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Product Quality Uncertainty in Online Auction Marketplaces: Overcoming Adverse Product Selection with Price Premiums

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ABSTRACT

To overcome a market of ‘lemons’, online auction marketplaces must be able to differentiate among products and generate price premiums for high-quality ones. Still, the literature has only focused on seller quality uncertainty (seller reputation), alas ignoring the role of *product quality uncertainty*, which is defined as the degree by which the outcome of the transaction cannot be accurately predicted due to fears that product quality may differ from what is expected. This is especially problematic for used products where product quality uncertainty is often greater. To overcome adverse product selection, this study first introduces four product-related variables (inspection, warranty, value, and attributes) that impact price premiums, and it also proposes their interaction effect with seller reputation. The proposed model will be tested with secondary data from used cars on eBay Motors. Implications for mitigating product quality uncertainty and preventing a market of ‘lemons’ are discussed.

Keywords:

Product Quality Uncertainty, Seller Quality Uncertainty, Online Auctions, Price Premiums

INTRODUCTION

The physical separation between buyers and sellers in online auction marketplaces, such as eBay, creates major uncertainties for buyers since they cannot physically inspect and evaluate the products they purchase. Whereas buyers in physical markets can evaluate a product’s quality by “kicking the tires,” online buyers must evaluate product quality through the web interface. Product quality uncertainty is defined as the degree by which the outcome of the transaction cannot be accurately predicted due to fears that product quality may differ from what is expected. Product quality uncertainty makes it difficult for buyers to select high-quality products due to information asymmetry (Kirmani and Rao, 2000), thereby raising the possibility for adverse product selection.

Price premiums for superior products are essential for the survival and success of online auction marketplaces since lack of product differentiation would force high-quality products to flee the marketplace as their quality could not be rewarded, thus resulting in a market of ‘lemons’ (Akerlof, 1970). Hence, product quality uncertainty and adverse product selection can have a fatal impact on online auction marketplaces if products cannot be differentiated to result in price premiums for superior ones. Therefore, this study first examines the negative impact of product quality uncertainty on price premiums.

Despite concerns for adverse product selection, the literature on online auction marketplaces has predominantly focused on seller quality uncertainty, focusing on understanding how seller reputation (primarily from superior feedback scores) results in buyer’s trust and price premiums (e.g., Ba and Pavlou, 2002; Dellarocas, 2003; Pavlou and Gefen, 2005). In contrast, research on understanding and mitigating product quality uncertainty is scarce. The literature has examined the perceptual construct of perceived product diagnosticity (Jiang and Benbasat 2004), described as the extent to which a buyer believes that a website is helpful in terms of evaluating a product. However, research that specifically focuses on overcoming adverse product selection through objective product quality signals is still at its infancy. Therefore, the study’s second objective is to understand how product-related factors, specifically product inspection, product warranties, product value, product characteristics (e.g., product price, year, and used car mileage) can act as signals that convey useful product information, and in doing so, to reduce product quality uncertainty and prevent adverse product selection. Third, this study aims to understand the interaction between seller and product quality uncertainty, aiming to examine how seller reputation through feedback ratings interrelates with the proposed product related-factors to predict price premiums. We propose product quality

uncertainty to be more problematic when dealing with low quality sellers that may intentionally misrepresent the product’s conditions through false signals to get higher prices. Finally, while the literature has mostly examined on new and inexpensive commodity items, this study aims to study used and expensive specialty products (used cars).

The proposed research framework (Figure 1) represents a comprehensive set of seller and product related factors and how their interactions predict price premiums (controlling for auction related factors). The proposed model will be tested with secondary data from used cars on eBay Motors.

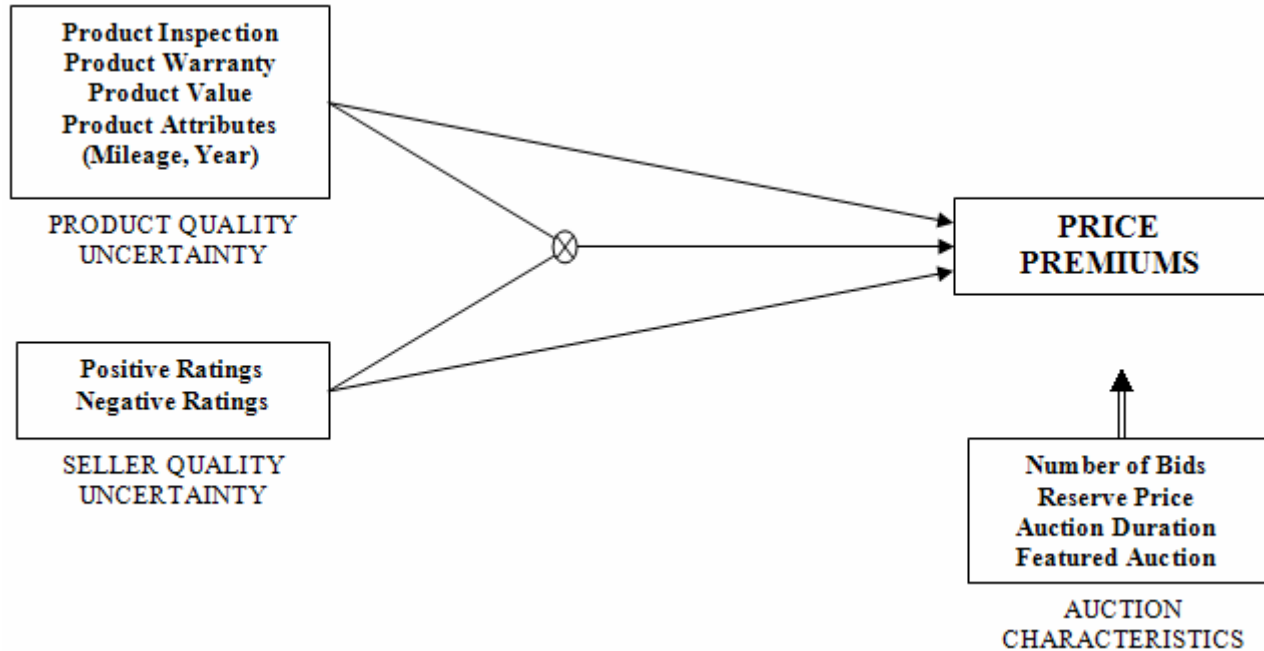


Figure 1. The Proposed Research Framework

The study’s primary contribution is to introduce product quality uncertainty as an important antecedent of price premiums, aiming to show that overcoming adverse product selection through product information can have a positive effect on a product’s price premium (accounting for seller feedback scores and controlling auction characteristics).

CONCEPTUAL DEVELOPMENT

Price Premiums

Price premiums are defined as the result of high prices that lead to above-average profit for the same product (Shapiro, 1983). Applied to online auction marketplaces, price premium is defined as the monetary amount above the average price received by multiple sellers that sell a perfectly duplicate product during a finite period (Ba and Pavlou, 2002). As mentioned above, price premiums represent an important element to the survival and success of online auction marketplaces, and they are herein proposed as this study’s ultimate dependent variable.

In this study, since all used cars are unique, it is not possible to obtain the price premium by using the average price. Instead, we match each used vehicle sold on eBay with the corresponding market value for a car with the exact same characteristics (year, mileage, options) given by Edmunds (www.edmunds.com).¹ The standardized difference from the market value is the price premium.

¹ Edmunds provides an estimated value of used cars given some standard characteristics (model, year, mileage, options); however, the car’s true condition and actual quality cannot be evaluated through Edmunds.

Product Quality Uncertainty

All transactions have a certain degree of uncertainty about their outcome, and buyers cannot accurately predict whether a transaction will be fulfilled successfully. In buyer-seller relationships, quality uncertainty is defined as the degree to which the outcome of a transaction cannot be accurately predicted by the buyer due to the seller- and product-related factors. Uncertainty consists of *seller quality uncertainty* (seller hiding its true attributes, making false promises, or defrauding), and *product quality uncertainty*, the degree by which the outcome of a transaction cannot be accurately predicted by the buyer.

Following the adverse selection problem (Akerlof, 1970), product quality uncertainty arises due to hidden information regarding the true quality of a seller's products, given that product information is asymmetrically distributed between buyers and sellers. Information asymmetry has been recognized as a common (hidden information) problem in buyer-seller relationships in which sellers usually possess more information than buyers (Mishra *et al.*, 1998). This brings buyers in a disadvantaged position as they are faced with a pool of products with potentially undesirable characteristics. In other words, buyers cannot easily discriminate the "cherries" (high quality products) from the "lemons" (low quality products).

Product quality uncertainty has a negative effect in online auction marketplaces. Dewan and Hsu (2004) showed that buyers give a 10-15 % adverse selection discount on their prices for stamps on eBay's auctions compared to traditional auctions. Accordingly, Wolf and Muhanna (2005) concluded that online car auctions lead to adverse selection problems, and thereby lower prices compared to traditional used car prices. In their analysis of used cars, Garicano and Kaplan (2001) showed that adverse selection problems in online auctions are similar to traditional car auctions, which were deemed to be pervasive. Product quality uncertainty and adverse product selection are thus important problems with implications for price premiums.

What Reduces Product Quality Uncertainty?

Buyers can reduce product quality uncertainty and prevent adverse product selection by obtaining accurate information about a product's true quality. One of the most prominent means to reduce the hidden information problem is through *signals*.² Signals are designed and sent by sellers to disclose the private information about their true quality of their products. In turn, buyers examine these signals to assess their value, content, and credibility in order to assess a product's true characteristics. A set of signals is herein proposed to reduce product quality uncertainty:

Product Inspection

Product inspection by an independent third party is a signal that conveys credible information about a product's true quality. In doing so, it reduces product quality uncertainty and helps buyers select high-quality products. Moreover, in a related study, Emons and Sheldon (2002) examined inspection records of used vehicles and found that the vehicles sold by private parties (which were not required to be inspected) were more likely to have defects than vehicles sold by dealers who were required to submit an inspection report. Recognizing that higher quality vehicles are likely to be inspected, buyers would feel less uncertain about car's true quality if the product is independently inspected,³ and they would be more likely to pay a premium.

Product Warranty

Product warranty is a tangible pledge by the seller that the product will adhere to some posted specifications. For example, used cars are often sold with warranties against defects or promises to repair any problems. Product warranty is a signal that the product is of high-quality, and also an incentive for the seller to sell a high-quality product to prevent returns or repairs. Viewing this signal, buyers would perceive the product as less uncertain, and thereby be willing to offer a price premium.

Product Value

The higher the product's expected value, the higher the degree of uncertainty given the monetary loss assumed by the buyer. Therefore, more expensive products are likely to be viewed as more uncertain, and thereby receive a price discount.

Product Attributes

The product's inherent characteristics can be viewed as signals that reveal a product's hidden information. Avery *et al.* (1999) showed the more information is available, the less the uncertainty about the product's true quality is. For example, important characteristics about a used car include year built and mileage. Older cars with many miles can be viewed as more uncertain since their true condition cannot be easily assessed. Therefore, they are likely to receive a price discount.

² In theory, effective signals must be credible, visible, unambiguous, and differentially costly to allow high-quality products to differentiate from low-quality ones.

³ Since the inspector is selected by the seller, we expect an interaction effect between seller reputation and product inspection.

Seller Quality Uncertainty and Price Premiums

The literature on online auction marketplaces has emphasized seller quality uncertainty, focusing on how seller reputation (primarily from numerical feedback ratings) results in buyer's trust and price premiums (e.g., Ba and Pavlou, 2002; Dellarocas, 2003; Pavlou and Gefen, 2005). Recent studies have also found a significant association between a seller's positive and negative feedback ratings and auction prices (Dewan and Hsu, 2004; Wolf and Muhanna, 2005). Therefore, seller feedback ratings are expected to predict price premiums.

Interaction Effects between Product and Seller Characteristics

Product and seller quality uncertainty are inter-related constructs since sellers have the opportunity to misrepresent the true quality of their products or deliver products that differ from their posted description. Therefore, we examine the interaction effects between product and seller characteristics. In the literature, Genesove (1993) examined adverse selection in the used car market by comparing used cars auctioned by new car dealers (who sell both new and used cars) with car dealers of only used cars. In this setting, new car dealers sell a much greater percentage of their used cars (regardless of product quality) than used car dealers, who are more likely to retain and retail better quality trade-ins. Consistent with adverse selection theory, Genesove finds that seller reputation affects used car prices, showing that new car dealers (who are perceived as more reputable) receive higher prices than used car dealers (who are perceived as more uncertain) for equivalent cars. Accordingly, Avery et al. (1999) showed that reputable sellers did not need to disclose as much information about their products compared to less reputable sellers who had to disclose more information to reduce the product quality uncertainty.

Control Variables

In addition to product and seller characteristics (and their interaction effects), auction characteristics may also have an impact on price premiums. Therefore, we control for the number of auction bids, the existence of reserve prices, the auction's duration, and whether the auction is advertised as a featured auction.

RESEARCH METHODOLOGY

The proposed model will be tested with secondary data from over 300,000 completed auctions of used cars on eBay Motors. Using advanced text mining tools, we collected multiple data from completed auctions, including highest winning bids, seller's feedback scores (positive and negative ratings), reserve prices, auction duration, number of bids, featured auction, among others. Most important, we collected detailed information about the advertised used car, including product inspection, warranties, and product characteristics (year, mileage, model, VIN, options, location, color, etc.). This information enabled us to match each used vehicle to its corresponding market value, as provided by Edmunds (www.edmunds.com). In doing so, we were able to obtain a comparable price premium value for all used cars, enabling us to make comparisons across products. In terms of differences in geographic location, since virtually all used cars are shipped across the United States for a comparable fee (\$500), shipping costs for all products in our sample is considered to be a constant.

To the best of our knowledge, this is the first study to obtain price premiums for used products. Previous research has used brand new items to calculate price premiums by subtracting the product's highest winning bid from the average price from multiple perfectly duplicate new products (e.g., Ba and Pavlou, 2002). However, this calculation is impossible for used cars that are all unique and not perfectly duplicate. Therefore, obtaining and matching each used car's detailed characteristics with Edmunds' market value data for used cars allows us to obtain a comparable price premium value for each car. Moreover, whereas previous research has used a small number of completed auctions (e.g., Wolf and Muhanna, 2005), this study will use data from over 300,000 completed auctions, thereby allowing a much higher power of econometric analysis.

Specifically, the proposed model will be tested with econometric analysis, using the following equation:

$$PP = a_0 + b_0 * INSP + b_1 * WARR + b_2 * VAL + b_3 * YEAR + b_4 * MIL + b_5 * S_POS + b_6 * S_NEG + b_7 * CONTROLS + \epsilon_0$$

Where: PP:	Price Premium (Highest Winning Bid – Edmunds obtained market value for exact used product)
INSP:	Product Inspection (whether product was inspected by independent third-party inspector)
WARR:	Product Warranty (whether product carries a warranty)
VAL:	Product Value (Edmunds obtained market value for exact used product)
YEAR:	Year Used Car was manufactured
MIL:	Used Car Mileage
POS/NEG:	Seller's Positive and Negative Feedback Ratings
CONTROLS:	Control Variables (Auction Bids, Reserve Price, Auction Duration, Featured Auction)

Moreover, we will examine a multivariate regression model with the interaction effects between the product's characteristics (e.g., inspection, warranty, and value) with the seller's characteristics (positive and negative feedback ratings).

The data analysis and results of these econometric models will be available for presentation at AMCIS.

CONCLUSION

To prevent a market of 'lemons', online auction marketplaces must not only differentiate among sellers, but they must also differentiate among products and reward high-quality ones with price premiums. Failure to differentiate between high-quality and low-quality products will force high-quality products to exit, resulting in a market of only low-quality products. Therefore, product quality uncertainty and adverse product selection are fundamental issues for online auction marketplaces, and any means for differentiating among products has implications for the survival and success of online marketplaces. Following the logic of signals, we propose four product-related variables (inspection, warranty, value, and attributes) that influence price premiums (accounting for seller quality characteristics). Moreover, we propose that product and seller interaction effects are likely to have an impact on price premiums (controlling for auction characteristics).

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