75.00%	1271.67	18	46.47	152.44
	Claimed Near Mint - Mint (8 or 8.5)	29	82.76%	2444.07	24	49.14	243.43
	Claimed Mint (9 or 9.5)	105	78.10%	290.07	82	70.01	137.58
	Claimed Gem Mint (10)	43	83.72%	320.81	36	90.60	81.45
	Total	372	81.45%	739.53	303	61.93	140.03
				(1980.40)	(26.53)	(272.70)	

Note: standard deviation in parentheses.

Table 3: Regression results of eBay watch data

Dep. Var.	=1 if complete the auction Probit (coefficients)		ln (winning price / low book price) Heckman 2-step (coefficients)
=1 if Graded	2.286 (1.261) *	0.285 (0.428) *	1.774 (0.456) ***
=1 if Ungraded with no self grade	2.417 (1.205) **	0.430 (0.280) *	1.821 (0.439) ***
Seller self grade * ungraded	0.248 (0.137) *		0.216 (0.049) ***
=1 if self grade 9 * ungraded		0.089 (0.306) *	0.234 (0.107) **
=1 if self grade 10 * ungraded		0.806 (0.385) **	0.539 (0.126) ***
ln(seller ratings+1) * graded	0.084 (0.049) *	0.088 (0.049) *	-0.017 (0.017) -
=1 if any negative ratings * graded	0.099 (0.158) ***	0.101 (0.159) ***	-0.008 (0.052) -
ln(seller ratings+1) * ungraded	0.178 (0.058) ***	0.177 (0.058) ***	-0.020 (0.018) -
=1 if any negative ratings * ungraded	-0.649 (0.226) ***	-0.692 (0.223) ***	-0.112 (0.072) -
=1 if scanned picture is clear	0.307 (0.140) **	0.320 (0.139) **	0.022 (0.052) 0.023
=1 if scanned picture is unclear	0.757 (0.235) ***	0.770 (0.236) ***	-0.051 (0.074) -
=1 if the seller claims to be a card dealer	-0.146 (0.170) -	-0.168 (0.169) -	-0.024 (0.054) -
Obs	1124	1124	778
R-Square	0.461	0.463	N.A.

Notes: All regressions control for a full set of card identity dummies, payment methods, shipping options, length of auction, whether the auction ended on a weekend, whether the auction ended in primetime, where there was a public or secret reserve price and whether there was a Buy It Now option. The number of observations in the price regression is less than the total number of completed auctions, because Beckett Baseball Monthly does not report book prices for some cards graded below 8 (due to low trading volume). Fluctuation of card value is controlled by Beckett low book price (by card-month). Standard errors in parentheses. \*\*\*p<0.01, \*\* p<0.05, \*p<0.1, two-tail.

Table 4: Experimental Results Summary I - Price and Quality

	Online				Retail	Online vs. Retail		
	Best Ranked	Median Ranked	Best vs. Median Ranked (pairwise comparison)	Online Overall				
N	53	47		100	126			
N of defaults	4	0		4	0			
N of counterfeits	5	2		7	4			
Total of defaults and counterfeits	9	2		11	4			
<b>Full sample</b>								
=1 if default or counterfeit	0.17 (0.05)	0.04 (0.03)	0.12 (0.06)	**	0.11 (0.03)	0.03 (0.02)	0.08 (0.04)	**
Card Quality <sup>1</sup>	6.06 (0.40)	7.05 (0.24)	-0.90 (0.49)	**	6.53 (0.24)	7.35 (0.14)	-0.82 (0.28)	***
Seller claim of card quality <sup>2</sup>	9.21 (0.09)	8.39 (0.13)	0.99 (0.16)	***	8.87 (0.09)	N.A.		
Seller claim -True card quality <sup>2</sup>	3.17 (0.44)	1.42 (0.32)	1.71 (0.62)	***		N.A.		
Final winning price we paid (\$)	73.49 (7.16)	47.65 (2.27)	24.50 (8.35)	***	61.34 (4.13)	62.19 (1.30)	-0.85 (4.33)	
Card Value <sup>3</sup>	34.62 (6.59)	36.65 (3.07)	0.09 (8.26)		35.57 (3.99)	40.69 (1.75)	-5.12 (4.35)	
<b>Authentic Deliveries Only</b>								
Card Quality	7.30 (0.14)	7.37 (0.11)	0.03 (0.21)		7.33 (0.09)	7.59 (0.07)	-0.26 (0.11)	**
Seller claim of card quality <sup>2</sup>	9.12 (0.10)	8.41 (0.13)	0.88 (0.18)	***		N.A.		
Seller claim -True card quality <sup>2</sup>	1.81 (0.18)	1.04 (0.18)	0.84 (0.32)	**		N.A.		
Final winning price we paid (\$)	73.18 (8.49)	47.96 (2.35)	25.17 (10.49)	**	60.43 (4.54)	61.95 (1.32)	-1.52 (4.73)	
Card Value <sup>3</sup>	41.70 (7.51)	38.28 (2.98)	7.62 (9.70)		39.97 (3.99)	42.02 (1.64)	-2.05 (4.31)	

Note: Standard errors in parentheses. \*\*\*p<0.01, \*\* p<0.05, \* p<0.1, two-tail. The number of best-ranked cards is slightly bigger than the number of median-ranked cards because several best-ranked cards are sold in a package of multiple copies (of same card same claim). Pairwise comparison between best- and median-ranked groups is conducted within card-week. (1) Defaults and counterfeits are coded as zero quality. (2) The online comparison of seller claims is conditional on cards that have any seller claims. It does not change any conclusion if we impute no claim as claiming 8. Retail dealers rarely make any quality claims for ungraded cards. (3) Card value is calculated based on Beckett low book prices.

Table 5.1: Experimental Results -- Summary of Online Seller Reputation

Sample: Online purchases only

		N	ln (seller net ratings +1)	Significant Difference?
Best ranked?	Yes	53	5.42 (0.23)	
	No	47	4.92 (0.30)	
Have any self grade?	Yes	89	5.05 (0.22)	
	No	11	5.99 (0.62)	
Self grade 9 or 10?	Yes	66	4.72 (0.23)	**
	No	34	6.00 (0.30)	
Self grade 10?	Yes	18	3.63 (0.43)	***
	No	82	0.49 (0.20)	
Default or counterfeit?	Yes	11	3.83 (0.66)	**
	No	89	5.32 (0.19)	

Note: Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, two-tail.

Table 5.2: Experimental Results -- Regression on Online Purchases

Dep. Var.	Default or Counterfeit? Probit (coefficients)		Card Quality OLS (coefficients)				ln (winning prices/book low) OLS (coefficients)	
Sample	All Online Purchases		All Online Purchases		Authentic Deliveries Only		All Online Purchases	
Seller self grade	0.303 (0.308)		-0.542 (0.484)		-0.020 (0.137)		0.276 *** (0.069)	
=1 if seller self grade 9 or 10		-0.080 (0.468)		0.345 (0.727)		0.366 (0.248)		0.355 *** (0.126)
=1 if miss self grade	dropped	dropped	-2.647 (3.893)	2.022 * (1.094)	0.113 (1.215)	0.415 (0.462)	2.400 *** (0.614)	0.239 * (0.123)
ln(seller net rating +1)	-0.224 (0.142)	-0.272 ** (0.134)	0.415 ** (0.199)	0.505 ** (0.212)	-0.020 (0.055)	0.000 (0.061)	0.020 (0.029)	-0.001 (0.031)
=1 if has any negative feedback	0.589 (0.443)	0.553 (0.444)	-0.130 (0.781)	-0.377 (0.711)	0.014 (0.294)	-0.095 (0.336)	0.103 (0.111)	0.143 (0.130)
OBS	100	100	100	100	89	89	100	100
R2	0.1182	0.0965	0.728	0.7152	0.6444	0.66	0.7476	0.6827

Note: Standard errors in parentheses. \*\*\* p<0.01, \*\*p<0.05, \*p<0.1, two-tail. In addition to a full set of card type dummies, the Probit specification includes cluster of card-week. Quality and price regressions include a full set of card-week dummies. All defaults and counterfeits have seller self grades, so the missing dummy for seller self grade drops out of the Probit equation.