A Comparison of Reputation, Certification, Warranties, and Disclosure as Remedies for Information Asymmetries: Lessons from the On-line Comic Book Market

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Abstract

Signaling strategies which sellers of high quality securities, goods, or services employ to differentiate their securities or products from those of lower quality include: (1) developing a reputation for high quality, (2) certification by a respected third party (e.g., underwriters, bond rating agencies, and auditors, for securities, and testing laboratories for goods), (3) warranties (for goods), and (4) information disclosure (such as financial statements for securities and specifications and test results for goods). These signaling strategies are compared using data from the online comic book auction market. This market has a number of important advantages: (1) the information asymmetry is substantial, (2) good measures of reputation are available, and (3) there are many sellers employing different combinations of the four strategies.

Of the four strategies, we find certification by a respected third party sends the strongest signal. On average certified comics sell for over 50% more than otherwise equivalent uncertified comics. Moreover it appears that part of this price premium is due to risk reduction, i.e., not all is due to differences in the expected quality of certified and uncertified books. We find that both how positive or negative the seller's reputation is and how well established that reputation is significantly impact the price though reputation is less important than certification. We find no evidence that warranties in the form of money-back guarantees impact the price. Apparently buyers reason that seller's of truly high quality books should seek certification so discount the presence of both warranties and positive reputations. Virtually all sellers disclose information in the form of scans and failure to do so lowers the price a modest amount. Since for a single sale, the seller's reputation is exogenous while the other three strategies are endogenous, we explore how the seller's strategy choices depend on their reputation.

A Comparison of Reputation, Certification, Warranties, and Disclosure as Remedies for Information Asymmetries: Lessons from the On-line Comic Book Market

I. Introduction

This paper empirically compares four signaling strategies which sellers of high quality goods, services, or securities often employ in an attempt to differentiate their products from those of lower quality. Since the publication of Akerlof's seminal lemons paper, economists have identified and analyzed a number of strategies which sellers of high quality goods or services or issuers of high quality securities might utilize to distinguish their products from those of lower quality. One analyzed by Klein and Leffler (1981), Shapiro (1982, 1983) and Diamond (1989), among others, is to invest resources in developing a reputation for high quality products. A second possible strategy (Grossman, 1981, Gal-Or, 1989, and Weiner, 1985) is to offer a warranty or "money-back" guarantee. Third, high quality sellers or issuers sometimes seek certification by a respected third party, Carter and Manaster (1990), Anderson, et al (1999). Examples of such certifying third parties would include bond rating agencies, such as Moodys and Standard and Poors, securities underwriters, testing organizations, such as Underwriters Laboratory, and professional licencing bodies. Fourth, the seller or issuer may provide information to the prospective purchaser, e.g., advertising, financial statements, specifications and test results. Some signals, such as audited financial statements, combine two of more strategies.

While each of these strategies has been the subject of considerable theoretical attention, empirical studies have been much more limited. Moreover, to our knowledge, no one has conducted a comparison of the different strategies either theoretically or empirically. For instance, when a paper analyzes the choice of whether or not to offer a warranty, the alternative is invariably to do nothing rather than to seek certification or provide information. Likewise, to our knowledge, no one has asked how the decision to offer a warranty or seek certification depends on whether or not the seller has an established reputation. Yet obviously the availability of alternatives is important.

Suppose high quality sellers can choose between two equally costly alternative strategies A and B to distinguish their products from those of lower quality. Suppose it is impossible for low quality sellers to mimic A and unlikely but possible for them to mimic B. Although B might lead to a separating equilibrium in the absence of A, in the presence of A, rational buyers would tend to conclude that a truly high quality seller would choose A so that those who choose B are likely of lower quality. Consequently, we would expect the most effective signaling strategy to eviscerate the less effective.

In this paper we compare these four information asymmetry remedies using data from eBay's comic book auction market. For a number of reasons, the on-line market for classic comic book provides an almost ideal experiment for this comparison. First, the information asymmetry is serious and important. Time and kids have not always been kind to comic books so quality differs greatly and the quality/price differentials are substantial. Traditional dealer pricing conventions price comic books graded "Good" at roughly 10% of the price of a "Near Mint" comic book. Between more extreme grades, the price differentials are even greater and our data indicate these traditional guidelines understate current price differentials. Obviously, since the online buyer cannot handle and examine the book, the information asymmetry is considerable. Second, in this market, there are a large number of sellers employing a variety of informational strategies. For instance, in our data set there are 1398 unique sellers and each of the four strategies: reputation building, third party certification, warranties in the form of money back guarantees, and information disclosures in the form of scanned images, is employed by a substantial number. Third, reliable data is readily available. Empirical research on reputation as a remedy for the seller-buyer information asymmetry has been hampered by the lack of good measures for reputation. Researchers have had to rely on such proxies as advertising expenditures (Sappington and Wernerfelt, 1985), market share (Megginson and Weiss, 1991) and position in tombstone ads (Carter and Manaster, 1990). However, eBay invites all buyers and sellers in its auctions to rate their satisfaction with the other

party and then posts the results. These feedback ratings, which are often cited as a major factor in eBay's success, give us a much better measure of reputation than those available heretofore.

Our findings include the following. Certification: Third party certification of a comics quality by Comic Guaranty LLC results in a clear separating equilibrium. On average, certified copies sell for roughly fifty percent more than uncertified comics of the same claimed quality and the percentage differential is higher at the higher grades. Certified books command more of a premium if the seller's reputation is ill defined or poor but certification results in a higher price regardless of the sellers reputation. It appears that not all of the price differential is due to an expected quality difference between certified and uncertified comics suggesting that part is due to a risk reduction effect. Reputation: Reputation is also important. Books from sellers with a positive reputation sell for more than books from sellers with a relatively poor reputation. Also, books from sellers with established reputations tend to sell for more than those from seller's with non-existent or fledgling reputations. There is also evidence that on-line sellers strive to develop positive reputations since instances of negative feedbacks from previous customers are relatively rare - less than 1% of total feedbacks. However, the price differentials between sellers with well-established positive reputations and those with negative or undeveloped reputations are much less than those between certified and uncertified comic books. There is no evidence that reputation is a good substitute for certification and no evidence that sellers view it as such. Warranties: Our evidence indicates that warranties in the form of money back guarantees do not result in a separating equilibrium, i.e., there is no evidence that books with warranties attached sell for more than books without warranties. Apparently, buyers either view these warranties as too costly to enforce or they reason that sellers of truly high quality comics would seek certification so discount warranties. There is no evidence that seller's view warranties as substitutes for a good reputations but there is evidence that they view certification and warranties as alternative strategies. Information Disclosure: Our evidence indicates that voluntary disclosure in the form of scans leads to a partial but relatively ineffective separation of high and low quality comic books. The fact that scans are

provided for over 96.5% of the comics in our data set suggests that many sellers of lower quality books find it relatively easy to mimic this strategy of the higher quality sellers. Failure to provide a scan reduces the price by a significant but fairly modest 12 to 17%.

Overall, our results indicate that alternatives are important - that strategies for ameliorating an information asymmetry should not be considered in isolation because the most effective strategies further weaken the less effective. In the absence of a reliable third-party certification procedure, reputation, warranties, and disclosure might well be more important. However, in this market, certified books command a substantial premium over uncertified. Hence, if a seller with a very positive reputation offers an uncertified book, rational buyers apparently still question why the seller failed to obtain a certification if the book was so good. Likewise, buyers apparently question why sellers of uncertified books failed to obtain certification even if they offer a warranty.

The remainder of the paper is organized as follows. In the next section, we describe the online comic book market. We briefly review existing research on other online auction markets - most of which focuses on impact of the auction design, not the information asymmetry question. In section III, we describe our data set and our measures of the four signaling strategies: reputation, certification, warranties and information disclosure. In section IV, we test how the prices of comic books in this auction market depend the various signals sent by the seller. In section V, we explore what determines the seller's choice of signaling strategies. Note that in this regard reputation is a long-run strategy while the others are short-run strategies. In other words, at the time a given book is auctioned, the seller's reputation is exogenous but she can choose some combination of the certification, warranty, and information disclosure strategies. Section VI summarizes our findings for each signaling strategy and concludes the paper.

II. Collectible Comic Books and eBay Auctions.

II.1. The Market for Collectible Comic Books.

This paper examines the on-line auction market for collectible comic books from what is generally referred to as comics' "Silver Age," the period from 1956-1969 when such heros as Spider Man ruled supreme. This is the most active collectible comics market. For instance, on August 16, 2002, eBay had 16,558 auctions underway in Silver Age comics, versus 5087 for comics published before 1956 and 10,181 for comics published from 1970-1980. Obviously, time and kids have taken their toll on comics from this era so quality varies widely and is a major determinant of a comics price. The grading scheme which has evolved in the marketplace recognizes 25 different grades based on such characteristics as tears, creases, whiteness of the paper, gloss of the cover colors and condition of the spline. The major grades are: Poor, Fair, Good, Very Good, Fine, Very Fine, Near Mint, and Mint. Such intermediate grades as Fine+, Fine-, and Fine/Very Fine round out the 25 grades. Traditionally dealers price Good and Fine comic books at roughly 10% and 25% respectively of the price of a Near Mint Book.

In an Internet comic book auction (or mail order sale) the information asymmetry between the seller and buyer is obviously much greater than in a dealer's shop or at a comic book show since the buyer cannot personally inspect the book. Hence the seller and buyer must rely on some combination of reputation, warranties, scanned images and third party certification to resolve the quality uncertainty and avoid a lemons problem.

Arrangements in which the seller hires a trusted third party to certify the quality of its product or service are common in many markets. They are ubiquitous in financial markets where auditors, bond rating agencies (such as Moodys and Standard and Poors), and investment banks and underwriters all fill this role. Examples in product markets are Underwriters Laboratory and the ISO.[1] While such certification agents have been part of the collectible stamp and coin markets for years, there was no such agent in the comic book market until 1999 when Comics Guaranty LLC (hereafter CGC) entered the market. For a fee, which ranges from $20 to $55 for the majority of

comics in our data set, CGC will grade and certify a comic. To maintain the integrity of its certification, CGC encapsulates the certified comics in a plastic casing or holder." If the holder is opened, the certification is invalidated. Obviously, this limitation imposes an additional cost on the collector since she cannot open or read the comic without destroying the certification.

II.2. eBay auctions.

The growth of the Internet, and eBay in particular, have transformed the markets for collectibles including classic comic books. A spot check of the eBay auctions on March 3 2002, found 14,092 auctions in progress of Silver Age (1956-69) comic books. In comparison on the same day there were 2674 such auctions in progress on Amazon and 599 on Yahoo. In setting up an Ebay auction, the seller sets four parameters: (1) the length of the auction (3, 5, 7 or 10 days), (2) the minimum acceptable bid, (3) the means of payment (money order, credit card, personal check), and (4) shipping charges if any. The seller can also decide to include scans of the comic book, to offer a money back guarantee, and/or to set a secret reserve price (for a fee)

eBay's auctions are variations of Vickery's second price sealed bid auction in that the winner in an eBay auction pays the second highest bid plus a set increment. While bidders tell the eBay computer the maximum they are willing to pay, the computer enters the minimum bid necessary to lead the bidding. For example, suppose a seller posts a item with a minimum acceptable bid of $100. Suppose the first bidder, A, tells eBay that she is willing to pay up $110. The eBay computer posts A as the highest bidder at $100.00. If bidder B enters the bidding with a maximum bid of $125, she becomes the high bidder at $112.50 - A's maximum bid plus the preset $2.50 increment. If B had instead set a maximum bid of $105, A would have remained the high bidder at $107.50 - B's limit plus $2.50. Hence the winner pays the maximum set by the second highest bidder plus a small increment. Note that given this pricing scheme, minimum bids and reserve prices essentially introduce an additional bidder into the process.

eBay auctions have been the subject of considerable economic research in recent years (for an excellent review see Hortacsu, 2002). Most of this research has focused on questions of auction design: the ascending auction second price structure, minimum bids, secret reserve prices, and auction length. Researchers have also explored the late bidding strategy (most bids are submitted in the final minutes) (e.g., Roth and Ockenfels, 2002) and whether the auctions exhibit winner's curse (according to Bajari and Hortascu, 2000, they do).

Most relevant for the present paper are those papers examining the role played by eBay's feedback mechanism, which has been credited with being a big reason for eBay's success. As noted above, lack of a good measure of reputation has hampered past efforts to empirically test its efficacy as a signal of quality. eBay's feedback ratings provide such a measure. After each auction, eBay invites the buyer and seller to express their satisfaction with the other party's performance by assigning a positive, neutral, or negative rating . They can also make comments. The number of net positive (positive minus negative) responses is displayed on the main page and by clicking on the seller's ID, prospective buyers can see detailed statistics and individual comments. A number of papers have examined how reputation, as reflected in these feedback ratings, impacts prices including: McDonald and Slawson (2000) (Barbie Dolls), Houser and Wooders (2001) (microprocessors), Lucking-Reiley, et al (2000) (coins), and Melnik and Alm (2000) (coins). All find that sellers with better reputations receive higher prices.

As noted by Hortascu (2002), a surprising aspect of these studies is not so much that reputation matters but that, in light of the serious information asymmetry, it doesn't matter more. For instance, Houser and Wooders estimate that a 10% increase in the number of positive responses raises the sale price only 0.17% while a 10% increase in negative responses lowers the price -0.24%. Lucking-Reiley et al estimate that a 10% increase in positive (negative) responses raises (lowers) the price .3% (-1.1%). Noting that the vast majority of sellers have very positive feedback ratings, Hortascu concludes that the feedback ratings provide a strong incentive to sellers to provide good service leading to a situation in which almost all traders have very good reputations. Of course an

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alternative possibility is that the buyers don't fully trust the ratings. For instance, McDonald and Slawson note that buyers may be reluctant to give a seller a negative rating for fear that the seller will respond with a negative rating of the buyer thereby making other sellers reluctant to do business with the buyer.[2]

To our knowledge, reputation is the only information asymmetry remedy which has been examined in online markets. No one has explored certification, warranties, and information disclosures as alternatives. In this regard, it should be noted that reputation is a long-run strategy while the others are short-run. At the time a seller lists an item for sale on eBay, they cannot change their reputation but can decide to seek certification, offer a warranty, and/or provide information. Note also that the efficacy of reputation as a signal may depend on whether better strategies are available. If for instance seller's of high quality comics almost always seek certification, buyers would be rational to question why the seller of an uncertified book did not even is her reputation is stellar.

III. Data, Signaling Measures, and Estimation Procedures.

III.1. Data

For this study we collected data on auctions over the January 12 , 2001 - June 23, 2001 period (using auction ending dates) of the 30 Silver Age comic books listed in Table 1 - a total of 4012 auctions.[3] Because the extent and quality of any restoration work can differ tremendously and are hard to quantify, we dropped from the data set, 201 comics which were identified as having been restored. We also dropped 147 sold through eBay's "Buy-it-now" option leaving a sample of 3664 observations. Characteristics of the 30 comic books as well as the entire sample are reported in Table 1. The mean price is $357 but with a standard deviation of $1439 there is great variation. The median grade is Fine- and 61.2% of the auctions result in a sale.

III.2. The Price Measure and Estimation Procedure.

Our first objective is to test how the price of a classic comic in an on-line auction depends on the actions taken by the seller to resolve the information asymmetry controlling for the other factors that impact the price. This is complicated by the fact that some auctions do not result in a sale either because no one was willing to bid above the minimum bid (which is observed) or because the highest bid was below a secret reserve price. Virtually all econometric studies of eBay auctions follow basically the same procedure when relating the auction price to various characteristics of the item, seller, and auction setup. The dependent variable is generally measured as the price (or its log), if the auction results in a sale, and as the highest bid, if the auction does not result in a sale because the highest bid was below an unobserved secret reserve price. A Tobit procedure is then generally employed to control for the fact that in some auctions, no bids are received because noone is willing to bid above the (observed) minimum bid set by the seller. While using the highest bid in those cases when there is no sale because of a higher secret reserve price provides a measure of the value the market places on these items, it may introduce a slight bias. As described above, in the absence of a secret reserve, the winner pays a price equal to the maximum set by the *second* highest bidder plus the minimum increment. In cases where there is no sale because of a secret reserve, the recorded price or value is the maximum set by the highest bidder, not the second highest, so may be biased upward.[4] We follow the approach employed by the other studies of on-line markets in that our dependent variable, LN(PRICE), is equal to the log of the price received if the item is sold or the highest bid if it is not. However we also include a zero-one dummy to designate the presence of a secret reserve to account for the possible bias.

III.3. Information Asymmetry Variables.

Our main interest is how the price received in an auction depends on the information asymmetry and actions taken by the seller to ameliorate that asymmetry. As noted above we test four possible strategies or remedies: reputation, certification, warranties, and information disclosures.

Reputation. Reputation as measured by eBay's feedback ratings is a common variable in previous studies. While some use eBay's net measure, the most common procedure is to include the number (usually in log form) of positive and negative (or non-positive) responses as separate variables. This allows the impact of an additional negative response to differ from the impact of an additional positive response.

Our approach is slightly different. We hypothesize that two separable aspects of reputation could impact price: (1) whether the seller has a well-established, nascent, or non-existent reputation, and (2) (if it has a reputation) whether that reputation is good or bad. To measure whether the sellers' reputation is good or bad, we define PCTNEG = (# of negative responses) / (# of positive responses + # of negative responses + 1.0).[5] Obviously we expect price to be negatively related to PCTNEG. To measure how established or inchoate the seller's reputation is, we define FEEDBACKS= ln(# of total buyer feedbacks + 1.0). For a first time seller, FEEDBACKS = ln(1.0) = 0. If two sellers have equally positive reputations but one is an established seller with many customer feedbacks while the other is a seller with no or few feedbacks, we expect buyers to prefer the former. Consequently, we expect the price to be positively related to FEEDBACKS.

While eBay's feedback ratings are better than those available in most other markets, they are not perfect. As mentioned earlier, it has been argued that buyers may be reluctant to give seller's negative feedback ratings for fear the seller will respond in kind. The ratings also abstract from details that appear in the comments which prospective buyers can access.

Most bonds in our sample are offered by sellers with very positive and well established reputations. The mean and median values of FEEDBACKS in our sample are 4.818 and 5.209 respectively which translate into123 and 182 feedback ratings from previous customers. Nonetheless, there are 318 auctions in our sample by sellers with no feedback ratings. The mean of PCTNEG is only 0.502% and the seller has no negative feedbacks in 59.4% of our observations.

Certification. To identify those comics which have been certified, we define the variable CERT=1 if the comic has been certified by Comics Guaranty LLC and zero otherwise. As explored

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below, certification is a fairly costly process with fees ranging from $20 for a turnaround time of 25 to 30 business days for comics with an estimated value of $250 or less to $95.00 for one day service on books with an estimated value above $5000. The customer also faces the cost of shipping the comic to CGC and as mentioned above the certification is lost once the plastic holder is opened. In our sample, 27.9% of the comics are certified. As one would expect given this cost structure and is explored more fully below, certification is more common for more valuable comics. For instance, among comics rated Very Fine or higher, 53 % are certified while only 4% of those rated Good or lower are certified.

Warranties.   The variable WARRANTY = 1 if the seller promises to refund the seller's purchase price in full if the buyer is dissatisfied and 0 otherwise.[6] A positive coefficient is predicted. Overall, 14.2% of the comics in our sample carry such a warranty. In virtually all cases, the buyer would still be out the cost of returning the comic to the seller. In markets such as consumer durables, an issue with many warranties is the cost of enforcement - particularly since sellers often include a list of circumstances in which the warranty is void, such as abuse or normal wear and tear. While the money-back guarantees in the comic book market don't normally include such qualifications, the comic book buyer may well wonder what her recourse is if the seller does not follow through and refund her money. The cost of enforcing the warranty could be considerable.

Information Disclosure. It is common for sellers of goods, services, and securities to provide the prospective buyer with information in the form of advertising, specifications, and financial statements. In the online comic book market this information disclosure takes the form of a claimed grade (which all the comics in our sample have) and scanned images. The scans almost always show the front and back covers and sometimes inside details. In the online comic book market, scans are the rule, not the exception with 96.5% providing scans. Hence we define the variable NOSCAN=1 if the seller fails to provide a scan and 0 otherwise. A negative coefficient is expected. A problem with scans is that while they give the buyer an indication of the book's condition, they do

not provide a complete picture. In particular, they usually fail to reveal the presence of restorative work which lowers the book's value.

III.4. Control Variables

We also include a number of control variables. First among these is the comic's claimed grade. There are 23 separate grades in our data set ranging from Poor to Near Mint/Mint. Since the relation between price and grade may not be linear, we assign zero/one dummy variables, GRADEi, for all grades i except Poor which is the left-out category. Obviously, we expect positive coefficients and further expect them to increase monotonically with the grade. The distribution of the grades is shown in Figure 1 where we report certified and non-certified grades separately. Several points stand out from this graph. One, there is a wide grade dispersion though there are relatively few books in the very low and very high grades. Two, certified books are considerably more common in the higher grades. Three, there is a tendency for non-certified books to be bunched in the more basic categories, such as Good, Very Good, and Fine, rather than in the finer categorizations such as Good+, Very Good-, or Good/Very Good. This may indicate that non-professional graders have difficulty making the finer quality distinctions.

As noted above, our data set encompasses 30 different comic books. As reported in Table 1, because of collector interest and scarcity, their mean prices differ widely. Accordingly, we use 29 different zero-one dummy variables, BOOK$_i$, to identify the different comics. The comic "X-Men 16" is the left-out comic. Comics which tend to have higher or lower values than X-Men 16 should have positive and negative coefficients respectively but we do not hypothesize which comics these should be.

As noted above, most previous studies of online markets have explored how auction design impacts price. While that is not our focus here, we do want to control for these possible price determinants. Sellers can decide on 3, 5, 7, or 10 day auctions. While bidding is normally highly concentrated in the last few hours, it is possible that longer auctions attract more bidders resulting in

a higher price. Several studies, such as Houser and Wooders (2001) and Lucking-Reiley, et al (2000), have found that longer auctions are associated with higher prices though the relation is often not significant. We define zero-one dummies, D5, D7, and D10 for 5, 7, and 10 day auctions respectively with three day auctions as the left-out group.

Finally, we include a dummy RESERVE to designate those auctions where the seller sets a secret reserve price - 29.8% of our sample. Lucking-Reiley et al (2000) have found significant positive coefficients for this variable. As explained above, this does not necessarily mean that including a reserve raises the price since when an item does not sell due to a high reserve, the dependent variable is the highest bid, not the second highest.

III.5 Procedures

The log of the price or highest bid is regressed on the variables just described controlling for the truncated nature of the data:

$$
\begin{aligned}
LN(PRICE)_i = {} & \beta_0 + \beta_1 CERT_i + \beta_2 FEEDBACKS_i + \beta_3 NEGPCT_i + \beta_4 NOSCAN_i \\
& + \beta_5 WARRANTY_i + \sum_{i=1}^{22} \alpha_j GRADE_{ji} + \sum_{l=1}^{29} \gamma_l BOOK_{li} + \theta_1 D5_i + \theta_2 D7_i \quad \textbf{(1)} \\
& + \theta_3 D10_i + {} + \eta RESERVE_i + e_i
\end{aligned}
$$

In 758 or 20.7% of our 3664 observations no bids were received so the data is left truncated at the minimum bid set by the seller. To obtain consistent parameter estimates in light of this truncation, we utilize both a Tobit estimation procedure and Heckman's least squares procedure. For the former we use the minimum bid as the left-truncation level. For the Heckman estimation, we first estimate the likelihood of receiving bids as a function of the minimum bid and the comic characteristics described above (results available on request) then form the inverse Mill's ratio, $n(p>mb)/N(p>mb)$, where $n()$ and $N()$ are the normal density and distribution functions respectively, p is the price or value of the comic and mb is the minimum bid. This variable is then included as an additional variable in an OLS regression over the 2906 observations when bids were received.

IV.1 Basic Results.

Results of the estimation of equation 1 are reported in Table 2. As shown there, our specification explains almost 95% of the variation in the price across the various auctions. With the exception of the dummy for warranties, all information variables have the predicted signs and are significant at the .01 level.

Certification. Clearly, certified comics sell for considerably more than otherwise identical non-certified comics. The coefficient of the CERT variable is .465 in the Tobit estimation and .460 in the Heckman estimation implying that comics books with grades certified by Comics Guaranty LLC tend to sell for about 58% to 59% more than similarly graded non-certified comics.[7] Clearly third-party certification provides a signal which buyers take very seriously. As we shall see shortly, the estimated impact of certification on the price exceeds that of the other signaling variables.

Reputation. Both reputation variables are significant at the .01 level indicating that both how well-established a seller's reputation is and whether that reputation is good or bad matter to customers. According to our Tobit (Heckman) regression estimates, the price received by a seller with one hundred positive or neutral feedbacks and no negative feedbacks tends to be about 7.6% (6.3%) higher than that received by a seller of the same book with no feedback ratings.

As noted above, in 59.4% of our auctions, the seller has no negative feedbacks from previous customers. In 5.5%, the percentage of negative feedbacks exceeds 2.5%. Our Tobit estimates imply that the prices obtained by sellers with 2.5% negative ratings are about 3.0% lower than those obtained by sellers with no negative ratings. According to the Heckman estimates, the price difference is about 2.6%.

While significant, the impact of reputation on the price is considerably less than that of certification. As noted above, certified books command prices more than 55% higher than similar non-certified books. Based on the estimated coefficients of FEEDBACKS and NEGPCT and their minimum and maximum values in our sample of 3664, there are no observation pairs where either

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of these variables would imply differences this large.[8] A one standard deviation change in FEEDBACKS translates into 3.4% change in the price according to the Tobit estimates and 2.9% according to the Heckman estimates. A one standard deviation change in NEGPCT translates into a 2.0% change in the price according to the Tobit estimates and 1.7% according to the Heckman estimates. By comparison the corresponding figures are 23.7% (Tobit) and 23.2% (Heckman) for CERT.

In summary, both the how well established a seller's reputation is and whether that reputation is good or bad clearly matter. A seller with many feedback ratings from previous customers tends to receive a higher price than a seller with few feedback ratings. Likewise a seller with a high percentage of negative feedbacks tends to receive a significantly lower price than a seller with none. Clearly buyers tend to offer lower prices to both sellers with bad reputations and those with inchoative or nonexistent reputations. However, the impact of the seller's reputation on the price is clearly much weaker than the impact of third-party certification.

Warranties. WARRANTY is the only insignificant information variable. While the estimated coefficient is positive as predicted, the estimated price increase is less than 2% and insignificant. A possible reason is that buyers may view the costs of enforcing the warranty as prohibitive since a dissatisfied customer must normally pay the return postage and may have difficulty forcing the seller to honor the money-back guarantee. Also the effectiveness of warranties may be undermined by the presence of a more effective signal in the form of certification. Buyers may question why the seller of a comic with a money-back guarantee didn't get the book certified if it was so good.

Information Disclosures. As noted above, scans of the comic are provided in 96.5% of the auctions in our sample. Failure to provide a scan lowers the price an average of 11.3% according to our Tobit estimates and 12.4% according to our Heckman estimates. While these are meaningful price differences, we had expected that failure to provide a scan would lower the price even more. Possible reasons are explored in section V below.

Control Variables. The considerable impact of the auctioned comic's claimed condition is readily apparent from our coefficient estimates for $GRADE_i$. As noted above, a traditional rule-of-thumb in the industry is that comic books graded Good and Fine sell for roughly 10% and 25% respectively of the price of the same book in Near Mint condition. Our estimates indicate that the price differentials are almost about double these rules of thumb. Specifically, our Tobit coefficients indicate that comics graded Good sell for about 5.2% of the Near Mint price while comics graded fine sell for about 12.9% of the Near Mint price. The Heckman coefficients imply 5.7% and 13.9% respectively. With the single exception of an inversion in the implied prices of the G/VG and VG-grades in the Heckman estimation, prices increase monotonically with the claimed grade. Clearly the assigned grade is an extremely important determinant of a comic's price.

There is also evidence that running the auction longer results in a higher price. Recall that 3 day auctions are the left-out group so our estimates imply that auctioning the same book for 5 days raises the price 11% to 12% and that extending the auction to 10 days results in a slightly higher price. The dummy for the presence of a secret reserve price is significant in the Tobit estimation but not in the Heckman estimation.[9]

Summary. In summary of the four possible strategies that sellers of high quality comic books might undertake to reduce the information asymmetry, we find that three: (seeking third-party certification, developing a positive reputation, and disclosing information) raise the price. On the other hand, there is no evidence that offering a money-back guarantee raises the price. Of the three effective strategies, obtaining third-party certification has the greatest impact - raising the price more than 50% relative to uncertified comics on the same claimed quality.

IV.2. Signal Interactions.

Attention is now turned to interactions among the signaling variables and between the signaling variables and the control variables.

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Certification and Grade: One question is whether the impact of third party certification differs by grade. The specification in equation 1 presumes that the *percentage* impact (which we estimate at around 46% in log terms and over 50% in non-log terms) is the same regardless of the grade. While this means that the dollar impact is higher at the higher grades, the percentage impact might also differ. For instance, if a comic is assigned a grade of "Poor" then it should matter little whether the comic is certified or not since it could not be graded lower. Indeed, if certified grades are viewed as much more reliable than non-certified grades, a non-certified book with a Poor grade might conceivably command a higher price since it is possible the seller of the non-certified comic has undervalued the book. At the other extreme, a very high non-certified grade, such as "Near Mint," might be especially suspect since the apparent dollar payoff to certification is so high at the higher grades. To test whether the impact of certification differs by grade, we add a set of interaction terms $(CERT_i * GRADE_{ji})$, to the equation yielding the revised equation:

$$
\begin{aligned}
LN(PRICE)_i = \ &\beta_0 + \beta_1\,CERT_i + \beta_2\,REPUTATION_i + \beta_3\,NEGPCT_i + \beta_4\,NOSCAN_i \\
&+ \sum_{i=1}^{22}\alpha_j GRADE_{ji} + \lambda_1\sum_{i=1}^{22}\alpha_j(CERT_i * GRADE_{ji}) + \sum_{l=1}^{29}\gamma_l BOOK_{li} \qquad (2a) \\
&+ \theta_1 D5_i + \theta_2 D7_i + \theta_3 D10_i + + \eta\,RESERVE_i + \zeta\,IMills_i + e_i
\end{aligned}
$$

or equivalently:

$$
\begin{aligned}
LN(PRICE)_i = \ &\beta_0 + \beta_1\,CERT_i + \beta_2\,REPUTATION_i + \beta_3\,NEGPCT_i + \beta_4\,NOSCAN_i \\
&+ \sum_{i=1}^{22}\alpha_j(1+\lambda_1 CERT_i)\,GRADE_{ji} + \sum_{l=1}^{29}\gamma_l BOOK_{li} \qquad (2b) \\
&+ \theta_1 D5_i + \theta_2 D7_i + \theta_3 D10_i + + \eta\,RESERVE_i + \zeta\,IMills_i + e_i
\end{aligned}
$$

In this and subsequent estimations, we drop the WARRANTY variable since there is no evidence that this factor influences the price.[10] Note that if $\lambda_1=0$, equation 2 reverts to equation 1 (sans the warranty variable). In the equation 2 specification, the percentage impact of certification on the price of a comic with grade j is $\beta_1+\lambda_1\alpha_j$. If as we hypothesize, certification has a greater percentage impact at the higher grades, then we should observe $\lambda_1>0$. Note that since the coefficient of

GRADE$_{ji}$ is a function of both λ_1 and α_j the equation is nonlinear. Consequently, equation 2 is estimated using the Heckman procedure only.

Results of the estimation of equation 2 are reported in Table 3. As hypothesized, we find that the percentage impact of certification on the price is greater, the higher the claimed grade. Moreover, since the estimated coefficient β_1 is minuscule and insignificant, the percentage impact is basically proportional to the grade coefficient. Since $\beta_1 \approx 0$ and the estimated λ_1 is a highly significant .2287, the implication is that the percentage price differential between certified and non-certified comics with a grade of j is $\approx \exp(.2287\alpha_j)$-1. For instance, the implication is that certification adds nothing to the price of a comic rated "Poor" - as we hypothesized it should not. For comics rated "Good," our results indicate that certification raises the price about 23.8%. The implied price differential is 36.5% for comics rated "Very Good", 51.8% for those rated "Fine", 72.1% for those rated "Very Fine" and 126.3% for those rated "Near Mint."

Reputation and Certification: Next we explore whether the other signals matter more if the book is not certified. First, we hypothesize that reputation should matter more for uncertified books than for certified books - or alternatively that certification matters more if the seller does not have an established positive reputation. Certifying agencies, such as bond rating agencies and testing laboratories, are effectively selling their reputation to security issuers and product manufacturers. In order to sell their services, these certification agencies must maintain a spotless and trusted reputation that exceeds that of their customers. Since on a certified comic book the seller has effectively substituted the reputation of the certifying agency for its own reputation, we hypothesize that the seller's reputation will matter less for certified comics. Indeed, if the comic book's condition were the only aspect of the trade with an information asymmetry, we would expect reputation not to matter at all for certified comics. However, buyers may well be concerned about other aspects of the trade - specifically whether the seller will follow through as promised. An unscrupulous seller of certified comics could still fail to send the comic, delay sending the comic,

or substitute a different comic. Consequently we hypothesize that reputation will matter for both certified and non-certified comics but matter more for certified comics.

To test these hypotheses, we add to the term $\lambda_2 \text{CERT}_i (\beta_2 \text{FEEDBACKS}_i + \beta_3 \text{NEGPCT}_i)$

to the estimated equation. This means that the coefficient of FEEDBACKS is β_2 for non-certified comics and $\beta_2(1+\lambda_2)$ for certified comics. For NEGPCT, the implied coefficients are β_3 for non-certified comics and $\beta_3(1+\lambda_2)$ for certified comics. The hypothesis that reputation matters more for non-certified comics implies $\lambda_2<0$. The hypothesis that reputation still matters for certified comics implies $(1+\lambda_2)>0$.

Information Disclosure and Certification: We also hypothesize that failure to provide a scan matters more if the comic is not certified so add the variable $\lambda_3 [\text{CERT}_i (\beta_5 \text{NOSCAN}_i)]$. The implied coefficient of NOSCAN is now β_5 for uncertified comics and $\beta_5(1+\lambda_3)$ for certified comics so our hypothesis that failure to provide a scan matters more for non-certified comics implies $\lambda_3<0$. If the condition of the comic book is the only information asymmetry and CGC's certifications are viewed as completely reliable then scans should not matter for non-certified books implying $(1+\lambda_3)=0$. However, there may still be some uncertainty on certified books that a scan reduces such as confirming that book being sold is indeed the book and issue that the seller claims, e.g., the first issue of Spider Man instead of a later issue.   Also by showing the casing, the scan confirms that the comic is indeed certified. Finally, buyers may not fully trust the CGC ratings so may prefer a scan as a second indicator of quality. Consequently, we expect $(1+\lambda_3)>0$.

The estimated equation is now:

$$\text{LN(PRICE)}_i = \beta_0 + (1 + \lambda_2 \text{CERT}_i)(\beta_2 \text{REPUTATION}_i + \beta_3 \text{NEGPCT}_i)$$
$$+ (1 + \lambda_3 \text{CERT}_i)\, \beta_4 \text{NOSCAN}_i + \sum_{i=1}^{22}(1 + \lambda_1 \text{CERT}_i)\, \alpha_j \text{GRADE}_{ji} + \quad (3)$$
$$+ \sum_{l=1}^{29} \gamma_l \text{BOOK}_{li} + \theta_1 \text{D5}_i + \theta_2 \text{D7}_i + \theta_3 \text{D10}_i + \eta \text{RESERVE}_i + \zeta \text{IMills}_i + e_i$$

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Note that we dropped the separate term for certification since it proved insignificant in equation 2 and is highly correlated with the other certification variables.

Results: Results are reported in the columns labeled "equation 3" in Table 3. The evidence supports our hypothesis that reputation matters more when the comic which is for sale is not certified. Specifically, $\lambda_2 = -.665$ indicating that the incremental impact of a better reputation is roughly three times stronger for non-certified comics. The null that $\lambda_2 \geq 0$ is rejected at the .05 level.[11] Whether the seller's reputation still matters when the comic is certified is less clear. While the estimated $(1+\lambda_2)>0$, the null that $(1+\lambda_2)\leq 0$ cannot be rejected.

It is unclear whether scans matter more if the comic is uncertified. The estimated $\lambda_3 = -.2384$ suggesting that scans are more important if the comic is not certified but the null that $\lambda_3 \geq 0$ cannot be rejected. Likewise, we cannot reject the null that $(1+\lambda_3)\leq 0$. As noted above scans are present in 96.5% of our auctions. Apparently there are just not enough auctions without scans to afford reliable tests of whether the importance of scans differs depending on certification.

IV.3. Summary

In summary, our results indicate that three of the four signaling strategies that we examine significantly impact the price: developing a positive reputation, obtaining third party certification, and providing information in the form of scans. Our findings for specific information asymmetry amelioration strategies are as follows. **Third-party Certification**: Of the four signaling strategies, obtaining third party certification has the greatest impact on the price. We estimate that ceteris paribus certification by the Comics Guarantee Corporation raises the price over 50% on average but that the impact is roughly proportional to the comic's quality rising from 0% for "Poor" comics to over 100% for comics in "Near Mint" condition. Clearly buyers view third-party certification as leading to a dependable separating equilibrium between high and low quality comics. **Reputation:** We find that both how well established the seller's reputation is and how positive it is matter. The prices received

by sellers with a high proportion of negative feedbacks are lower than the prices realized by sellers with a low or zero proportion of negative feedbacks. Holding the proportion of negative feedbacks constant, sellers with few feedback ratings receive lower prices than sellers with many. As hypothesized, we also find that reputation is more important if the comic being offered for sale is not certified. However, the impact of reputation on the realized price is less than the impact of third-party certification. **Information Disclosure**: Failure to provide a scanned image of the comic book lowers the realized price about 12% to 17%. Since scans are provided in 96.5% of auctions it appears unlikely that scans separate out all the lower quality sellers. **Warranties:** We find no evidence that offering a warranty in the form of a money-back guarantee significantly impacts the price. Prospective buyers apparently reason that because the costs of enforcing such warranties are costly to the buyer, lower quality sellers can easily mimic this strategy and/or that sellers of higher quality comics have better signaling strategies available.

V. The Seller's Strategy Choice.

Attention is now turned to the seller's decision to pursue a signaling strategy. Note that while third-party certification, information disclosure, and warranties are short-run strategies, reputation is a long-run strategy. In other words, when an individual comic is being offered for sale, there is little or nothing the seller can do to improve its reputation in time to help with selling that comic book. However, the seller can choose among the third-party certification, information disclosure, and warranty strategies. Consequently, in this section we view the seller's reputation as fixed and examine their choices among the other three strategies.

V.1. The Certification Decision.

Our results in the previous section have established that the signaling strategy with the greatest impact on the price received in an auction is obtaining certification from Comics Guaranty LLC.

However, this is also a fairly expensive strategy. GCC's fees range from $20 to $95 per book depending on the turnaround time and estimated value.[12] The customer seeking certification also pays the shipping costs (both ways) and any insurance.

Our first step is to compare the estimated costs and benefits of certification. The benefits of certification are estimated for each issue using the equation 2 parameter estimates reported in Table 3.[13] Using equation 2, we first estimate the value of the comic without certification, then with certification, and then calculate the benefit of certification as the difference between the two.[14] Obviously, this procedure assumes that CGC and the seller assign the same grade to the comic - an assumption explored below.

As noted above, CGC's fees depend on both the estimated value of the comic, EP, and the turnaround time, TT. Specifically at the time of our sample, CGC's fees were: (1) $20.00 for EP<$250 and 5 weeks$\leq$TT<6 weeks, (2) $35.00 for $250\leq$EP<$1000 and/or 12 days $\leq$TT<15days, (3) $55.00 for $1000\leq$EP<$5000 and/or 3 days$\leq$TT<5days, and (4) $95.00 for $5000\leq$EP and TT=1 day.[15] To estimate the cost of certification we assume the sellers choose the cheapest level of service available to them regardless of the turnover time. We assume that shipping and insurance costs also increase with the service level. Specifically we assume costs of $15.00 for comics in group 1, $20.00 for comics in group 2, and $25.00 for groups 3 and 4.[16] Hence our estimated certification costs are: (1) $35.00 for EP<$250, (2) $55.00 for $250\leq$EP<$1000, (3) $80.00 for $1000\leq$EP<$5000, and (4) $120.00 for $5000\leq$EP. To estimate EP we again use the equation 2 parameters in Table 3. Since CGC's estimated prices do not depend on seller and auction characteristics, EP is estimated solely from the book type and grade.[17] We then calculate the estimate net benefit to certification as the estimated benefit minus the estimated cost.

According to our calculations, the benefits of certification exceed the costs for 56.8% of our sample of 3664 auctioned comics. By comparison only 27.9% are actually certified. This discrepancy implies that either (1) sellers of un-certified comics tend to claim grades higher than those which would be assigned by CGC, (2) our estimated the costs of certification are too low or our estimated benefits

are too high and/or (3) sellers underestimate the benefits of certification. Since the proportion of negative feedbacks is so small (less than 1% for 86.7% of our sample), it seems clear that in the vast majority of sales, buyers are satisfied with the claimed grade so the evidence points to one or both of the latter two explanations. Since CGC was not established until 1999, it is possible that some sellers are unaware of its procedures and benefits. If this is the cause, then the percentage of certified books should increase in the future.

Aside from over-estimating the likelihood of certification, our comparison of estimated benefits with estimated costs predicts certification fairly well. When the estimated costs of certification exceed the benefits, certification is rare - about 8.0%. When the estimated benefits exceed the estimated costs, 43.0% are certified. Overall, the model correctly predicts an issue's certification status 64.2% of the time.

Our next question is how the decision to seek certification depends on the seller's reputation. According to our analysis in section IV and the results for equation 3 in Table 3, certification has a larger impact on price if the seller has a nascent or nonexistent reputation or if her reputation is relatively negative. Hence, the benefits to certification should be higher if the seller has a inchoate or negative reputation. This implies that all other things equal, sellers with negative or under-developed reputations should be more likely to seek certification so the likelihood of certification should be negatively related to our FEEDBACKS variable and positively related to PCTNEG. On the other hand, the costs of certification should be lower for big volume sellers. First, CGC gives a 20% discount to dealers. Second, high volume sellers can lower shipping costs by bundling several comics together. Third, their own handling costs are probably lower because they ship to CGC on a regular basis. This cost difference implies that sellers with high values for FEEDBACKS should be more likely to seek certification. Whether certification should be related to PCTNEG is unclear. Finally, established sellers may be more aware of the benefits of certification (particularly since there was no certification agency until 1999) than low volume sellers. If this hypothesis, holds, then again the likelihood of certification should be positively related to FEEDBACKS.

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To test these hypotheses, we relate the certification decision (specifically the variable CGC) to the net benefits of certification and the reputation variables in a Probit estimation. Our measure of the net benefit of certification is as follows where $E(B)_i$ represents the estimated benefits of certification as described above and $E(C)_i$ represents the estimated costs:

$$NETBENEFIT_i = ln[E(B)_i - E(C)_i + 1] \qquad if\ E(B)_i \geq E(C)_i \qquad and$$

$$- ln[E(C)_i - E(B)_i + 1] \qquad if\ E(B)_i < E(C)_i$$

We use this log transformation since in dollar terms the net benefits are dominated by a few observations where the estimated benefits in dollars are over $1000.

One potential cost of certification not captured by our measure of the monetary cost is the time involved. If a customer seeks the least costly level of service, certification can take a couple of months. On the presumption that this cost might matter more to those seeking to sell their comic in a short period, we include in the probit estimation a measure of the length of the auction, DAYS, which takes values of 3, 5, 7, or 10.

The estimated equation is:

$$PROB(CGC_i=1) = N[\beta_0 + \beta_1 NETBENEFIT_i + \beta_2 FEEDBACKS_i + \beta_3 PCTNEG_i + \beta_4 DAYs_i] \quad (4)$$

where N[ ] is the cumulative standard normal distribution.

Obviously we expect $\beta_1 > 0$. The hypothesis that the benefits of certification are higher for sellers with less-established reputations implies that $\beta_2 < 0$ while the hypothesis that the benefits of certification are higher to those with relatively negative reputations implies $\beta_3 > 0$. Both the hypothesis that the costs of certification are lower for high volume sellers and that the benefits of certification are understood better by experienced sellers imply $\beta_2 > 0$. The hypothesis that the time costs of certification are higher for sellers who set short auctions implies $\beta_4 > 0$.

Results are presented in Table 4. As expected given the results presented above, the likelihood of certification is strongly related to its estimated net benefits. The coefficient of FEEDBACKS is also positive and highly significant indicating that sellers with well established reputations are more likely

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to seek certification than sellers with non-existent or fledgling reputations. While our earlier results in Table 3 indicated that certification has a greater positive impact on the price if the seller has an inchoative or negative reputation, there is no evidence that such sellers are more likely to seek certification. The positive coefficient for FEEDBACKS is consistent with both the hypothesis that the costs of certification are lower for high volume sellers and the hypothesis that experienced sellers are more cognizant of the benefits.

V.2. Information Disclosure

We have seen above that almost all (96.5%) online sellers provide scans of the offered comic and have also seen that failure to provide a scan lowers the price about 12%-17%. These figures suggest that buyers probably view a scan as a vague signal for distinguishing between high and low quality sellers.

Turning to the question why some sellers choose to provide a scan and a few do not, the hypothesis that failure to provide a scan signals a low quality seller suggests that the non-scanner group would tend to have worst reputations than the scanner group. This would indicate that the likelihood that a scan is provided should be negatively correlated with NEGPCT . On the other hand, given the relatively small number of sellers who fail to provide a scan, one possibility is that these few are those for whom the costs are high because they lack the technology or knowledge and the cost of acquiring scanning capability is costly because they sell so few comics. This would suggest that the likelihood that a scanned image is provided should be positively correlated with the number of past sales as proxied by the FEEDBACKS measure.

Along the same lines, if failure to provide a scan lowers the price received by 12 to 17% as our results indicate, then the dollar benefits of scanning depend on the value of the offered comic (the issue and grade). If this is the case, we would expect the likelihood that a scan is provided to be higher if the comic's estimated value is higher. To test this, we estimate the variable VALUEINDEX based on the BOOK and GRADE variables and the parameter values from equation 2 in Table 3. Finally, if the

comic is certified by CGC, a scan should provide little additional information as to the comic's condition. In this case sellers may not provide a scan because they view it as superfluous. However, as discussed above, a scan still provides confirmation that the issue is that claimed by the seller , e.g., the first Spider Man issue instead of the fifth, and that the comic is indeed certified.

To test these hypotheses, we estimate the probit equation:

$$\mathrm{PROB(SCAN_i=1)} = \mathrm{N}[\beta_0 + \beta_1 \mathrm{VALUEINDEX_i} + \beta_2 \mathrm{FEEDBACKS_i} + \beta_3 \mathrm{PCTNEG_i} + \beta_4 \mathrm{CGC_i}] \quad (5)$$

The hypothesis that a scan indicates a higher quality seller implies $\beta_3 < 0$. The hypothesis that those who fail to provide a scan do so because the costs are too high because they lack the means and are infrequent sellers implies $\beta_2 > 0$. The hypothesis that sellers of certified comics don't provide a scan because their incremental informational value is low in these cases implies $\beta_4 > 0$. Finally the hypothesis that a scan is less likely to be provided if the value of the comic is small implies $\beta_1 < 0$.

Results are presented in Table 5. The main result is that failure to provide a scan is much higher if the comic is offered by a first-time or infrequent seller. This suggests that the main reason sellers fail to provide scans is that they lack the knowledge and/or technology to do so. However, there is also weaker evidence that failure to provide a scan indicate an increased likelihood that the seller is unreliable in that a scan is more likely if PCTNEG is low. Overall these two results indicate that failure to provide a scan provides a weak signal of the seller's quality. That may explain why the market reaction to failure to provide a scan is relatively modest (12 to 17%) in that buyers may recognize that it signals little about the quality of the book or seller. There is no evidence that scans are less likely on certified comics and only very weak evidence that scans are more likely for higher value comics.

V.3. Warranties

In section IV, we found no evidence that offering a warranty in the form of a money-back guarantee impacts the price in any significant way. Nonetheless, such warranties are offered in

conjunction with 14.2% of our observed auctions so the question arises what advantage those offering warranties think they bestow.

Our first question is whether warranties help distinguish between low and high quality sellers. The basic signaling theory of warranties is of course that the expected cost to high quality sellers is small since the expected number of returns is low but prohibitive to low quality sellers since the expected number of returns is much larger. If indeed warranties tend to be offered by higher quality sellers, then we would expect them to be offered by those with few negative feedbacks from previous customers, i.e., low values of NEGPCT. Of course if warranties fail to impact the price because buyers think the cost of enforcing compliance is too high, then such offers may cost lower quality sellers little. On the other hand, warranties could be viewed as a substitute for reputation by those with inchoate or negative reputations. Despite the lack of any evidence of such an effect from our price estimations, sellers with an undeveloped or negative reputation may feel that offering a warranty will compensate for the lack of a strong, positive reputation. If this reputation substitution hypothesis is correct, then the presence of warranties should be negatively correlated with FEEDBACKS and positively correlated with NEGPCT.

Along the same lines, sellers may view warranties as a substitute for third-party certification. Despite the lack of such evidence from our price equation estimations, sellers of un-certified comics may feel that offering a warranty will help resolve the information asymmetry while sellers of certified comics see no such need. This hypothesis implies that warranties will be more prevalent on non-certified books.

Finally we once again include the variable VALUEINDEX. If the costs to the buyer of enforcing such warranties are substantial but fixed, then enforcement makes sense for high price but not low price books. This implies that if warranties are used by high quality sellers to distinguish themselves from low quality sellers, they will tend to be offered on high value books where the consequences of information asymmetry are most serious and the likelihood of returns is higher. If

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warranties are a sham offered by low quality sellers in an attempt to mislead customers, then they will tend to be offered on lower value books where the cost of enforcement relative to the payoff is small.

To test these hypotheses, we estimate the equation:

$$PROB(WARRANTY_i = 1) = N[\beta_0 + \beta_1 VALUEINDEX_i + \beta_2 FEEDBACKS_i + \beta_3 PCTNEG_i + \beta_4 CGC_i] \quad (6)$$

Results are presented in Table 5. The evidence there suggests that warranties do tend to be offered by higher quality sellers in an attempt to distinguish themselves from lower quality sellers. The positive coefficient for FEEDBACKS and the negative coefficient of NEGPCT are consistent with this hypothesis while the positive coefficient for VALUEINDEX indicates that warranties tend to be offered on higher value comics where the benefits of enforcing the warranty should be higher. If sellers of lower quality comics were using sham warranties to mislead buyers, we would expect to see them offered on lower value comics where the costs of enforcement exceed the benefits . The evidence on warranties in Table 5 is somewhat inconsistent with that in Tables 2 and 3 in that the evidence in Table 5 indicates that warranties are more likely to be issued by higher quality sellers while the evidence in Tables 2 and 3 indicates that the presence of a warranty has little impact on the price. Apparently buyers view the reputation and certification measures as better indicators of the comic's likely quality than the presence or absence of a warranty and feel they subsume the information in the WARRANTY variable. If we re-estimate the equation 2 relation without the two reputation variables, the coefficient of the warranty dummy and it significance level increase. However the variable is still not quite significant at the .05 level.

The coefficients of FEEDBACKS and NEGPCT are inconsistent with the hypothesis that sellers with negative or undeveloped reputations use warranties as a substitute for reputation. On the other hand the significant negative coefficient of the CGC variable indicates that sellers do view warranties as something of a substitute for certification. Expressed another way, sellers of certified comics apparently see little need to offer a warranty.

VI. Implications for Signaling Strategies

VI.1. Reputation

We now discuss the implications of our findings for each of the four signaling strategies. Our findings regrading the impact of reputation on the price of auctioned items include the following. One, both how well established a seller's reputation is and how positive that reputation is matter. Sellers with good reputations as measured by the proportion of negative feedbacks receive higher prices than sellers with poor reputations. Holding the proportion of negative feedbacks constant, sellers with many feedbacks (both good and bad) from previous customers receive higher prices than seller's with few feedback ratings from previous customers. Apparently, buyers tend to avoid seller's with few feedback ratings even if most are positive. Two, most comics on eBay are offered by sellers with well-established and highly positive reputations. The median number of feedbacks in our sample is 182 and the median percentage of negative feedbacks is 0%. The means are 642 and 0.5%. Apparently both buyers and sellers take reputation seriously. Buyer's reward sellers with well-established positive reputations and sellers seem to strive to develop and maintain strong, positive reputations.

Three, while reputations significantly impact the price, they are considerably less important than third-party certification. Our results indicate that for all except the least expensive comics, a novice seller offering a certified comic for sale receives a higher price than a seller with a well-established highly-positive reputation offering an uncertified comic at the same grade. In the absence of a certification process, reputation might well matter much more. However, given the availability of a certification process, buyers apparently question why sellers don't seek certification of high quality, high value comics, even if the seller's reputation is spotless. Four, reputation has a greater impact on price when the issue is not certified than when it is certified. In this sense, certification and reputation appear to be substitutes, i.e., reputation matters more when issues are uncertified and certification matters more when the seller's reputation is low. However, we find that sellers do not treat them as substitutes since sellers with well-established reputations are more, not less, likely to seek certification.

VI.2. Certification

According to our estimates, the strongest signal that a seller of high quality classic comics can send is to seek certification by a respected third party. We find that certification raises the price received by over 50% on average and that the percentage improvement ranges from 0% for the lowest grade to over 100% at the highest grades. In a sense, this should not be surprising. In financial markets, virtually all new security issues are accompanied by certifications from several third parties. To begin with, the issuing firm's financial statements are certified by outside auditors. In addition, virtually all issuers of public debt pay both Moodys and Standard and Poors (and often others) to rate their creditworthiness. Finally it has been argued that a major part of the service which underwriter's provide is to attest to the quality of the new equity or debt. Certification is less ubiquitous but common in product markets where products are often submitted to testing laboratories and well-respected names sell branding rights to less well-known companies.

One obvious question is why certification results in such a large premium. Specifically, is the expected grade much lower if the book is not certified or is part of the certification premium due to a risk reduction? While our data do not afford a definitive test, available evidence indicates that the risk reduction accounts for a major part of the premium. In our sample, 72% of the auctioned books are not certified yet most sellers have highly positive reputations. The median number of negative feedbacks is zero and the mean percent negative is one half of one percent. If sellers are assigning grades which are too high, we should observe many more negative comments but we do not. It appears therefore that a large part of the premium to third-party certification is due to a risk reduction.

Another question which this large premium raises is why more sellers don't seek certification. Certainly part of the reason is that it is fairly costly. We estimate average costs between $35 and $120 depending on the estimated value of the book and turnaround time.[18] Nonetheless, we estimate that the benefits of certification exceed the costs for 56.8% of the comics while the actual percentage certified is 27.9%. While our cost estimates may be too low, that cannot fully explain the difference. One possible explanation is that the claimed grades of uncertified comics are too high but again this is hard

to reconcile with the extremely low levels of negative feedbacks from buyers. Another possibility (and one which our data support) is that since certification is a relatively new phenomenon in this market (having been introduced in 1999), sellers are still learning the benefits. Although our results show that the benefits to certification are considerably greater to those sellers with an inchoate or non-existent reputation, we also find that established sellers are considerably more likely to seek certification. These results suggest that the most active participants in this market may have discovered the benefits of certification while the least active have not.[19]

An issue which our data allows us to examine is whether prospective buyers engage in the "out-of-body" reasoning that the signaling hypothesis presumes. Specifically, if the apparent benefits far outweigh the costs do prospective buyers reason "if the comic is really this good, why didn't they seek certification?" and therefore attach more weight to certification in these cases? Certainly, our evidence to date is consistent with the hypothesis that prospective buyers engage in such reasoning in that we find in Table 3 that certification has very little impact on the price for low graded comics and considerably more impact on the price of high graded comics. This is the pattern which we would expect if prospective buyers discount the claimed grade on uncertified comics when the apparent benefits to certification outweigh the costs. For a cleaner test whether the signal that certification sends depends on whether the expected costs outweigh the benefits, we examine whether the impact of certification on the price depends on the issue. If buyers discount the grades assigned to uncertified comics more when the apparent benefits to certification far outweigh the costs, then at the same grade, certification should matter more on expensive comics than on less expensive comics. For instance consider the following, according to the parameter estimates for equation 2 in Table 3, for comics graded Fine, certification raises the price by approximately $[\exp(.2287*1.8241)-1] = 51.8\%$. However, this translates into a much larger dollar price difference for the first issue of Amazing Spiderman, where the average price is $3161 (see Table 1), than for the 19th issue of the same comic, which has a average price of $97. Consequently, rational buyers should question why certification was not sought on the former while they might reason that the costs of certification outweigh the benefits on the latter.

If bidders discount the claimed grades on uncertified books when the apparent benefits of certification far out-weigh the apparent costs, then the impact of certification on the price should be higher for issues with large positive coefficients γ_1 in equations 1, 2, and 3 than for issues with low or negative coefficients. To test this, we add interaction terms, $CERT_i * BOOK_{li}$, to equation 2 resulting in the equation:

$$LN(PRICE)_i = \beta_0 + \beta_1 CERT_i + \beta_2 REPUTATION_i + \beta_3 NEGPCT_i + \beta_4 NOSCAN_i$$
$$+ \sum_{i=1}^{22} \alpha_j (1+\lambda_1 CERT_i) GRADE_{ji} + \sum_{l=1}^{29} \gamma_1 (1+\lambda_2 CERT_i) BOOK_{li} \qquad (7)$$
$$+ \theta_1 D5_i + \theta_2 D7_i + \theta_3 D10_i + + \eta RESERVE_i + \zeta IMills_i + e_i$$

The hypothesis that certification (or lack thereof) sends a stronger signal when the apparent benefits far exceed the costs implies $\lambda_2 > 0$.

When we estimate equation 7 using non-linear least squares, $\hat{\lambda}_2 = 0.0399$. With a t value of

3.23, it is significant at the .01 level. Since the other parameter estimates are little changed from those for equation 2 reported in Table 3, they are not repeated here but are available on request.

In summary, it appears that bidders for comic books do question why sellers failed to seek certification when it appears economic to do so.

VI.3. Warranties.

In 14.2% of our auctions, the seller offered a warranty in the form of a money-back guarantee but our evidence shows that these had little impact on the price. We see two possible reasons why buyers apparently ignored the presence of warranties. One, buyers may feel the costs of enforcing the warranties are too high to make them effective. Two, buyers may reason that there are stronger signaling strategies, certification especially, available to high quality sellers so discount the warranty signal. Despite the fact that warranties apparently do not impact the price, a minority of sellers clearly do view warranties as a strategy worth pursuing. We find no evidence that sellers view warranties as a substitute for reputation but do find evidence that they are viewed as a substitute for certification.

VI.4. Information Disclosure.

Some form of information disclosure precedes virtually every security, good, or service trade. Examples include financial statements, specifications, and advertising. Scans play this role in the on-line comic book market. Much like financial statements in security markets, scans have become an almost de rigueur part of on-line comic book auctions being provided in 96.5% of the observed auctions. We find that failure to provide a scan lowers the price roughly 12% to 17%. While significant, this impact is less than we had expected - particularly since failure to seek certification reduces the price much more. Since those sellers who fail to provide scans are normally those with non-existent or embryonic reputations, their comics would tend to sell for lower prices anyway and buyers may reason that the lack of a scan probably reflects a lack of sophistication and resources rather than low quality. In any case, buyers apparently feel that the signal which failure to provide a scan sends has only modest informational value.

VI.5. General Observations

Overall, our results emphasize how important information asymmetries between sellers (or issuers) and buyers are and how much expense and effort sellers of high quality goods, services, or securities are willing to expend to signal the quality of their products. The vast majority of sellers of classic comic books clearly feel that the long-run benefits of developing a reputation for honesty and high quality out-weigh the considerable short-run benefits of overestimating the comic's true quality. While the costs of getting a comic's grade certified by a trusted third party are substantial, the benefits are also substantial - particularly at the higher grades. Since the price premium on certified comic books apparently exceeds the expected quality difference, it appears that part of the premium represents a premium buyers are willing to pay to have their uncertainty reduced.

Our results also emphasize the importance of considering alternatives when analyzing signaling strategies. We find the seller's reputation matters much more when the comic book being offered for sale has not been certified by a trusted third party. In the absence of certification, money-back

guarantees and reputation might well matter much more but since this highly effective signaling strategy is available, rational buyers will tend to question why a seller chose a less effective strategy if indeed the quality of the offered comic is as high as claimed.

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Figure 1
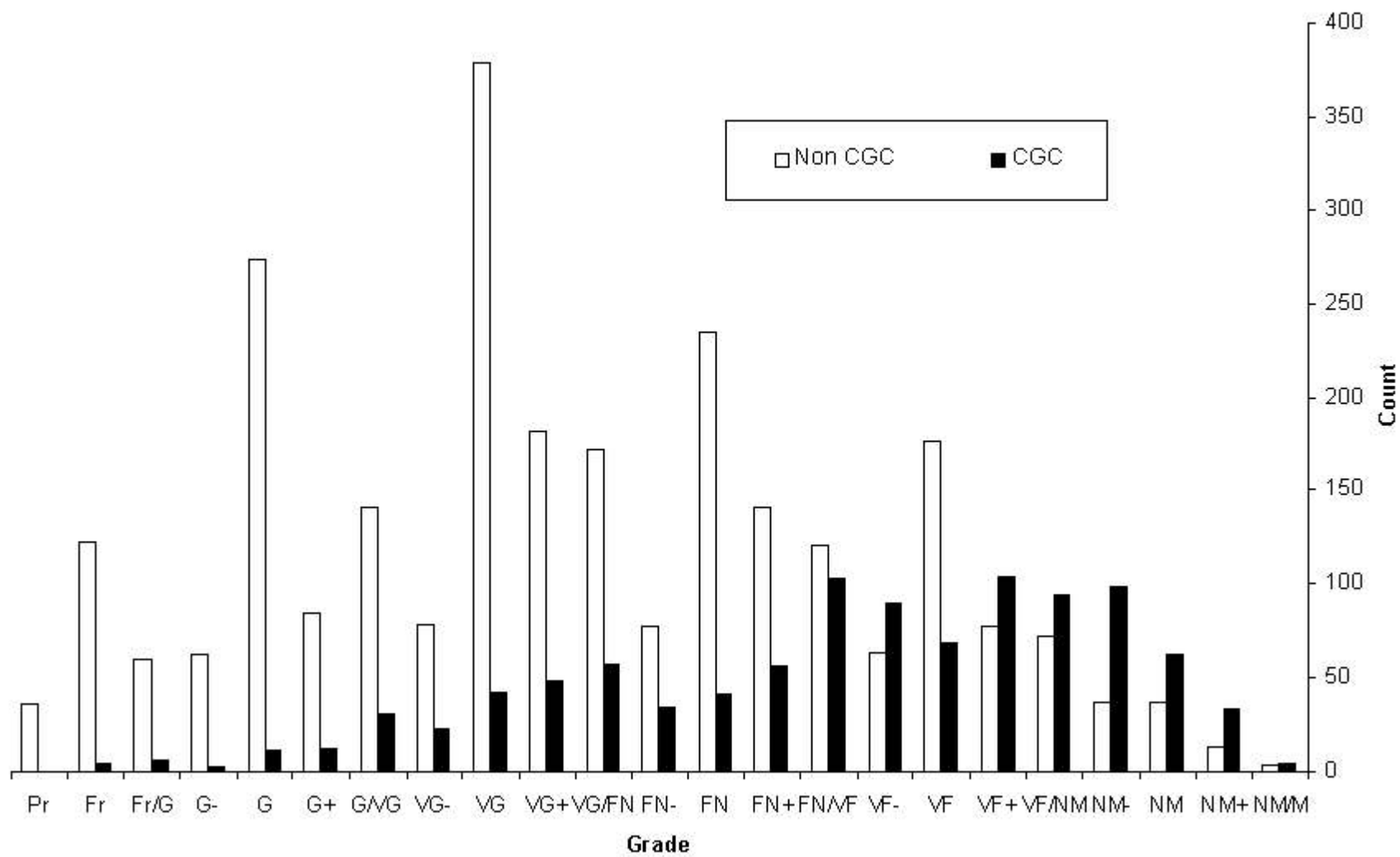**Grade Distribution for Certified and Non-Certified Comic Books**

Table 1 - Sample Statistics

Statistics are reported for 3664 eBay auctions of 30 classic age comic books over the period from 1/12/2001 through 6/23/2001. The column labeled "Percent Sold" reports the percentage of auctiOns in which the highest bid exceeded the minimum required bid and (if present) any secret reserve price. Percent Certified reports the percentage of comic auctions in which the claimed grade is certified by Comic Guaranty LLC while Percent Warranty reports the percentage of times the seller promised to fully refund the price if the buyer was dissatisfied.

Issue	# Auctions	Mean Price	Median Price	Std. Dev.	Percent Sold	Median Grade	Percent Certified	Percent Warranty
Amazing Fantasy 15	45	$ 2,986	$ 2,125	$ 2,857	53%	VG+	33%	11%
Amazing Spiderman 1	94	$ 3,261	$ 1,275	$ 8,186	52%	VG	37%	16%
Amazing Spiderman 2	70	$ 394	$ 292	$ 436	73%	VG	17%	21%
Amazing Spiderman 5	95	$ 281	$ 115	$ 581	71%	VG	27%	19%
Amazing Spiderman 14	125	$ 338	$ 203	$ 370	66%	VG+	34%	13%
Amazing Spiderman 19	142	$ 97	$ 45	$ 163	72%	VG/FN	22%	23%
Amazing Spiderman 41	114	$ 55	$ 27	$ 96	76%	VG+	10%	19%
Avengers 1	124	$ 388	$ 203	$ 615	64%	VG	27%	9%
Avengers 4	171	$ 355	$ 201	$ 451	57%	FN+	36%	16%
Avengers 11	61	$ 53	$ 33	$ 84	75%	FN-	8%	16%
Captain America 100	191	$ 118	$ 50	$ 195	63%	FN	17%	15%
Daredevil 1	136	$ 404	$ 230	$ 544	65%	VG+	32%	12%
Doctor Strange 169	122	$ 71	$ 22	$ 111	57%	FN+	23%	12%
Fantastic Four 1	69	$ 1,238	$ 860	$ 1,495	55%	VG	23%	16%
Fantastic Four 3	59	$ 270	$ 255	$ 173	54%	VG/FN	24%	15%
Fantastic Four 48	282	$ 256	$ 118	$ 392	57%	FN	34%	11%
Incredible Hulk 1	39	$ 853	$ 490	$ 1,108	62%	VG-	46%	5%
Incredible Hulk 6	69	$ 147	$ 126	$ 80	61%	VG+	20%	16%
Iron Man & Sub-Mariner 1	166	$ 49	$ 27	$ 67	82%	FN	14%	13%
Iron Man 1	256	$ 213	$ 90	$ 334	59%	VF-	35%	11%
Showcase 4	18	$ 1,787	$ 1,500	$ 1,380	39%	VG	39%	0%
Silver Surfer 1	207	$ 182	$ 75	$ 321	58%	FN+	29%	8%
Silver Surfer 2	200	$ 75	$ 31	$ 157	50%	FN+	20%	14%
Silver Surfer 4	130	$ 227	$ 91	$ 328	67%	VF-	48%	13%
Sub-Mariner 1	155	$ 70	$ 31	$ 107	68%	FN/VF	28%	14%
Tales of Suspense 39	62	$ 594	$ 416	$ 633	60%	FN-	48%	21%
The Brave and the Bold 28	78	$ 383	$ 230	$ 517	24%	VG	49%	17%
X-Men 1	158	$ 831	$ 510	$ 1,207	52%	VG+	30%	15%
X-Men 2	133	$ 441	$ 167	$ 632	51%	VG+	23%	17%
X-Men 16	93	$ 50	$ 27	$ 74	72%	FN	17%	19%
Sample	3664	$ 357	$ 103	$ 1,439	61%	FN-	28%	14%

Table 2 - Price Regressions

The log of the sale price or highest bid for a comic is regressed on (1) a dummy for certified comics (CGC), the log of the number of eBay feedback ratings of the seller (FEEDBACKS), the percent of negative feedback ratings (NEGPCT), a dummy for comics with money back guarantees (WARRANTY), a dummy for failure to provide a scan (NOSCAN), dummies for the grade assign to the comic (above poor) (GRADE$_j$), dummies for the different books as listed in Table 1 (BOOK$_i$) [these are not reported below but are available on request], dummies for auction length in days (D5, D7, D10) if greater than 3 days, and a dummy for the presence of a secret reserve price (RESERVE). Since sample is left truncated at the minimum bid, the equation is estimated using the Tobit and Heckman procedures. The equation is estimated based on 3664 eBay auctions of silver age comic books over the 1/12/2001-6/23/2001 period.

Variable	Tobit estimation		Heckman estimation	
	Coefficient	t-value	Coefficient	t-value
Signaling Variables:				
CERT (certification)	.4651	26.50	.4596	28.94
FEEDBACKS (log of feedback ratings)	.0159	4.54	.0133	4.22
NEGPCT (% negative feedback)	-1.1824	-2.99	-1.0085	-2.79
NOSCAN	-.1199	-2.71	-.1321	-3.51
WARRANTY	.0122	.58	.0150	.82
Grade dummies:				
FR (fair)	.4076	5.22	.3718	5.36
FR/G	.5920	6.83	.5647	7.38
G-	.6168	7.01	.6158	7.97
G (good)	.8996	12.09	.9051	13.77
G+	.9968	12.26	.9852	13.75
G/VG	1.0792	13.94	1.1114	16.35
VG-	1.0887	13.35	1.1089	15.52
VG (very good)	1.3545	18.54	1.3195	20.36
VG+	1.3787	18.03	1.3781	20.46
VG/FN	1.5443	20.56	1.5280	22.96
FN-	1.7518	21.70	1.7014	23.76

FN (fine)	1.8094	23.99	1.7917	26.84
FN+	1.8854	24.39	1.8676	27.32
FN/VF	2.0438	26.42	2.0060	29.20
VF-	2.2855	28.62	2.2441	31.53
VF (very fine)	2.4022	31.22	2.3646	34.64
VF+	2.7184	34.38	2.6721	37.94
VF/NM	3.0131	38.18	2.9713	42.38
NM-	3.3655	41.36	3.3140	45.68
NM (near mint)	3.8592	46.94	3.7746	50.94
NM+	4.2430	45.59	4.1948	50.54
NM/M	4.9381	33.73	4.8783	34.74
Other control variables				
D5 (5 day auction)	.1018	2.18	.1158	2.90
D7 (7 day auction)	.1475	3.47	.1364	3.79
D10 (10 day auction)	.1810	4.12	.1646	4.39
RESERVE (secret reserve price dummy)	.0514	3.17	.0183	1.20
Inverse Mills ratio			.3765	15.68
R^2	.949		.949	

Table 3 - Price Regressions with Interactions

The log of the sale price or highest bid for a comic is regressed on signaling variables for reputation, certification, warranties, and information disclosure, control variables for the comic's type and grade and the auction characteristics allowing for interactions between the signaling variables. The estimated equations, 2 and 3 are shown in the text. The equations are estimated based on 2906 eBay auctions of silver age comic books over the 1/12/2001-6/23/2001 period using the Heckman procedure to account for the fact that the data are left-truncated at the minimum bid.

Coefficient	Equation 2		Equation 3	
	Coeff.	t-value	Coeff.	t-value
Signaling Variables :				
β_1 (certification)	-.0078	-.16		
β_2 (log of feedback ratings)	.0115	3.76	0.1435	3.81
β_3 (% negative feedback)	-.8944	-2.52	-1.1287	-1.82
β_4 (no scan)	-.1528	-4.14	-.1628	-3.12
λ_1 (certification - grade interaction)	.2287	10.18	.2417	13.80
λ_2 (certification - reputation interaction)			-.6650	-1.95
λ_3 (certification - information interaction)			-.2384	-.60
Grade dummies:				
α_1 (FR or fair)	.3979	5.86	.4125	4.69
α_2 (FR/G)	.6084	8.18	.6239	6.69
α_3 (G-)	.6441	8.54	.6572	6.18
α_4 (G or good)	.9327	14.49	.9472	11.09
α_5 (G+)	1.0273	14.73	1.0410	11.97
α_6 (G/VG)	1.1619	17.52	1.1778	13.68
α_7 (VG-)	1.1750	16.94	1.1936	13.81
α_8 (VG very good)	1.3593	21.45	1.3738	16.24
α_9 (VG+)	1.4298	21.78	1.4460	17.00
α_{10} (VG/FN)	1.5763	24.32	1.5921	18.69
α_{11} (FN-)	1.7406	25.18	1.7553	19.64
α_{12} (FN fine)	1.8241	28.01	1.8397	21.42

α_{13} (FN+)	1.9017	28.70	1.9166	22.21
α_{14} (FN/VF)	2.0370	30.68	2.0537	23.53
α_{15} (VF-)	2.2440	32.98	2.2608	25.24
α_{16} (VF very fine)	2.3750	35.89	2.3883	26.76
α_{17} (VF+)	2.6216	38.67	2.6349	28.69
α_{18} (VF/NM)	2.8886	42.53	2.8981	31.43
α_{19} (NM-)	3.1541	44.78	3.1625	32.13
α_{20} (NM near mint)	3.5703	48.96	3.5748	34.15
α_{21} (NM+)	3.9161	48.43	3.0187	34.36
α_{22} (NM/M)	4.5705	35.69	4.5660	40.66
Other control variables				
θ_1 (D5 - 5 day auction)	.1200	3.07	.1197	3.33
θ_2 (D7 - 7 day auction)	.1359	3.85	.1348	4.32
θ_3 (D10 - 10 day auction)	.1780	4.85	.1777	5.39
η RESERVE (secret reserve price dummy)	.0085	.56	.0089	.59
Inverse Mills ratio	.3599	15.28	.3598	18.75
R^2	.951		.951	

Table 4 - The Certification Decision

Estimations of the probit equation:

$$\mathrm{PROB}(\mathrm{CGC}_i=1) \ = \ N[\beta_0 + \beta_1 \mathrm{NETBENEFIT}_i + \beta_2 \mathrm{FEEDBACKS}_i + \beta_3 \mathrm{PCTNEG}_i + \beta_4 \mathrm{DAYs}_i]$$

where N[] is the cumulative standard normal distribution are presented. NETBENEFIT is a log transformation of the estimated net benefits of certification where the benefits are estimated using the parameter estimates for equation 2 in Table 3 and costs are based on the CGC's cost schedule. FEEDBACKS is the log of 1 plus the number of eBay feedbacks (positive, neutral, or negative). PCTNEG is the percentage of eBay feedbacks which are negative. DAYS is the length of the auction in days. The equation is estimated based on 3664 eBay auctions of silver age comic books over the 1/12/2001-6/23/2001 period.

Variable	Coefficient	z - statistic
Intercept	-1.3316	-11.04
NETBENEFIT	0.1831	25.72
FEEDBACKS	0.0608	5.38
PCTNEG	-1.1913	-0.91
DAYS	0.0104	0.75

Table 5 - The Information Disclosure and Warranty Decisions

Probit estimations of the likelihoods that (1) a scan will be provided, and (2) that a money-back guarantee will be offered are presented. These two likelihoods are related to (1) VALUEINDEX, an estimate of the comic's value (in 000$) based on the issue and claimed condition, (2) FEEDBACKS, the log of the number of feedbacks (positive, neutral, or negative) from previous eBay customers, (3) PCTNEG, the percentage of negative feedbacks, and (4) CGC, a dummy for comics certified by Comic Guaranty LLC. The equation is estimated based on 3664 eBay auctions of silver age comic books over the 1/12/2001-6/23/2001 period.

Variable	Scan Probit		Warranty Probit	
	Coefficient	z-statistic	Coefficient	z-statistic
Intercept	1.052	13.01	-1.441	-19.91
VALUEINDEX	.127	1.08	.202	4.63
FEEDBACKS	.177	10.01	.090	6.82
NEGPCT	-3.624	-2.40	-15.333	-4.36
CGC	.196	1.85	-.314	-5.02

1. In a broader sense such testing agencies as Consumer Reports could be viewed as certification agencies but we restrict the term to cases where the cost is borne by the seller.

2. An examination of the comments accompanying negative ratings supports this view. A buyer or seller who receives a negative rating often responds that it was a merit less retaliatory response to a negative rating that they had given the other party for good cause.

3. The 30 comic books were chosen by first checking eBay in early January for comics which were (1) heavily traded, and (2) fairly expensive so certification was a reasonable option. We did not collect data on an auction (1) if the data were incomplete (such as no grade assigned) or (2) if it was obvious from the scan that the assigned grade was totally unrealistic. These would represent less than 2% of the total auctions.

4. Sellers may use a secret reserve price to judge the demand for the item, then contact the highest bidder and try to negotiate a higher price.

5. The 1.0 is included in the denominator to avoid a zero denominator in the case of new sellers.

6. Payment by a credit card may provide an implicit warranty since a dissatisfied buyer may be able to stop payment. However, buyers may be reluctant to provide their credit card number online - particularly if the site is not secure. Sellers, small sellers in particular, may be reluctant to accept credit card payments either because of the cost involved or the fear buyers will stop payment. Because of this ambiguity, we decided not to include a dummy variable for sellers accepting credit card payments in our main regressions. However, we have run estimations with such a variable. It is insignificant and has little impact on the other parameter estimates.

7. Since the dependent variable is in log form, the estimated percentage impact of certification on the price is $exp(1+\beta_1)$.

8. It is possible that the two reputation variables combined might imply differences as large as those implied by certification. In other words, if one seller had an extremely low FEEDBACKS and extremely high NEGPCT while another had extremely high FEEDBACKS and zero negative feedbacks then the forecast difference between the two might exceed 55% but these would have to be very extreme cases given the observed values in our sample.

9. As noted above, a positive coefficient does not necessarily mean that adding a secret reserve tends to raise the price received since the sample dependent variable is the based on the highest bid when the item fails to sell because on a high reserve price.

10. We have estimated versions of equations 2 and 3 with WARRANTY and it remains insignificant as in equation 1.

11. The multicollinearity between all the variables involving certification in equation 3 appears to be resulting in relatively high standard errors. If the certification-scan interaction variable is

dropped from equation 3, the standard error of λ_2 falls considerably but not enough to make λ_2 significant at the .01 level.

12. These were the fees in effect during our sample period. They have since increased slightly. Dealers receive a 20% discount from these.

13.   We use equation 2, rather than equation 3, to estimate the benefits to certification because we want to test separately how the decision to seek certification depends on reputation.

14. Since its purpose is purely to correct for the truncated nature of the data, we exclude the inverse Mill's ration variable and also assume no reserve price is set.

15. Dealers receive a 20% discount from these rates and there is also a $5 to $10 discount to re-grade comics whose casing has been opened.

16. Note that sellers can reduce per issue shipping costs by sending more than one comic book at a time and indeed there is a three book minimum to qualify for the $20.00 rate.

17. Specifically we assume that the seller has no reputation, that a scan is provided, and that the auction lasts 7 days.

18. These costs probably partially explain why certification is such an effective signal in that it is a cost which only the high quality sellers would be willing to bear.

19. On the other hand the cost of certification are also likely lower to established sellers as discussed below.