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Sellers' Economic Incentives to Disclose Negative Information in Online Markets*

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Abstract

Purpose: This study aims to verify sellers' economic incentives for voluntarily disclosing negative information in online markets and provide practical guidelines to online sellers in terms of whether, when, and how sharing low quality to buyers increase sales. **Research design, data and methodology:** Our model examines the number of bidders in Internet auctions to measure potential demand and uses count data analysis following previous studies that have also analyzed the number of bidders in auctions. After checking over-dispersion and zero-inflation in our data, we have run a Poisson regression to analyze the effect of sharing negative information on sales. **Results:** This study presents a counterintuitive result that low-quality sellers can increase their demand by fully disclosing negative information in an online market, if appropriate risk-reducing methods are employed. Our finding thus shows that there exists economic incentive for online sellers to voluntarily disclose negative information about their products, and that the context of transactions may affect this incentive structure as the incentive varies across product categories. **Conclusions:** As the positive impact of disclosing negative information has rarely been studied so far, this paper contributes to the literature by providing a unique empirical analysis on the impact of sellers' honesty on sales. By verifying economic incentives of disclosing low quality with actual online sales data, this study suggests practical implications on information disclosure strategy to many online sellers dealing with negative information.

Keywords : Information asymmetry, negative information, lemon market, online auction, quality certification

JEL Classification Code : D81, D83, M31

1. Introduction[†]

Is honesty the best policy for sellers? Many sellers often encounter the temptation to conceal negative aspects of their products when buyers cannot accurately evaluate the quality, sometimes even after purchase. According to conventional wisdom, when there exists this type of information asymmetry, sellers should hide negative information of their products as much as possible to maximize their profit. According to Berger, Sorensen, and Rasmussen (2010), the academic literature has also mostly agreed that the impact of revealed negative product information has negative effect on sellers. However, we

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should also note that this type of non-disclosure may increase buyers' perceived risk of purchase, which plays an important role in buyers' purchase decision (Bauer, 1960). More specifically, if sellers do not reveal negative aspects of their products, buyers may feel perceived risk and the willingness to pay might thus decrease.

Therefore, whether to fully disclose negative quality information is not a simple decision for many sellers with relatively low-quality products, and this type of perceived risk has an even stronger impact on buyers in an online setting where information asymmetry is high. Basically, when buyers cannot figure out the actual quality, online sellers who are selling low-quality products have two options for information disclosure. First, they may not fully reveal quality information and claim higher than true quality, as it is usually very hard for buyers to evaluate the quality online. In this case, although their claimed quality may be high, purchase intention of buyers may not be strong since sellers' quality claim is not credible, increasing perceived risk. Second, online sellers may fully reveal quality information through using risk-reducing technologies such as quality certification. In this case, although buyers may trust their quality claim and thus have low perceived risk, their low claimed quality may have negative effect on sales. Therefore, whether to reveal true quality is clearly a dilemma for online sellers with low-quality products. When buyers cannot evaluate the quality, should online sellers reveal low quality through quality certification, or falsely claim high quality?

This study attempts to address the questions of whether revealing low-quality actually increases seller profit, and if so, how much of such negative information is reasonable for sellers to reveal. We focus on the managerial relevance of this particular dilemma of sellers' information disclosure by investigating economic incentives for low-quality sellers to fully disclose negative quality information under online purchase environment where buyers' perceived risk is high. More specifically, we empirically examine actual sales data from one of major online auctions in the U.S. and analyze whether sellers may increase demand by revealing negative quality information, in order to provide practical guidelines for managers.

This paper proceeds as follows. We first review the related literature in Section 2, and present our empirical model and analyze relevant market data in Section 3. After we discuss main findings and issues of our results in Section 4, we conclude our study with some managerial implications and suggestions in Section 5.

2. Literature Review

Although the majority of related academic studies have documented disadvantages of sharing negative information with customers (Berger et al., 2010), there are also several studies that have examined how sharing negative information can help sellers from a variety of perspectives. Some studies have found that sellers may voluntarily share negative information in order to build reputation through repeated transactions (Farrell, 1980; Riordan, 1986; Wilson, 1985) or try to be honest to buyers in order to build trust and maintain long-term relationships (Chaudhuri & Holbrook, 2001; Coulter & Coulter, 2002; Crosby, Evans, & Cowles, 1990; Farrell, 1980; Sung & Kim, 2010). Our paper differs from these studies by examining the instant effect of seller's honesty on seller profit in the short run. The research on two-sided advertising has also addressed how including negative claims may positively influence the effect of advertising (Crowley & Hoyer, 1994; Eisend, 2006, 2007; Settle & Golden, 1974). Our study contributes to this finding by empirically showing how negative quality claim can affect seller profit in actual online market transactions. Moreover, several studies have provided unique perspectives regarding the positive effect of sharing negative information. Berger et al. (2010) have shown that negative publicity can increase sales of relatively unknown products by increasing product awareness, and Tadelis and Zettelmeyer (2011) have explained that negative information may work as a matching mechanism by increasing sales for low-quality products when certain customers prefer those products. While the findings from these studies provide important implications regarding market situations where awareness or market heterogeneity is a major issue, our paper attempts to observe more general cases of buyer-seller interactions focusing on online purchases.

The main element of this paper's empirical model, perceived risk of purchase, has been found to affect consumer behavior by many studies. More specifically, since Bauer (1960) explained how the concept of risk works as a major element on customer choices, many researchers have produced general understandings about perceived risk of buyers (Dowling, 1986; Markin, Jr., 1974; Ross, 1975; Stone & Winter, 1985; Taylor, 1974). The literature has defined perceived risk of purchase as the function of the probability of possible loss and the size of loss from purchase (Peter & Ryan, 1976; Peter & Tarpey, Sr., 1975; Srinivasan & Ratchford, 1991), and many studies have shown that the probability of possible loss from purchase may negatively affect buyers' purchase intention (Crespo, del Bosque, & de los Salmones Sánchez, 2009; Z. Li et al., 2020; Wang & Hazen, 2016).

This paper is also closely related with those empirical studies about information disclosure and signaling in an online environment. In particular, Jin and Kato (2006), Li et al. (2009), and Lewis (2011) have provided interesting findings about information disclosure in online auctions. Li et al. (2009) and Lewis (2011) contributed to the literature through

investigating the effect of different types of risk intermediaries. However, these two studies have not investigated the effect of seller claimed quality, which is one of the main factors of the current study. On the other hand, Jin and Kato (2006) have considered the variable representing the quality of the products when examining the relationships among price, quality, seller reputation, and seller claims in Internet auctions. They have not only investigated the sales data but also purchased and appraised actual products to show that there existed a certain amount of fraud as false claim provided higher profit, and that the information disclosure may not be sufficient to prevent adverse selection in this market. Although Jin and Kato (2006) and our study examine those product categories and variables that are similar, the focus and the findings are different as the former shows that fraudulent claim works positively for low-quality sellers, supporting mandatory disclosure policy, while our study verifies that there exist the economic incentives for sellers to fully reveal low quality, supporting voluntary disclosure policy.

3. Empirical Analysis

3.1. Data

As explained, this study attempts to check whether there exists an economic incentive for low-quality sellers to fully disclose negative information, through analyzing online transactions of relevant products. After investigating several product categories, two product categories have been selected for our empirical analysis – collectible baseball cards and collectible coins – for the following reasons. First, the markets for these collectibles show strong information asymmetry, as customers can rarely evaluate the actual quality of products even after purchasing them. Second, the products sold in these markets have various levels of perceived risk as customers trust some sellers more than other sellers, and only some products are professionally verified of their qualities. Third, it is relatively easy to compare the quality of those products, as most products traded in these markets are measured by the industries' universal grading system. Finally, those baseball cards and coins of the same product types are basically identical and they only differ in quality levels, price, and the size of risk.

We have selected the Upper Deck card of Ken Griffey, Jr. (1989) and the Morgan silver dollar (1921) among many types of collectible baseball cards and coins, since they are actively traded products in both markets. For baseball cards, we have collected eBay’s sales data from the period between February 2013 and May 2013, and for collectible coins, we have analyzed the sales data between December 2014 and February 2015. For professionally graded baseball cards, we have examined those graded by BGS (Beckett Grading Services) and for professionally graded coins, we have investigated those graded by NGC (NGC Coin Grading System), since they are very highly trusted grading services in their industries. Overall, we have analyzed sales data of 456 baseball cards, where 225 of them are professionally graded, and 438 coins, where 224 of them are professionally graded.

3.2. Model

3.2.1. Variables

We have carefully selected the variables that fit this study's objective through reviewing previous literature on Internet auctions and also using our own judgment. Therefore, the variables in the next paragraph have been considered for both product categories.

Since our main interest is how demand shifts with related variables, the number of (unique) bidders is selected as a predicted variable. This study uses the number of bidders to estimate the demand for those products as every bid in an eBay auction is considered as a legal agreement to buy the product. As every bidder has agreed to buy the product (if buyers would not have had the intention of buying the item, they would not have placed a bid at first), we can logically consider the number of bidders as a possible construct to represent the size of potential demand. Although traditional auction literature has treated the number of bidders as exogenous, recent online auction studies have considered it to be endogenous, according to Bapna et al. (2004). Then, we consider independent variables that might have an impact on the number of bidders in four categories: perceived risk, quality claim, price, and others.

First, we consider variables measuring perceived risk. The first one in this category is the dummy variable representing whether the product is professionally graded. Moreover, the number of sides of the product presented with high-resolution pictures is selected as an independent variable since the physical condition is very important in determining quality level,

and high-resolution pictures can thus be an effective risk reducer. Variables measuring the seller's trustworthiness are the seller feedback, a dummy for whether the seller has 100 percent positive feedback, and a dummy for "Top-Rated" seller. eBay calculates the feedback score based on the difference between the number of negative feedbacks and the number of positive feedbacks, and "Top-Rated Seller" should meet several conditions including an eBay account active for ninety days, positive feedbacks of 98 percent, and more than 100 transactions along with $1,000 in sales in 12-month period. Second, the quality claim is the grade claimed by sellers. For baseball cards, it ranges between 1 (Poor) and 10 (Gem-Mint) and for coins, it ranges between 1 (Poor) and 70 (Mint State/Uncirculated). Third, we measure the prices of the products using starting and shipping price, while the final price is not adopted as an explanatory variable since a seller cannot directly control this variable. The literature on auction considers the final price of an auction as the result of its competitiveness, but not an independent variable (Bapna, Jank, and Shmueli 2008; Pinker, Seidmann, and Vakrat 2003; Reddy and Dass 2006). Fourth, for the estimation of coins data, there are two additional dummies for the location of production facility (Denver and San Francisco), thus it is a very important element in determining the value of a coin.

We have also checked if there is any multicollinearity issue among the independent variables in our model. The analysis has shown that none of the correlation coefficients between independent variables and VIF (variance inflation factor) values are worrisome, and there seems to be no need for further investigation of multicollinearity in our model.

3.2.2. Model Specification

As is mentioned above, this study's dependent variable (the number of bidders) has been considered as exogenous in most of auction literature. More specifically, as those literature has analyzed traditional auction markets, the number of bidders has mostly been regarded as fixed and also commonly shared knowledge to all participants (Athey & Haile, 2002; Bapna et al., 2004). Nonetheless, it is different in online auction studies. The studies on online auction have regarded the number of bidders to be random. For example, some studies have considered the arrival of buyers (the number of bidders) to follow a Poisson distribution (Ackerberg, Hirano, & Shahriar, 2006; Bajari & Hortacsu, 2003; Etzion, Pinker, & Seidmann, 2006; Hong & Nekipelov, 2012). As our study also analyzes an online auction, we follow the approach from these online auction studies and regard it as count data analysis.

We then check over-dispersion to figure out if Poisson or negative binomial distribution fits our data. In both the baseball card and coin cases, the likelihood ratio test for over-dispersion parameter shows a sufficiently low chi-squared value. As over-dispersion parameter alpha is not significantly higher than 0 (p = 0.49), it suggests that negative binomial and Poisson distributions are equivalent, meaning that over-dispersion is not an important issue in our case. In terms of zero-inflation, we cannot conclude that a separate process exists with those products with zero bidders in this auction setting, and the Vuong statistics with AIC and BIC correction (following *ZIPCV* and *ZINBCV* of STATA 13.1) show no support for the zero-inflated model either. Based on these results, we adopt a Poisson regression to analyze both baseball card and coin data.

3.3. Estimations

3.3.1. Estimation Procedure

We estimate our model with the variables defined in a previous section, using the data from two product categories.

3.3.1.1. Baseball Cards

We assume the number of (unique) bidders for the auction product j which is sold by seller i follows a Poisson distribution, the mean of which is represented by the parameter $\boldsymbol{\lambda_{ij}}$:

$$\text{Prob}\left(Q_{ij} = q\right) = \frac{e^{-\lambda_{ij}}\lambda_{ij}^{q}}{q!},$$

where $q = 0, 1, 2, \ldots$, and $\ln(\lambda_{ij}) = \beta X_{ij}$.

The following specification is applied for the independent variables:

$$\beta X_{ij} = \beta_0 + \beta_1 \text{Dummy for Professional Grading}_{ij} + \beta_2 \text{Number of High-Resolution Pictures}_{ij} + \beta_3 \text{Feedback Score}_{ij} + \beta_4 \text{Dummy for Only Positive Feedback}_{ij} + \beta_5 \text{Dummy for "Top-Rated" Seller}_{ij} + \beta_6 \text{Card Grade Claim}_{ij} + \beta_7 \text{Starting Price}_{ij} + \beta_8 \text{Shipping Price}_{ij}$$

Table 1 shows the result of this estimation. We can run some basic analysis by checking whether this result verifies the incentive for low-quality sellers to honestly reveal their quality. First, we examine if the product's demand increases with smaller perceived risk. According to the results, the coefficients for those variables indicating perceived risk—if the card is graded professionally and the number of card sides shown with high resolution pictures—are positive and significant. Therefore, the result of the estimation shows that smaller perceived risk increases demand. Second, we examine whether the demand increases when claimed quality is higher. According to the result, the coefficient for claimed quality (claimed card grade) is positive and significant. Therefore, we can say that the claimed quality also increases demand. Third, the variable for auction starting price is strongly significant and negative. In summary, this primary analysis shows that demand for collectible baseball card increases with smaller perceived risk, higher claimed quality, and lower price.

Table 1: Estimation Results for Baseball Cards

Perceived Risk		
Dummy = 1 if professionally graded	0.1279	***
	(0.0499)	
Number of card sides clearly shown	0.0845	**
	(0.0427)	
Feedback score	0.00000156	*
	(0.000000808)	
Dummy = 1 if only positive feedback	0.0404	
	(0.0576)	
Dummy = 1 if the seller is "top rated"	0.0619	
	(0.0622)	
Claimed Quality		
Claimed card grade	0.2377	***
	(0.0303)	
Price		
Auction starting price ($)	-0.0548	***
	(0.0031)	
Shipping price ($)	-0.0054	
	(0.0170)	
Observations	451	
Chi-squared	459.48	***
d.f.	8	

* p<0.1.
** p<0.05.
*** p<0.01.

3.3.1.2. Coins

We also run a Poisson regression for the coin data with the variables defined and assume the number of (unique) bidders for the auction product *j* sold by seller *i* follows a Poisson distribution, the mean of which is represented by the parameter $\boldsymbol{\lambda_{ij}}$:

$$\text{Prob}\left(Q_{ij} = q\right) = \frac{e^{-\lambda_{ij}}\lambda_{ij}^{q}}{q!},$$

where q = 0, 1, 2, …, and $\ln\left(\lambda_{ij}\right) = \beta X_{ij}$.

The following specification is applied for the independent variables:

$\beta X_{ij} = \beta_0 + \beta_1$Dummy for Professional Grading$_{ij}$
$+ \beta_2$Number of High-Resolution Pictures$_{ij}$

$$+ \beta_3 \text{Feedback Score}_{ij} + \beta_4 \text{Dummy for Only Positive Feedback}_{ij} + \beta_5 \text{Dummy for "Top-Rated" Seller}_{ij} + \beta_6 \text{Card Grade Claim}_{ij} + \beta_7 \text{Starting Price}_{ij} + \beta_8 \text{Shipping Price}_{ij} + \beta_9 \text{Dummy for Denver Production}_{ij} + \beta_{10} \text{Dummy for San Francisco Production}_{ij}$$

Table 2 shows the estimation result for coins data. We can do some basic analysis again by investigating whether this result verifies the incentive for low-quality sellers to honestly disclose quality information. First, we examine if the demand increases with smaller perceived risk. According to the results, the coefficients for those variables of perceived risk—if the coin is graded professionally and the number of coin sides shown with high resolution pictures—are both positive and significant. Therefore, the result shows that smaller perceived risk increases demand. Second, we examine whether the demand increases when claimed quality is higher. It is found from the results that the coefficient for claimed quality (claimed coin grade) is positive. Nevertheless, this effect is insignificant, unlike with the baseball card case. Therefore, in this case, claimed quality does not increase demand. This also differs from the Jin and Kato (2006)'s findings, which have found that the claim of higher grade works positively for sellers of baseball cards, even if the claim is false. We suppose that this result from coin data is related with the market circumstances of collectible coins. More specifically, the impact of claimed quality itself might be negligible in collectible coin case, due to strong information asymmetry in this market. Third, the variable for auction starting price is strongly significant and negative. In summary, this basic analysis finds that demand for collectible coin increases when perceived risk and price are lower, but the effect of claimed quality is insignificant.

Table 2: Estimation Results for Coins

Perceived Risk	
Dummy = 1 if professionally graded	0.3553
	(0.1127)
Number of coin sides clearly shown	0.4098
	(0.1997)
Feedback score	-0.000000698
	(0.0000037)
Dummy = 1 if only positive feedback	-0.1584
	(0.1068)
Dummy = 1 if the seller is "top rated"	0.1826
	(0.1027)
Claimed Quality	
Claimed coin grade	0.0109
	(0.0091)
Price	
Auction starting price ($)	-0.0293
	(0.0037)
Shipping price ($)	-0.0175
	(0.0316)
Other	
Dummy = 1 if produced in Denver	0.0857
	(0.0814)
Dummy = 1 if produced in San Francisco	0.0262
	(0.0925)
Observations	438
Chi-squared	132.63
d.f.	10

* p<0.1.
** p<0.05.

*** p<0.01.

3.3.2. Analysis of the Results

With the results of estimation, we can closely investigate if there exists an economic incentive for sellers to honestly disclose information about low-quality. For our study, we focus on the third-party certification's role in providing this incentive in an online setting.

3.3.2.1. Baseball Cards

Here, the coefficient for professional grading is 0.128. Therefore, the number of bidders goes up by $e^{(0.128)} \approx 1.136$ if it is professionally graded. Additionally, since the coefficient for card grade claim is 0.238, the number of bidders goes up by $e^{(0.238)} \approx 1.268$ when claimed grade increases by 1.

From these findings, we can calculate the total effects from these variables and show if revealing low quality may benefit sellers. We now analyze the estimated demand from three different strategies of sellers with low-quality products: i) falsely claiming higher than actual quality, ii) revealing lower quality with no certification, and iii) revealing lower quality using certification. First, for the false claim strategy, we assume sellers become dishonest to buyers and overstate the grade of their products by 0.5. Say, even though the actual grade is 7, a seller can claim the grade to be 7.5. Second, sellers honestly reveal the true grade but do not show certification to support their quality claims, for no-certification honesty strategy. Say, when the true grade is 7, some sellers honestly say that the grade is 7, but without using a grading service. Third, for the strategy of revealing lower quality using certification, sellers reveal the actual grade of their cards and show certification. For example, when the actual grade is 7, these sellers honestly claim that the grade is 7, and show a professional grading. During this analysis, other continuous variables and dummy variables are fixed at mean and zero, respectively.

By comparing these strategies, we can check if there is an incentive for sellers to honestly reveal low quality. For example, let's say there is a collectible baseball card which has an actual grade of 7. Then, a seller can select one of three strategies as follows: he either falsely claims the grade to be 7.5, shares the correct (lower) grade of 7 with no certification, or discloses the correct grade of 7 but with certification. According to our results, if a seller falsely claims the value of this card as 7.5, without using a grading service, the number of bidders is predicted to be 2.23. If this seller reveals the correct grade of 7 without certification, then the demand is predicted to be 1.98, which is smaller than the demand from false quality claim. On the other hand, if the same seller gets the grading service, it is estimated to rise to 2.25, which is higher than the predicted demand with falsely claiming higher quality. Therefore, the estimated demand from our analysis shows that the demand for those products disclosing low quality and reducing risk can be bigger than the demand for the products falsely claiming high quality. Although honest revelation of low quality is not generally believed to be an appropriate strategy to achieve an instant increase in sales when there is information asymmetry, our empirical analysis of online market shows that sellers can immediately increase demand by revealing information about low quality when customers feel high perceived risk, which suggests that there exists an economic incentive for low-quality sellers to reveal quality information.

However, in the case of baseball card, the economic incentive is rather small, since the incentive from revealing low quality using certification is not as high as the incentive from falsely exaggerating the grade by, for example, one. Therefore, when the true quality is 8, falsely claiming the quality as 9 provides a higher incentive (predicted demand of 3.19) to the seller than revealing low quality using certification (predicted demand of 2.86). Table 3 summarizes these results on economic incentives. The finding that the incentive for revealing low quality is relatively small in the baseball card market may be related with Jin and Kato (2006)'s finding that many sellers actually overstate their products' value and achieve high profit in the market for baseball card.

Table 3: Estimated Demand of Baseball Cards

Estimated Demand When	Actual Quality of Card				
	7	7.5	8	8.5	9
Fraudulently increasing the grade by one half (i.e., +0.5)	2.23	2.51	2.83	3.19	3.59
Disclosing true quality					
Without certification	1.98	2.23	2.51	2.83	3.19
With certification	2.25	2.54	2.86	3.22	3.62

Notes: All other continuous variables are fixed at mean values and all other dummy variables are fixed at zero.

3.3.2.2. Coins

In the coin case, the coefficient for professional grading is estimated to be 0.355. Therefore, the number of bidders increases by $e^{(0.355)} \approx 1.427$ if the coin is graded professionally. However, this effect is insignificant, and it is inconsistent with Jin and Kato (2006)'s finding that a higher claim helps sellers even though the claim is false. In their paper, Jin and Kato (2006) have thus shown that dishonesty may help sellers, which is also somewhat consistent with our analysis of baseball card case. However, our findings on coin data seem to be different, as the seller claiming higher grade simply does not affect buyers' behavior. In other words, there does not seem to be any economic incentive for sellers in the coin market to overstate quality, possibly because of intense information asymmetry.

We can check this argument as follows. Just as with the baseball card case, we have examined the estimated demand in three strategies: i) falsely claiming high quality, ii) disclosing low quality with no certification, and iii) disclosing low quality using certification. During this analysis, other continuous variables and dummy variables are fixed at mean and zero, respectively.

Let's say there is a coin which has a grade of 55. Then a seller can pursue one of three strategies as mentioned above: he either falsely claims the grade to be 60, reveals the correct grade of 55 with no certification, or reveals the correct grade of 55 with certification. Based on the result of our analysis, regardless of if a seller falsely claims the value to be 60 or shares the correct grade of 55, both without using a grading service, the number of (unique) bidders is predicted to be 2.59. Therefore, there do not exist any incentives for sellers of coins to overstate quality, which is contrary to the finding of Jin and Kato (2006) and our own analysis of baseball card case. On the other hand, when a seller shares the correct grade of 55 and shows the professional grading, the demand is predicted to increase to 3.7, which is higher than the predicted demand when a seller claims higher quality. Therefore, the prediction from our empirical analysis presents that the demand of the product revealing low quality and reducing risk can be bigger than the demand of the product falsely claiming high quality. This confirms that a seller can immediately increase demand by revealing low quality in an online market, which suggests that certain economic incentives exist for sellers to honestly reveal low quality. Unlike baseball card market, any quality claim by a seller does not have an impact on buyer behavior if it is not supported by certification, and it shows that there exists even stronger incentive for honest disclosure of low quality in coin market. Table 4 summarized these economic incentives.

Table 4: Estimated Demand of Coins

Estimated Demand When	Actual Quality of Coin			
	50	55	60	65
Fraudulently increasing the grade by five (i.e., +5)	2.59	2.59	2.59	2.59
Disclosing true quality				
Without certification	2.59	2.59	2.59	2.59
With certification	3.70	3.70	3.70	3.70

Notes: All other continuous variables are fixed at mean values and all other dummy variables are fixed at zero.

4. Discussion

So far we have examined the question of whether honestly disclosing lower quality or falsely claiming higher quality is better for sellers, focusing on market demand. Although the sizes differ, we have shown that there exist certain economic incentives in online markets for revealing low quality throughout all product categories that we analyzed. First, in the market for baseball card, the incentive for revealing low quality is relatively small while the incentive for falsely claiming high quality is relatively large, which may encourage baseball card sellers to exaggerate their quality, similar to the findings from Jin and Kato (2006). However, with the coin case, there exists almost no incentive for falsely claiming high quality and the incentive for revealing low quality is thus apparent. According to these results, although its impact differs depending on the market circumstances, a third-party certification provides certain incentives to low-quality sellers to reveal quality information. Therefore, we can say that the result from our analysis basically shows a counterintuitive result: low-quality online sellers can actually increase demand by fully disclosing negative information, if appropriate risk intermediaries are employed. In our analysis, the certification turns out to be an effective signaling mechanism and thus provides certain incentives to low-quality sellers to fully reveal quality information online.

However, the result of this paper also presents some issues that may restrict these results to be directly applied to real market situations. First, the size of economic incentives in certain product categories may not be sufficient to encourage sellers to voluntarily reveal negative aspects of their products and solve adverse selection issues. As is shown above, a seller in those product categories may ignore those small incentives for being honest and instead simply take advantage of the information asymmetry in their markets. Second, the inconsistent results from different product categories may prevent the results to be generally applied to other product categories, as the effect of revealing low quality quite differed between two product categories that we analyzed. If that is the case, it is not advisable for managers in many different industries to employ the results of our study, without more generalized findings about the incentives. Third, while the accuracy of certification used in our study was relatively high, many risk intermediaries actually suffer from various issues which may damage their reliability such as noise in the data-gathering, imprecise standards, and the conflict of interest (Dranove and Jin, 2010). If quality certifications are not accurate for some reason, then their role of reducing perceived risk may not be dependable either, and economic incentives for revealing low quality may be negligible.

5. Conclusion

In many markets with information asymmetry, whether to share negative information with customers is a clear dilemma for sellers, and this dilemma is even stronger in online markets where buyers experience higher perceived risk. Therefore, if online sellers claim higher than actual quality, purchase intention of buyers may not be strong since the quality claim isn't credible. On the other hand, if online sellers fully reveal negative information, purchase intention of buyers can still be weak

because of revealed low quality. In spite of this common dilemma for sellers, the literature has not fully investigated this potentially positive effect of sharing negative information with customers. This study has thus attempted to provide practical guidelines for sellers dealing with negative product information, through examining whether, how, and when revealing low quality helps sellers in an online market. More specifically, by measuring the effects of negative information on demand with the sales data of collectible goods from one of the major online auctions in the U.S., we have shown that there exists economic incentive for low-quality sellers to voluntarily disclose negative information about their products and that this economic incentive differs according to the market circumstances of different product categories.

Therefore, the observation from this study contributes to the understanding of information disclosure in markets under information asymmetry. More specifically, it has shown that the certification may provide appropriate incentives to online sellers so that they can voluntarily disclose low quality, encouraging full disclosure. As the incentive to disclose low quality has rarely been studied so far, this finding provides a unique perspective to the related literature, generally supporting voluntary disclosure. However, the size of this incentive might differ depending on product categories, and the context of the market situation may thus affect the incentive structure for information disclosure. The findings from this study also provide managerial relevance to related literature by verifying the economic incentive for honest disclosure with real market data, and the dimensions covered in this study may provide meaningful public policy suggestions to solve fraud issues happening in online markets where information asymmetry is high, as establishing a solid quality assurance is found to encourage voluntary quality disclosure even from low-quality online sellers.

We hope that future studies continue to investigate the findings of this paper and examine the sellers' incentives for honesty under various other settings, both theoretically and empirically. More specifically, the issues of insufficient incentives for revealing low quality, inconsistent effects in different product categories, and inaccurate quality certification can be addressed in the following studies.

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