The Role of Information Search Cost on Seller's Disclosure of Negative Information

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정보 검색 비용이 판매자의 부정적 정보 공개에 미치는 영향에 대한 연구

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Abstract This study has attempted to provide an important understanding about the information asymmetry in markets through empirical analysis on how the disclosure of low quality can increase demand even in the short run. More specifically, this study has extended the previous findings from the related literature by considering the effect of information search cost and providing empirical evidences about the effect of voluntary disclosure of low quality, using an experimental method with purchase scenarios. The results from our analysis show that reduced perceived risk have an important effect on sharing negative information, while the effect of information search cost is minimal. We also explain the circumstances whereby the information disclosure of a seller with low-quality product can enhance not only the seller's profitability but also customers' welfare by increasing the market demand and the demand for the seller claiming high quality.

Key Words : Information asymmetry, negative information, lemon market, perceived risk, information search cost

요 약 본 논문은 부정적 정보의 공개가 어떻게 단기간에 판매자의 수요를 증대시킬 수 있는지에 대한 경험적 분석을 통해 시장의 정보 불균형에 대한 중요한 이해를 제공하고자 한다. 이를 위해 본 연구는 기존의 관련 연구 결과에 더하여 정보 검색 비용이 부정적 정보 공개에 미치는 영향을 예측하고, 이러한 해석에 대하여 가상의 시장 거래를 통한 실험적 분석을 실시한다. 본 연구의 결과는 구매 위험도가 부정적 정보 검색에 중요한 역할을 하고 있는 반면 정보 검색 비용의 효과는 크지 않음을 나타내며, 특히 실험의 결과는 저품질의 제품을 판매하는 판매자가 어떻게 정보 공개를 통해 자신의 수익성 뿐 아니라 시장과 경쟁 제품의 수요를 증대시켜서 소비자 효용을 증대시킬 수 있는지를 보여준다.

주제어 : 정보 불균형, 부정적 정보, 레몬시장, 위험 인식, 정보 검색 비용

1. Introduction

In a recent "Dieselgate" scandal, one of the largest automakers in the world had programmed their cars' diesel engines so that the emissions controls only worked in the laboratory, but not in actual driving setting. Therefore, they deceived not only the United States Environmental Protection Agency but also many customers who were sensitive about the effect of

emissions on the environments. In this case, customers were never able to figure out the actual level of the emissions on their cars because they did not have necessary knowledge or tools to correctly evaluate them. As such, in many product categories, buyers have less information about the quality of products than sellers and this can cause the issue of adverse selection or unexpected loss from purchase.

Since the classic "lemon market" paper by Akerlof [1], the literature has analyzed the issue of information asymmetry from various perspectives, focusing on the tension between the sellers trying to hide any negative information about their products and the customers searching for necessary information before purchase. On the one hand, the literature has generally agreed that it does not help sellers to reveal any negative information about their products [2], which is also common knowledge for many sellers. On the other hand, the literature has also shown that hiding negative information might not always be the best strategy for sellers, if we consider the impact from perceived risk of purchase. From the seminal work by Bauer [3], the perceived risk has been considered to have an important effect on consumer choice as the possibility of unexpected loss from purchase may reduce buyer's intention to purchase [4-8]. According to their findings, if sellers do not disclose possible weaknesses of their products, consumers may perceive the risk of purchase and hesitate to make purchase. Therefore, hiding negative information may not help sellers if it increases perceived risk of buyers and negatively affects purchase intentions. Instead, sellers may utilize risk intermediaries (such as quality certification) in order to disclose negative information and decrease perceived risk of buyers. In this regard, whether

to reveal true quality can be a major dilemma for those sellers with low-quality products. When buyers cannot estimate the quality, should sellers disclose low quality through quality certification, or falsely claim high quality? Which strategy helps sellers more?

To delve into this question, this study attempts to extend the findings of Huh [9], which is one of a few academic works on the short-term effect of voluntary disclosure of negative information. More specifically, while the original study has used an analytic model to show that a seller can increase his own demand through revealing low quality even in the short run because of reduced perceived risk of buyers, it did not provide any empirical evidences about its findings. Moreover, the original study also overlooked the effect of information search cost, although the size of information search cost in the market may affect the information disclosure of sellers. Our study thus seeks to complement the related literature by the following directions. First, we consider the impact of information search cost on how revealed information affects market outcomes. Second, we empirically verify its results through experimental analysis in order to check if the findings from the analytic model actually happen in reality.

We believe our study not only complements the related literature, but also contributes to the field and the academia by providing more detailed understanding about the effect of voluntary disclosure of negative information.

2. Predictions

2.1 Primary Findings

In this section, we first review the results from Huh [9] and summarize its findings. As is mentioned above, the paper provides unique

perspective to the related literature by showing how sharing negative information helps sellers in the short run, focusing on the effect of perceived risk. More specifically, the study presents various types of circumstances where the information disclosure of low-quality seller achieves increased sales and affects market demand and the demand for the competitor's product. The basic reason behind its results is the fact that customers can save information search cost if a seller voluntarily reveals negative information and reduces perceived risk. More specifically, their finding shows that, when the seller voluntarily reveals negative information in a duopoly market, the demand for low-quality product may increase if it has low perceived risk and relatively high quality. The market demand can also increase with this information disclosure depending on the level of perceived risk and quality of the low-quality product, and it also shows how the demand of the competitor's product (i.e., high-quality product) may be impacted with this information disclosure in a duopoly market. Table 1 summarizes their main findings on the impact of revelation of low quality.

Table 1. Primary Findings on the Impact of Disclosing Low Quality [9]

Affected Demand	Conditions for Bigger Impact	
	Perceived risk of low-quality product	Claimed quality of low-quality product
Low-quality product	Lower	Higher
Market	Lower	Higher
High-quality product	Higher	Lower

In the next section, we extend this primary result by considering the effect of information search cost, as it is believed to be an important factor affecting seller's information disclosure.

2.2 The Effect of Information Search Cost

Information search is an often-used risk-reduction method as customers usually try to decrease the probability of loss rather than the size of loss [10-13] when dealing with perceived risk, and the probability of loss decreases with more information. Moreover, when consumers make decisions about information search in a market under information asymmetry, information search cost plays an important role. More specifically, according to the economics literature, consumers compare the benefit and cost of information search and decide whether to do information search [14]. Accordingly, consumers tend to engage in information search more with lower information search cost, while they rather not search for information with higher information search cost even when the benefit from new acquired information is same. Several studies on consumer behaviors on the Internet have also found out that high search cost discourages information search, even when consumers need certain information before purchase [15-17]. This means that consumers sometimes give up information search and cannot obtain certain necessary information due to high information search cost. Therefore, we can conjecture that the impact of seller's voluntarily shared information on consumers' purchase decisions is bigger when the information search cost is higher. In other words, consumers would appreciate seller's information disclosure less when information search cost is lower, since they can choose to do information search by themselves and do not need seller's information disclosure as much, according to their cost-benefit analysis of information search.

In terms of the information search cost of products, the classical economics literature has

defined different types of product attributes based on the availability of information and the information search cost. More specifically, when customers can evaluate certain product attributes before purchase, such product attributes are "search" attributes, while customers can figure out the quality of "experience" attributes only after purchasing and using the product [18]. Moreover, there are also certain product attributes that customers can never estimate even after purchase, and Darby and Karni [19] have defined them as "credence" attributes. Therefore, most concerns regarding the information asymmetry in markets are related with either experience or credence attributes of products. For example, the emissions level of cars can be considered as a credence attribute as buyers will never be able to figure it out even after purchase, and this is how it caused one of the biggest market frauds in history. As key differences between search, experience, and credence attributes are how easily customers can find related information, information search cost is a major element in this classification. Therefore, consumers in a market under information asymmetry would behave differently depending on whether they are purchasing search, experience, or credence products.

Even with the importance of understanding the information search cost in buyer-seller interactions under information asymmetry, Huh [9] has not included this element in its analysis. Therefore, in this paper we have extended its primary findings by considering the impact of information search cost with respect to the results from the original model. More specifically, we consider the search cost of credence attributes to be extremely high, because, by definition, customers can rarely find out the information about credence attributes both before and after purchase. On the other hand, we regard the search cost of search or experience attributes to be smaller than the search cost of credence attributes. As is explained above, when the cost to obtain related information is high, then any information voluntarily revealed by sellers might affect consumer behavior stronger than the case when the information search cost is low and customers can easily find out related information. In other words, as consumers' decisions on information search is affected by the cost and benefit of information search [14, -17], their behaviors may not be affected by the revelation of low quality as much if they can easily find related information (i.e., search or experience attributes) while seller's voluntary disclosure might have a considerable impact when customers cannot figure out the actual quality by themselves (i.e., credence attributes). In short, consumers' purchase decisions may be affected by sellers' information disclosure more with higher information search cost.

We apply this logic to establish our predictions on the market outcomes from the revelation of low quality, and then observe the actual impact with our experimental analysis. By examining how market outcome changes between search, experience, and credence products, we aim to understand how information search cost affects seller's incentive for information disclosure.

2.3 Propositions

Based on the discussion above, we can extend the primary findings of Huh [9] with respect to how information search cost affects market outcomes and come up with the following propositions. These propositions are based on the assumption of a duopoly market where one seller has a high-quality product

while the other seller has a low-quality product.

We use the definition of "information collusion" [9] to refer to the case when both firms claim high quality and the low-quality seller thus does not disclose its quality in this duopoly market. We call this information collusion since we might consider this as both firms engaging in tacit collusion on negative information sharing, and it can be found in many real markets with experience or credence attributes. By comparing the market outcomes between information collusion and no information collusion, our propositions predict the actual impact of the revelation of low quality. More specifically, the propositions describe what might happen to market outcomes when one firm breaks information collusion and starts to honestly reveal low quality.

Here we establish three propositions about the demand for low-quality product, market demand, and the demand for high-quality product, respectively, focusing on the effect of perceived risk and information search cost.

Proposition 1. *If a low-quality seller discloses its quality in a duopoly market where sellers originally engaged in information collusion, the change in low quality seller's demand will be larger as the low-quality products' perceived risk is smaller and the low-quality product's claimed quality level is higher, and the absolute size of the change will be bigger with higher information search cost.*

Proposition 2. *If a low-quality seller discloses its quality in a duopoly market where sellers originally engaged in information collusion, the change in market demand will be bigger as the low-quality products' perceived risk is smaller and the low-quality product's claimed quality level is higher, and the absolute size of the*

change will be bigger with higher information search cost.

Proposition 3. *If a low-quality seller discloses its quality in a duopoly market where sellers originally engaged in information collusion, the change in the demand of the competitor will be larger as the low-quality products' perceived risk is higher and the low-quality product's claimed quality level is lower, and the absolute size of the change will be bigger with higher information search cost.*

In the next section, we verify if these predictions actually happen in real market situations, based on the observation of experimental data.

3. Experimental Analysis

We now analyze information disclosure's impact on actual market demands by examining customer choices in laboratory experiments with the purpose of providing answers about exactly how our theories are correct or wrong [20].

3.1 Experimental Procedure
3.1.1 Overview
In order for the experiment, we suggest certain purchase situations to participants and observe their purchase choices, following many other marketing studies [21, 22, 23, 24, 25]. Using this scenario method fits our purpose since it allows us to control variables and contexts which is not possible in a real market data [23], avoid any bias from selecting a real seller in the market [26], and investigate all subjects with one standardized stimulus [25].

3.1.2 Design of Experiment
We use 2-by-2 between-subjects design to

check our theoretical findings about low-quality sellers' incentives to disclose negative information as this design is useful to discover an intervention of two factors. More specifically, a 2x2 experimental design enables us to efficiently test whether the dependent variable is affected by the level of perceived risk and/or the size of information search cost. During the experiment, each participant is randomized to one of four scenarios and the main effects are assessed using a two-way ANOVA. Moreover, unlike most other observational market data, the experimental method enables us to control these key factors of our discussion (i.e., perceived risk and information search cost).

We select a used-car market as our target product since the context of purchase matches the objective of this study; the information asymmetry between sellers and customers in the used car market is evident, and the products in this market has various perceived risk levels. Therefore, perceived risk is manipulated in our experiment as follows. First, in the low risk case, the seller offers the third-party certification (from manufacturers or car mechanics) to reduce perceived risk. Second, in the high risk case, the sellers do not offer any types of third-party certification. We also control the information search cost as follows. First, in a high-cost situation (i.e., credence attributes), negative information is about the car's past accident history. Second, in a low-cost situation (i.e., experience attributes), negative information is about the noise of the car. The contrast between past accident history and the noise shows different levels of information search cost, as past accident history is a credence attribute which has very high information search cost and the car's noise is an experience attribute which has a moderate level of information search cost. In the experiment, the negative information disclosed by the seller in either case is not so serious that customers would consider it as a product failure and give up purchasing. The actual negative information provided to the participants in the experiment is as follows. In the high search cost case, the car had 'one minor accident in the past', and in the low search cost case, the car has 'a little noise which is not from the engine'. This experimental design is shown in Table 2.

Table 2. 2×2 Experimental Design

	Search Cost	
	Past accidents (Credence attributes)	Noise (Experience attributes)
Perceived Risk:		
Without Certification	▪ High perceived risk ▪ High info search cost	▪ High perceived risk ▪ Low info search cost
With Certification	▪ Low perceived risk ▪ High info search cost	▪ Low perceived risk ▪ Low info search cost

The subjects consist of college students at a public university. 154 subjects were observed in each experimental setting, and thus 616 subjects were observed in total. The scenarios in this experimental analysis went as follows. First, each participant was asked to choose which product he would like to purchase when two used-car sellers claim high quality (information collusion). Second, we then ask each participant again which product he would like to purchase when one of those two used-car sellers voluntarily reveal low quality (no information collusion). In both information collusion vs. no information collusion situations, the participants could also choose not to purchase any products, so that we could observe the size of market demand. During this

experiment, both used-car sellers were selling exactly same products (same model, year, color, etc) and the only difference was related with whether the seller revealed low quality or not.

We collected participants' responses in four different scenarios of 2-by-2 design to observe how the low-quality seller's information disclosure affects demand depending on the key factors of our propositions. Based on observing participants' purchase decisions during the experiment, we can investigate how varying levels of perceived risk of customers and information search cost of products affect various market outcomes (demand for low-quality products, market demand, and demand for high-quality products) when a low-quality seller voluntarily reveals his quality information

3.2 Results

We can examine whether our predictions match what we observe in reality by analyzing the experimental results. More specifically, we have investigated the impact perceived risk and information search cost have on the change in demand between two markets (between information collusion and no information collusion) so that we can check whether revealing low quality helps the seller. We would thus like to analyze what happens if one of two sellers deviates from the information collusion situation by voluntarily disclosing its low quality.

3.2.1 Impact on Low-Quality Product's Demand

The most important prediction of this study comes from the Proposition 1, as it has illustrated how disclosing low quality affects the demand for the low-quality product. According to the proposition, the change in the demand for low-quality products will be higher with lower perceived risk, and the size of it will be bigger with higher information search cost of

the related product. By analyzing the results of the experiment, we can check whether low-quality seller's disclosure shows the predicted impact patterns. Table 3 shows the change in demand of the low-quality product when the low-quality seller discloses its own quality in the experiment.

Table 3. Change in Demand of the Low-Quality Seller

| | | Information Search Cost | | | |
		High	Low	F	Sig.
Risk	Without Risk Reducer:				
	Change in Demand	−3	−15		
	%p	−1.9	−9.7	17.64	0.149
	With Risk Reducer:				
	Change in Demand	55.5	36		
	%p	36	23.4		
	F	213.16			
	Sig.	0.043			

As shown above, the change in demand of the firm sharing negative information partially shows predicted patterns as it is smaller with higher perceived risk (23.4%p 〉 -9.7%p and 36%p 〉 -1.9%p), while the absolute size shows somewhat mixed results in terms of the size of search cost (36%p 〉 23.4%p but -1.9%p 〉 -9.7%p). The two-way ANOVA (the change in demand being the dependent variable) has shown that the impact of perceived risk ($F(1,1)$ = 213.16, p 〈 0.05) is significant, while the impact of information search cost ($F(1,1)$ = 17.64, p = 0.149) is not. This shows that, when a low-quality seller discloses quality information, the change in demand of the seller's product is significantly affected by the perceived risk of its own product. However, we cannot conclude that information search cost shows a meaningful impact on the seller's demand, which overall provides partial support for Proposition 1.

One important and interesting result is that

the low-quality seller can enjoy positive change in demand with the disclosure of its quality, if perceived risk is appropriately reduced. Therefore, it is believed from this result that full disclosure helps low-quality sellers if they can reduce perceived risk with that information disclosure, verifying the economic incentive for low-quality sellers to voluntarily disclose quality information. However, this result also demonstrates that a low-quality seller may lose customers by revealing true quality if he cannot reduce perceived risk sufficiently, regardless of the information search cost. Therefore, the low-quality seller's information disclosure depends on how effectively the risk intermediary works in reducing perceived risk.

3.2.2 Impact on Market Demand

Proposition 2 has provided predictions on how low-quality seller's information disclosure affects the market demand. Our analysis has shown that the change in market demand produced by the disclosure of low quality will be lower with higher perceived risk of the low-quality product, and the size of this change will be smaller when information search cost is lower. Table 4 shows the observed change in market demand with the disclosure of low quality.

Table 4. Change in Market Demand

| | | Information Search Cost | | | |
		High	Low	F	Sig.
Risk	Without Risk Reducer:				
	Change in Demand	33	24		
	%p	21.4	15.6	5.686	0.253
	With Risk Reducer:				
	Change in Demand	60	38		
	%p	39	24.7		
	F		9.947		
	Sig.		0.195		

As is displayed above, the market demand partially shows predicted patterns. The change

in market demand is lower with higher perceived risk (24.7%p 〉 15.6%p and 39.0%p 〉 21.4%p), and the size of this change is smaller with lower information search cost (39.0%p 〉 24.7%p and 24.7%p 〉 15.6%p). Nevertheless, the two-way ANOVA (the change in demand being the dependent variable) has shown that neither perceived risk ($F(1,1)$ = 9.947, p = 0.195) nor the information search cost ($F(1,1)$ = 5.686, p = 0.253) is significant. This means that the effect of the information disclosure of low-quality seller on market demand is strongly affected by neither the perceived risk nor information search cost, although the results from the experiment show predicted patterns for the impact of perceived risk. Therefore, the result does not provide any support for Proposition 2.

However, there is an important and interesting observation from this experimental result, as it is shown that market demand goes up in all situations if a low-quality seller reveals quality information, notwithstanding the change in two factors. Therefore, although the result does not support the proposition, it provides us with important implications and ideas about consumer welfare in a market with information asymmetry; low-quality seller's voluntary disclosure can help the entire market through attracting more customers, suggesting some interesting research questions regarding public policy and marketing.

3.2.2 Impact on High-Quality Product's Demand

Here, we also check the predictions regarding the change in demand of the product maintaining high-quality claim. More specifically, Proposition 3 has predicted the change in the demand of the product claiming high-quality to be lower with smaller perceived risk of the low-quality product, and the size of the change to be smaller when information

search cost is lower. By analyzing the experimental results, we can check whether the information disclosure of a low-quality seller has affected the demand for a high-quality seller as predicted. Table 5 displays the change in the demand of the product with high-quality claim observed from the experiment when a low-quality seller discloses its quality.

Table 5. Change in Demand for the High-Quality Product

		Information Search Cost			
		High	Low	*F*	*Sig.*
Risk	Without Risk Reducer:				
	Change in Demand	36	39		
	%*p*	23.4	25.3	0.008	0.942
	With Risk Reducer:				
	Change in Demand	4.5	2		
	%*p*	2.9	1.3		
	F		155.12		
	Sig.		0.051		

As presented above, the demand for the high-quality product partially shows predicted patterns. While change in demand for high-quality product is smaller with lower perceived risk (25.3%*p* 〉 1.3%*p* and 23.4%*p* 〉 2.9%*p*) as predicted, the pattern shows some mixed results for the information search cost (1.3%*p* 〈 2.9%*p* and 25.3%*p* 〉 23.4%*p*). The two-way ANOVA (the change in demand being the dependent variable) has presented that the perceived risk's effect ($F(1,1)$ = 155.12, *p* = 0.051) is almost strongly significant although the effect of information search cost ($F(1,1)$ = 0.008, *p* = 0.942) is not. This shows that the change in high-quality product's demand is significantly affected by the perceived risk of the low-quality product, while the information search cost's impact is inconsequential.

One important and interesting result is that high-quality product's demand always increases if a low-quality seller fully reveals quality information. This suggests that the information disclosure of low-quality seller even helps the competitor that maintains high-quality claim. We can assume that revealing low quality will drive relatively risk-insensitive customers away from the low-quality product, resulting in increased demand for the high-quality product.

3.3 Summary of Results

So far we have used experimental methods to test whether our propositions are consistent with real market situations, and examined if two factors of interest really have strong impacts on the market outcomes as predicted. Our experimental results have shown that, if a low-quality seller reveals quality information, the outcome of the market is significantly affected by the perceived risk of this low-quality seller while the impact of search cost is somewhat unclear. Table 6 summarizes the results of our experimental analysis.

Table 6. Summary of Experimental Results

	Demand of Interest	Prediction on Perceived Risk	Prediction on Information Search Cost
Prop 1	Low-quality product	Supported	Not supported
Prop 2	Market	Not supported	Not supported
Prop 3	High-quality product	Supported	Not supported

We can think of possible reasons why information search cost seems to have insignificant effects, as follows. First, we conjecture that the difference of information search cost the participants in the experiments observed between two situations (accident history and noise) might not have been sufficient. In other words, the participants may have perceived that figuring out the car's noise before purchase is as hard as finding out past

accident history, if without the help from someone who has sufficient knowledge about cars. The information search cost could thus have been similar between the low-cost and the high-cost conditions in the experiment, contrary to our intention. Substituting other product attributes which have a lot lower information search cost (such as mileage or car appearances) might have strongly differentiated the search costs between two conditions in the experiment, possibly providing better understanding about how information search cost affects sellers' information disclosure. Second, we should also consider the possibility that theoretical predictions of the literature about the effect of information search cost on information disclosure cannot be reproduced in real market situations for some reason. If this is the case, we should carefully reanalyze related effects of information search cost both theoretically and empirically, so that we can come up with more accurate knowledge on the effect of search cost on information disclosure.

Overall, the experiment has presented strong supports for our finding that low quality seller's information disclosure may increase the demand for his own products if perceived risk is sufficiently reduced with the disclosure, verifying the existence of low-quality seller's incentive to fully reveal quality information. From this result, we can see that revealing low-quality can help sellers in the short run as long as perceived risk is reduced, even without taking the long term relationship with customers or the effect of seller reputation into account.

4. Discussion

Our study has attempted to provide an important understanding about the markets under information asymmetry by showing that the disclosure of low quality can increase demand even in the short run. More specifically, our study has extended the findings from Huh [9] by considering the effect of information search cost and providing empirical evidences about the results. Our results also explain the circumstances whereby a low-quality seller's information disclosure may improve his profitability and the welfare of customers by showing how a low-quality seller's information disclosure even increases market demand and demand for the product maintaining high quality claim.

This study can thus provide an important theoretical understanding that can solve various market dilemmas coming from information asymmetry. As most of the related literature has only focused on the high-quality sellers' information disclosure, the information disclosure of low-quality sellers has been generally overlooked so far. Therefore, this study has focused on the economic incentives for the information disclosure of low-quality sellers to provide important implications on whether, when, and how the sellers with low-quality products fully disclose quality information. Along with its contribution to the related literature, our study is also expected to provide some useful understanding to marketing managers in terms of marketing communications strategy using various risk intermediaries. More specifically, marketing managers can learn that voluntarily sharing negative information about their products can increase profit if suitable risk intermediaries accompany such a disclosure. Therefore, following the results of this study, a seller dealing with credence attributes of their products (such as used cars, medical products, financial products, etc.) should seriously consider voluntarily revealing certain negative information about their products if they can

provide appropriate certification about true quality of their products. Unlike common understanding, the study has shown that marketing managers can increase profits and also enhance entire market welfare through revealing certain negative information with suitable certification.

We believe future research can develop the ideas presented in this study further in various directions, including relaxing the assumptions of the analysis or examining observational market data to provide more diverse understandings on the effect of seller's voluntary disclosure. For example, we believe the effect of sharing negative information may be critically affected by the type of industry, as different industries have different types of risk intermediaries and also have varying levels of information search cost. Therefore, marketing mangers could benefit from future research which investigates the different impacts of revealing low quality of various products in different industries. One more potential area for improvement is understanding whether information search cost really affects sellers' information disclosure as predicted by theoretical findings of the literature. Future research thus should carefully analyze findings of the literature and establish appropriate hypotheses so that we can better understand the impact of search, experience, and credence attributes on the information disclosure of sellers.

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