Signaling Quality: An Examination of the Effects of Marketing- and Nonmarketing-Controlled Signals on Perceptions of Automotive Brand Quality

M. Billur Akdeniz*, Roger J. Calantone, and Clay M. Voorhees

When introducing new products to market, firms often leverage marketing signals in an effort to increase perceptions of product quality. While prior research mostly focuses on marketing-controlled signals that firms can directly influence to affect consumer perceptions of product quality, the proliferation of nonmarketing-controlled signals in the form of third-party product reviews introduces a new layer of complexity to a consumer’s inference process. Given the fact that propagation of marketing signals and third-party reviews has made the marketplace more interactive, it is no longer diagnostic to analyze the impact of various quality signals on consumer perceptions, separately.

The purpose of this study is twofold. There has been extant research on the individual effects of marketing-controlled signals on quality perception, but research providing a simultaneous examination of multiple signals is scarce. The first purpose is to examine interaction effects between various marketing signals on consumer perceptions of quality. Firms may be able to control the communication strategy of internal signals (e.g., price, advertising), but third-party signals are external to the firm, and hence are often perceived as being more credible and less biased than marketing signals. Despite the popularity of third-party product reviews, there is scarce empirical research about how they impact perceptions in the presence of marketing-controlled quality signals. Thus, the second purpose is to examine the interaction effects between marketing signals and independent third-party reviews on perceived product quality. This study advances existing models of market signaling to account for the potential interactions between various types of quality signals.

Hypotheses are tested using a longitudinal data set comprising all car brands that have existed in the U.S. automotive industry between 1990 and 2007. The automotive industry provides an ideal context for the analyses as quality is an indispensable yet not easily discernible attribute of cars. Furthermore, consumer perceptions of the quality of new vehicle introductions can have a profound effect on product performance. Data are compiled from various secondary sources, including Harris Interactive’s Equitrend, Consumer Reports, and TNS Media Intelligence, among others. Econometric techniques are used to estimate the empirical model.

Findings show that effects of quality signals are codependent such that third-party quality ratings reduce the effectiveness of pricing and advertising, whereas they enhance the credibility of warranty signal. Furthermore, warranty positively interacts with price and advertising. It is also demonstrated that car sales in the previous period and the country of origin of the car brand significantly impact perceived quality. Overall, the research findings can help car manufacturers better understand how their initial product configurations and marketing strategies impact the perception of new vehicle introductions.

Introduction

Companies continually struggle to develop and launch high-quality products and communicate these quality signals to consumers in an effort to earn their business. While the basic tenets underlying this strategy are simple (i.e., make excellent products and simply tell consumers about your quality improvements), the execution of this process is far more complicated as actual quality increases are not always reflected in consumer perceptions of quality. This strategic challenge was summarized by Ford’s President of North America as he noted that gains in quality perceptions are gradual and must build over time, thus mandating companies to commit to developments and communication strategies that demonstrate actual quality improvements to consumers in the long run (Dolan, 2008). Marketing researchers...
have confirmed this gap between perceived and objective quality by demonstrating that changes in consumer perceptions of quality often occur more slowly than changes in the objective quality of a product (Mitra and Golder, 2006; Morgan and Vorhies, 2001), further highlighting the strategic challenges associated with communicating changes in objective quality to consumers.

Given the importance of signaling high product quality upon introducing a new product, many firms leverage multiple marketing-controlled signals, such as price, advertising, and branding, to communicate quality enhancements (Guo and Zhao, 2009; Hennig-Thurau, Houston, and Sridhar, 2006). Extant research has been conducted that examines the effects of these quality signals on quality perception in isolation, but research that provides a simultaneous examination of multiple marketing signals is still scarce. This gap in the literature leads to a limited understanding of how consumer perceptions may change when exposed to multiple quality signals, which is the norm in industries like automotive. Thus, the first goal of this research is to fill this void in the literature by demonstrating the nature of the interactions between various marketing-controlled signals and their effects on consumer perceptions of product quality.

Building on the complexity of the simultaneous effects of marketing-controlled signals on consumer perceptions is the rising importance of nonmarketing-controlled quality signals (e.g., product reviews or ratings) released by independent third parties. Firms may be able to control the communication strategy focused on internal signals (e.g., price, advertising, and warranty), but third-party signals are external to the firm, and as a result they are often perceived as being more credible and less biased than marketing-controlled signals (Darke, Böhner, Einwiller, Erb, and Hazlwood, 1998). Despite the abundance of this information, there is scarce empirical research about how third-party product reviews can impact perceptions of quality in the presence of marketing-controlled quality signals (Basu, Desai, and Tulukdar, 2006; Chen and Xie, 2005). This gap further underscores the need for a comprehensive examination of various quality signals on product perceptions. Thus, the second goal of this research is to examine the interactive effects of marketing-controlled signals with independent third-party reviews on consumer perceptions of product quality.

Given the fact that propagation of marketing signals and third-party reviews has made the marketplace more interactive, it is no longer diagnostic to analyze the impact of various quality signals on consumer perceptions, separately. The contribution of this study to the literature is twofold. First, it empirically examines the impact of the interactions between different types of marketing-controlled signals on product quality perceptions. Second, it examines whether the existence of third-party product ratings attenuates the impact of marketing signals on quality perceptions. Overall, this is one of the few studies in the marketing literature that empirically analyzes interactions of various quality signals using real industry data over time. By simultaneously considering the effects of multiple marketing-controlled signals and nonmarketing-controlled signals, it provides further advancement to the understanding of how various quality signals affect consumer perceptions of new products.

To analyze these relationships, this study focuses on the automotive industry, including all car brands existing in the U.S. market between 1990 and 2007. The automotive industry provides an ideal context for this investigation because (1) quality is an indispensable attribute of cars, yet there is a large variance in the perceived quality across brands; (2) quality is not easily discernable to consumers because cars are complex, experiential products; and (3) consumer perceptions of the quality of new vehicle introductions can have a profound effect on firm performance (Srinivasan, Pauwels, Silva-Rosso, and Hanssens, 2009). The results of this research could help automotive manufacturers better understand how their initial product configurations (brand and warranty) and market strategies (advertising and pricing) may impact the perception of new vehicle introductions.

**BIOGRAPHICAL SKETCHES**

Dr. M. Bilal Akdeniz is an assistant professor of marketing at the Peter T. Paul College of Business and Economics, University of New Hampshire. She holds a Ph.D. in marketing from Michigan State University. Her research focuses on the empirical modeling of marketing strategy problems. She has published in *Journal of the Academy of Marketing Science, Academy of Management Journal, and Journal of Product Innovation Management*, among others.

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The organization of this paper is as follows. First, the conceptual background is presented, and research hypotheses are developed. Then, data, empirical model, and estimation method are explained. Next, findings are presented, followed by the discussion and managerial implications.

**Literature Review and Conceptual Framework**

**Signaling Perceived Quality**

Perceived quality is the subjective evaluation of consumers with respect to a product’s overall superiority or excellence (Zeithaml, 1988). Perceived quality may not reflect a product’s actual quality. Hennig-Thurau et al. (2006) addresses that producing and launching a high-quality product simply is not enough for success, but firms must also engage in marketing activities to inform consumers about their high quality. One of the theoretical frameworks explaining the difference between actual and perceived quality of a product is information asymmetry. According to information economics paradigm, parties having different amounts of information regarding a transaction leads to an information asymmetry in the marketplace (Akerlof, 1970; Mishra, Heide, and Cort, 1998). Information asymmetry can occur when the actual quality of a product is not readily observable due to its complex and experiential nature, or when companies do not share all product-related information with their consumers (Nelson, 1970; Tellis and Wernerfelt, 1987). As a result of information asymmetry, consumers can have impaired perceptions of product quality, which increases risk associated with their purchase decisions. The main purpose of market signaling is to convey credible information about unobservable product quality to the consumer (Rao, Qu, and Ruekert, 1999). Under imperfect information markets, marketing signals complement the product itself with additional cues that are external to the core offering. Marketing-controlled information and third-party product information (i.e., reviews, ratings) are two signaling mechanisms that attenuate information asymmetry between firms and consumers, and affect perceived quality.

This research focuses on three of the most frequently cited quality signals in the marketing literature: price, advertising expenditure, and warranty. Price serves as a popular proxy to quality when a consumer has inadequate information about other attributes of the product (Rao and Monroe, 1989; Zeithaml, 1988). The influence of price on quality perception is related to the riskiness of the purchase, and price has both an information and allocation role in risk determination (Olshavsky, 1985). High prices can alter the perception of risk by signaling superior quality products (Kirmani and Rao, 2000).

The level of advertising expenditure signals product quality because providers of high-quality products have more incentive to advertise than providers of low-quality products regardless of the content of advertisements (Kirmani and Wright, 1989; Nelson, 1970). If a firm spends a large amount of money on advertising, then consumers are more likely to believe its claims about unobservable product quality. Otherwise, once consumers realize the true product quality, they will not repeat their purchase and firms will not be able to recover costs of advertising (Kihlstrom and Riordan, 1984; Milgrom and Roberts, 1986). Moreover, investment in advertising signals a firm’s confidence in and commitment to its product’s superior quality (Kopalle and Lehmann, 2006; Moorthy and Zhao, 2000).

Warranty signals product quality as it increases the present expected utility of owning the product by reducing the negative payoff to a consumer in case of a possible future breakdown in the product. Because warranty fulfillment costs would be higher for poor-quality products with higher breakdown rates, a firm with a low-quality product often self-selects a shorter period and more limited warranties (Boulding and Kirmani, 1993; Rao et al., 1999).

In addition to marketing-controlled signals, third-party information, including other consumers’ reviews, ratings, and expert opinions, can impact consumers’ perception of products, purchase decisions, and product success. Third-party information facilitates the selling process through attenuating information asymmetry by providing informational and selling inputs to consumers (Iyer and Padmanabhan, 2006). Prior to making a significant purchase decision, consumers generally like to learn what others think about the product to reduce the purchase risk. The changing marketplace and trends have made it more convenient for consumers to acquire product and seller information through company and infomediary websites, as well as other Internet forums. Recent surveys reveal that 86% of consumers consult online reviews before making a major purchase decision, and that 90% of these consumers trust third-party reviews (Miller, 2008). Thus, understanding the relationship between third-party information and marketing strategy of a firm has been of growing interest to managers and researchers. Prior research has empirically examined the influence of third-party information and product reviews on product and firm performance (Duan, Gu, and Whinston, 2005;
Eliashberg and Shugan, 1997). However, empirical research examining the impact of third-party review information on the effectiveness of marketing variables is scarce (Basuroy et al., 2006; Chen and Xie, 2005; Moon, Bergey, and Iacobucci, 2010).

**Consumer Decision-Making for Automobiles**

Consumers generally seek out information when making complex decisions, specifically selection of an automobile, in an effort to make a more satisfying purchase decision. Previous research demonstrates that all consumers engage in information search and use this information to inform their decisions, and as a result automotive manufacturers should focus on “ensuring that the consumer obtains specific product (brand) information (Punj and Staelin, 1983, p. 379).” Due to the limited capacity of consumers to process information (Malhotra, 1982), it is critical that automotive manufacturers carefully select and deliver the appropriate information to consumers.

For high involvement purchases, like an automobile, perceived quality of a product can be a dominant driver of product selection, and consumers often gauge quality based on signals in the market (Olshavsky, 1985). More specifically, when faced with uncertainty surrounding the quality of products, consumers often rely on quality signals in the market to develop their opinions of competing products (Kirmani and Rao, 2000). This reliance on signals is even stronger for experience and credence goods where consumers cannot directly assess quality prior to purchase or ownership (Nelson, 1970). In contexts like consumer decision-making for an automobile, consumers engage in screening where they search for information provided by competing firms about the quality and attempt to assess its credibility as a quality signal.

In an effort to influence this decision, firms then develop and deploy a portfolio of quality signals to consumers. In an automotive context, the most commonly employed quality signals include price, advertising, warranty, and brand names. Each of these signals is often deemed credible by consumers because if automotive manufacturers were to send false pricing, warranty, and advertising signals, they would be vulnerable to consumer backlash in the long run, which would overshadow short-term gains. In addition to signals provided by the firm, consumers will also reach out to other sources for quality information, which include third-party reviews (e.g., J.D. Power, Consumer Reports, etc.), recommendations from friends and family, and product trial via test-drives. Ultimately, consumers incorporate and weigh all these signals to develop perceptions of quality, which ultimately drives their decisions. The following section provides a more detailed discussion of how these signals may interact to impact consumer perceptions of quality.

**Hypothesis Development**

The main effects of price, advertising, and warranty on perceptions of quality are well established in the marketing literature. Despite some opposing findings, it is generally agreed that higher prices signal better quality (Kirmani and Rao, 2000); an increase in advertising expenditure (Nelson, 1970) and longer, better warranties (Boulding and Kirmani, 1993) affect consumer perceptions of overall product quality positively. However, signals seldom operate in isolation, and an important concern for managers is to understand how to manage the mix of marketing signals. Furthermore, with the rising number and variety of third-party sources, it becomes evident that consumers frequently refer to third-party product reviews along with marketing signals to infer unobserved product quality. Thus, the hypotheses focus on the potential interactions between the marketing-controlled and nonmarketing-controlled quality signals. In doing so, the popular frameworks on signal categorization are leveraged to explain the nature of these interactions.

**Interaction effects between marketing-controlled signals.** The empirical nature of interactions between various marketing signals has received very scarce attention in the marketing literature (Basuroy et al., 2006). Prior research categorizes marketing signals into different conceptual groups. For example, Bhattacharya (1980) and Rao et al. (1999) categorize signals into two groups as dissipative and nondissipative, where dissipative signals involve an up-front expenditure that is forfeited if quality is lower than claimed, and nondissipative signals do not involve any up-front expenditure but place only future profits at risk. Similar to this idea, Kirmani and Rao (2000) developed a more detailed typology, which specifically groups signals as default-independent and default-contingent. Default-independent signals involve an up-front expenditure, and default-contingent signals are costless at the time the signal is sent. Based on this typology, they categorize price as a default-independent signal as it requires firms to either incur a profit reduction or demand reduction for their product if priced too high; thus, the firm incurs immediate costs once they set the price of their product. Similarly, advertising involves an
immediate, up-front cost, and hence is also categorized as a default-independent signal. Alternatively, warranty is a default-contingent signal as it requires no immediate investment by the firm, but incurs high cost in the long run if the signal is false.

Establishing baseline categorizations of these signals is important to propose a hypothesis regarding the directionality of an interaction effect on perceived quality (Basuroy et al., 2006; Kirmani and Rao, 2000). According to this typology, interactive effects between two marketing signals are contingent on the nature of signals. More specifically, the interaction between two dissimilar (i.e., default-contingent and default-independent) signals is expected to be positive and two similar signals to be negative. Theoretically, the positive interaction effect between two dissimilar-type signals occurs because by sending a default-contingent and default-independent signal, a firm shows such confidence in its product quality that it not only incurs current expenditures but also makes credible commitments for the future. Compared with the credibility of two signals of the same type, consumers are likely to perceive the simultaneous presence of different types of signals more credible. Therefore, the simultaneous transmission of two dissimilar signals has a complementary effect by increasing the effectiveness of each other. Conversely, a negative interaction effect between two similar-type signals occurs due to a substitution effect, which implies a reduction in the effectiveness of a signal because of the existence of another signal of similar type. Another theoretical support to the substitution effect comes from cue consistency theory (Maheswaran and Chaiken, 1991), which predicts that each signal's own credibility is weakened when accompanied by another similar signal because of a redundancy discounting.

Integration of this typology with resulting effects assigns directionality to the interactions between the signals. Specifically, interaction effects between “price and warranty” and “advertising expenditure and warranty” are positive because these pairings include two dissimilar signals (i.e., default-independent and default-contingent), allowing for complementary information to be sent to consumers. Alternatively, the interaction between “price and advertising expenditure” is negative because both of these signals are default-independent, and hence send similar type of information to the consumer. Thus:

H1: The interaction effect of two dissimilar (price × warranty [H1a] and advertising × warranty [H1b]) marketing signals on the perceived quality is positive.

Interaction effects between marketing-controlled and nonmarketing-controlled signals. Previous research suggests that interactions of marketing-controlled and nonmarketing-controlled signals (e.g., independent third-party information) on quality perceptions need more attention (Chen and Xie, 2005). In an effort to better understand the nature of such interactions, a competing hypotheses approach is adopted based on recommendations in Armstrong, Brodie, and Parsons (2001). The driving mechanisms behind the competing hypotheses are based on contributions to signaling theory by Albrecht (1981), which suggests substitutive interaction, and Archibald, Haulman, and Moody (1983), which suggests a complementary or synergistic interaction.

A substitutive relationship between marketing signals and independent third-party information (i.e., third-party quality ratings in this context) proposes a negative interaction effect on the perceived quality. Albrecht (1981) demonstrates that the credible, external information can attenuate the effects of internal signals due to a substitution effect, where the external signals are deemed more credible, and thus reduce the effectiveness of internal signals on consumer perceptions. These initial findings have heavily influenced the marketing literature’s understanding of the joint effect of information provided by third parties and marketing signals on the marketing strategy of a firm. For example, Basuroy et al. (2006) examines the interaction effect between independent information (i.e., critics’ review) and advertising and sequels in the motion picture industry. They find that critics’ reviews can reduce the information asymmetry about a movie’s quality, and therefore when aligned with advertising or sequel strategy of a movie, a negative interaction effect occurs on box-office revenues. Thus, based on the theoretical support by Albrecht (1981) and the results of Basuroy et al. (2006), it is proposed that the interaction between marketing signals and third-party product ratings leads to a substitution effect and a negative impact on perceived quality. Thus:

H3a: The interaction effect between marketing signals and third-party quality ratings on perceived quality is negative.

A complementary relationship between marketing signals and third-party quality ratings indicates a positive interaction effect on the perceived quality. After Albrecht (1981), Archibald et al. (1983) proposes a hedonic assumption, which suggests that the correlation between
marketing signals and perceived quality increases with the introduction of published third-party product information. Results show that in the presence of third-party ratings, the effect of marketing signals, such as price and advertising, on perceived quality increases. Results further contemplate that marketing strategy of a product should be better aligned with its quality strategy.

Recently, Chen and Xie (2005) introduced a comprehensive perspective to the interaction between third-party product review information and a firm’s marketing strategy. Their results indicate that the interaction of third-party reviews and a firm’s marketing strategy has two conceptually different effects. First, the interaction effect will be negative since third-party product reviews and marketing signals constitute a substitutive relationship (akin to Albrecht’s view). Second, the interaction will be positive due to a complementary relationship between third-party product reviews and marketing signals, and they increase the effectiveness of each other (akin to Archibald et al.’s view). Thus, based on the theoretical framework of Archibald et al. (1983) and results of Chen and Xie (2005), the competing hypothesis is that the interaction between marketing signals and third-party quality ratings leads to a complementary effect and a positive impact on perceived quality. Thus:

**H3b:** The interaction effect between marketing signals and third-party quality ratings on perceived quality is positive.

The interactions and the proposed directionality of the effects are presented in Figure 1.

**Control Variables**

Two control variables, which potentially affect the perceived quality of a brand, are included in the model. First, unit sales of car brands to control for positive network externality effects are included (Hellofs and Jacobson, 1999). Specifically, we examine whether consumers interpret higher sales in the past as indicators of high-quality brands. Second, the country of origin of each car brand is included. The vast literature addresses that the country of origin has substantial impact on the quality perceptions of a product or brand due to economic development, culture, and political climate of the source country (Bilkey and Nes, 1982). Thus, consumers rate products being significantly different quality when the only variation between products is the country of origin (Elliot and Cameron, 1994; Steenkamp, Batra, and Alden, 2003). A classic example in the auto industry is how German cars enjoy a favorable reputation for quality implied by German engineering, and this reputation

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**Figure 1. Conceptual Framework for the Interaction Effects of Marketing-Controlled and Nonmarketing-Controlled Quality Signals on Perceived Quality**
positively influences the purchase intention of cars across the world.

**Method**

**Data**

The data set has yearly repeated observations of auto brands (e.g., BMW, Lexus, Saturn), which have had a competitive presence in the U.S. automotive industry between 1990 and 2007. The dependent variable is perceived quality (PQ). PQ scores were obtained from Harris Interactive’s Equitrend brand equity data. In the Equitrend study, Harris Interactive conducts online surveys with 20,000–45,000 consumers aged 15 years or older to determine their perceptions of over 1000 brands across 35 product categories since 1989. Harris’s Equitrend data are popular in the industry and academic research, and have been used frequently in previous research on quality (e.g., Clark, Doraszelski, and Draganska, 2009; Mitra and Golder, 2006). In the data set, perceived quality of 33 car brands (excluding SUV and light trucks) ranges from 0–10, with “0” meaning poor and “10” meaning excellent quality.

The independent variables are third-party quality ratings and a set of marketing signals, including price, advertising expenditures, and warranty. Third-party quality ratings were obtained from Consumer Reports (CR), which provide consumers with one of the most trusted quality ratings in the marketplace. These ratings are highly objective since they are the outcome of a series of comprehensive laboratory tests conducted by product experts on products they purchase on the open market. Also, CR does not have any relationship with business organizations, nor accept sponsorships or advertisements, and strongly discourages the use of its ratings in company advertisements (Mitra and Golder, 2006). The use of CR ratings in quality research has been quite popular (Mitra and Golder, 2006). The rise of several online sources, CR is still one of the most frequently referred to source even in these web sites (e.g., MSN autos). In the data set, third-party quality rating (QualityRating) of car brands ranges from 1 to 5, where “1” is far below average and “5” is far above average.

For marketing signals, the manufacturer suggested retail price (Price) across brands was obtained from CR and verified using the NADA (National Automobile Dealers Association) yearly guides. Annual advertising expenditure (Advertising) was collected from TNS Media Intelligence through Ad$SPender and Advertising Age. For annual warranty (Warranty), the duration of basic warranty data in terms of months and mileage, as well as the warranty index from the *The Car Book* by Jack Gillis (Douglas, Glennon, and Lane, 1993), were collected. Basic warranty is difficult to analyze since there is little variation between brands. As a more comprehensive variable compared with basic month and mileage statements, *The Car Book* provides a warranty index as a compound assessment of the basic, power train, corrosion warranties, deductibles, and transfer fees where higher numbers indicate better warranties. In order to check the appropriateness of the index as a proxy for the warranty variable, a factor analysis was conducted to understand which measure was a better proxy for the warranty variable. Results showed that the one and only component score with an eigenvalue greater than 1.0 explained 84% of the variation. The warranty index had the highest loading to this component, with a coefficient of .945. Hence, the compound warranty index was used as it was a better proxy for the warranty variable as well as it had more variation across brands.

Regarding control variables, annual sales (Sales) of auto brands measured in terms of the units sold—not the dollar value—were collected from Automotive News Market Data Book. Finally, the country of origin (COO) for each brand was collected from company web sites, and its effects on the PQ of a brand “i” were captured using a series of dummy variables for the countries included in the data set: USA_i, Japan_i, Germany_i, Korea_i, and UK_i.

**Empirical Model**

The empirical model, which analyzed the main effects, interaction effects between marketing signals, and interaction effects between third-party quality ratings and marketing signals on perceived quality, is depicted in Equation (1).

\[
PQ_{it} = \beta_0 + \beta_1 \text{QualityRating}_{it-1} + \beta_2 \text{Price}_{it-1} + \beta_3 \text{Advertising}_{it-1} + \beta_4 \text{Warranty}_{it-1} + \beta_5 (\text{Price} \times \text{Advertising})_{it-1} + \beta_6 (\text{Price} \times \text{Warranty})_{it-1} + \beta_7 (\text{Advertising} \times \text{Warranty})_{it-1} + \beta_8 (\text{QualityRating} \times \text{Price})_{it-1} + \beta_9 (\text{QualityRating} \times \text{Warranty})_{it-1} + \beta_{10} (\text{QualityRating} \times \text{Advertising})_{it-1} + \beta_{11} \text{Sales}_{it-1} + \beta_{12} \text{USA}_i + \beta_{13} \text{Japan}_i + \beta_{14} \text{Germany}_i + \beta_{15} \text{Korea}_i + \beta_{16} \text{UK}_i + \gamma d\text{Year}_i + v_i
\]
where “i” and “t” denote the brand and the year, respectively. \( PQ_{it} \) denotes the perceived quality of brand \( i \) at year \( t \). As it takes time for consumers to update their perceptions, independent variables, interaction effects, and control variables were inserted with 1-year lag into the equation. Thus, \( QualityRating_{it-1}, Price_{it-1}, Advertising_{it-1}, \) and \( Warranty_{it-1} \) denote the CR ratings, average manufacturer suggested retail price, advertising expenditures in million dollars, and warranty index for brand \( i \) at year \( t-1 \), respectively. In the model, the country of origin of a car brand (i.e., USA\(_i\), Japan\(_i\), Germany\(_i\), Korea\(_i\), and UK\(_i\)), and each observation period (\( d\text{Year} \)) are taken into consideration via a dummy variable. In Equation (1) the composite error term “\( \nu_{it} = a_i + \mu_{it} \)” has a brand-specific error component “\( a_i \)” to account for unobserved, time-constant factors that can affect perceived quality and an idiosyncratic error component “\( u_{it} \)” where \( E(\mu_{it} \mid X_{it}, a_i) = 0 \) and \( \text{Var}(\mu_{it} \mid X_{it}, a_i) = \sigma^2_{\mu} \) for all \( t = 1990–2007 \). Normally, a pooled ordinary least squares (POLS) estimation assumes the composite error term “\( \nu_{it} \)” is uncorrelated with “\( X_{it} \)” to produce consistent regression parameters (\( \beta \)). One major drawback is that POLS will be biased and inconsistent when “\( a_i \)” and “\( X_{it} \)” are correlated (e.g., a potential correlation between the car segment and its price). A remedy for heterogeneity bias is to use fixed-effects estimation to account for brand-level heterogeneities (e.g., Tellis, Yin, and Niraj, 2009). A fixed-effects model produces POLS estimators based on time-demeaned variables, and hence “\( a_i \)” disappears since it is fixed over time (Greene, 2008). First, the equation was estimated via POLS, and then via fixed-effects estimation in Stata 12 (StataCorp LP, College Station, Texas, USA).

### Robustness Checks

**Multicollinearity.** In models with interaction terms, multicollinearity is a potential threat to coefficient estimates and their significance levels by inflating the standard errors of the estimates. The existence of multicollinearity was checked among the variables by calculating the variance inflation factors (VIFs) for each regression coefficient. Table 1 depicts high levels of VIFs. To reduce VIFs, the mean-centering procedure was employed to the variables in interaction terms (Aiiken and West, 1991). As demonstrated in Table 1, after mean-centering, tolerance values increased, and VIFs decreased to negligible levels, accordingly. The highest VIF, 2.22, was considerably lower than a commonly used cutoff value of 10 (Koutsoyiannis, 1977). The mean-centering procedure has been widely applied in the literature to reduce the threat of multicollinearity (Jaccard, Wan, and Turrisi, 1990; Kopalle and Lehmann, 2006). However, Echambadi and Hess (2007) conclude that mean-centering does not change the extent of the collinearity problem in moderated regression. Yet independent variable interpretation, as well as correct interpretation of interaction effects, is greatly facilitated by mean-centering of the raw data for the affected variables. Thus, for interpretation reasons, this treatment of the variables rescales their coefficients so that there is a tangible difference between mean-centered and uncentered models. When data are mean-centered, an interaction effect is interpreted such that the effect of an independent variable on the dependent variable depends on the specific value of the moderating variable (Echambadi and Hess, 2007; Yannopoulos, Auh, and Menguc, 2012).

### Table 1. Multicollinearity Diagnostics

<table>
<thead>
<tr>
<th>Variables</th>
<th>Before Mean-Centering</th>
<th>After Mean-Centering</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VIF</td>
<td>Tolerance</td>
</tr>
<tr>
<td>QualityRating</td>
<td>1890.09</td>
<td>.0005</td>
</tr>
<tr>
<td>Price</td>
<td>1817.15</td>
<td>.0006</td>
</tr>
<tr>
<td>Advertising</td>
<td>2004.27</td>
<td>.0005</td>
</tr>
<tr>
<td>Warranty</td>
<td>1230.55</td>
<td>.0008</td>
</tr>
<tr>
<td>Price × Advertising</td>
<td>451.15</td>
<td>.0022</td>
</tr>
<tr>
<td>Price × Warranty</td>
<td>3619.14</td>
<td>.0003</td>
</tr>
<tr>
<td>Advertising × Warranty</td>
<td>1895.76</td>
<td>.0005</td>
</tr>
<tr>
<td>QualityRating × Price</td>
<td>853.92</td>
<td>.0125</td>
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<tr>
<td>QualityRating × Advertising</td>
<td>57.14</td>
<td>.0175</td>
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<tr>
<td>QualityRating × Warranty</td>
<td>1133.73</td>
<td>.0009</td>
</tr>
<tr>
<td>Mean VIF</td>
<td>1359.56</td>
<td></td>
</tr>
</tbody>
</table>

For individual variance inflation factor (VIF), the cut-off is 10.00; for the average VIF, the cut-off point is 6.00 (Koutsoyiannis, 1977).
Thus, as data were mean-centered, the interpretation of findings was adjusted, accordingly. Along the same line, mean-centering also helps reduce the possibility of interpreting interaction effects at the nonexistent values of the variables (e.g., the impact of advertising on perceived quality when price equals zero) (Wooldridge, 2003).

**Serial correlation.** Next, serial correlation was tested as variables such as perceived quality can be sticky across years. The Wooldridge test for serial correlation was conducted in panel data models (Wooldridge, 2002). While a number of tests for serial correlation in panel data models have been proposed, this relatively new test requires fewer assumptions and works with unbalanced data (Drukker, 2003). The results ($F_{[1, 31]} = 21.734; \text{Prob} > F = .0001$) suggested to reject the null hypothesis of no serial correlation. As a remedy, clustering at the panel level, which produced consistent estimates of standard errors and more efficient estimates overall, was applied (Baltagi, 2001; Wooldridge, 2002). (Table 3 shows the results of fixed-effects regression models with robust standard errors to serial correlation after clustering at the panel level.)

**Endogeneity.** The central hypotheses of this research focus on the effects of marketing-mix signals on perceived quality. However, a reverse argument can be constructed in favor of the impact of perceived quality on the marketing-mix variables. Specifically, product managers might want to incorporate consumer perceptions in their market signaling efforts. Under this argument, marketing-mix signals become endogenously determined. To test for endogeneity, the Hausman–Wu test was used (Calantone and Rubera, 2012; Davidson and MacKinnon, 1993). Specifically, in the empirical model, for each potentially endogenous variable, both the variable and its instruments were included. A chi-square test on the significance of these instruments constitutes the exogeneity test. Results revealed that marketing-mix variables might create an endogeneity bias to the estimates ($\rho < .001$). Endogeneity may cause parameter estimates to be inconsistent due to the potential correlation between the endogenous variables and the error term ($\text{Cov (zit, uit)} \neq 0$). To address this, the empirical model was estimated via two-stage least squares (2SLS), which surmounted this issue by utilizing instrumental variables (IVs). In the estimation, residual value, number of dealers, and brand age as the IVs for price, advertising expenditures, and warranty were used. Residual value refers to the capital value (in U.S. dollars) of a brand remaining at the end of an investment period. The specific residual value at 24 months after the ownership is transferred from automaker to consumer was gathered from Automotive Leasing Guide and used in the analyses. The number of dealers refers to a brand’s network size and implies the degree of exclusivity of a brand. Annual data for an auto brand’s number of dealerships were collected from the U.S. Automotive News Center. Brand age refers to the number of years since the brand’s first launch. The age of a brand has implications on the survival and reliability of that brand in the market. The data for brand age were collected from automakers’ corporate web sites. Each IV was highly correlated with its corresponding endogenous variables ($\text{Cov (zit, uit)} \neq 0$) but not correlated with the error term ($\text{Cov (zit, uit)} = 0$) (Wooldridge, 2002).

**Results**

Table 2 presents pairwise Pearson correlations, significance levels, and descriptive statistics of the variables. Briefly, over 18 years across 33 car brands, the average perceived quality is 6.79 out of 10, and the average CR rating is 3.49 out of 5. For marketing signals, the average price is almost $33,000, with a standard deviation of nearly $17,000. On average, $218 million is spent on advertising, and the average warranty index is 1109 (corresponding to 40 months and 40,000 mileage).

Table 3 presents study findings across three estimation methods: POLS, fixed effects, and 2SLS, where 2SLS demonstrates how the parameter estimates differ when endogeneity in marketing signals is taken into account. For an easier interpretation of parameter estimates, several variables were modified prior to estimation, taking the natural log of price, advertising expenditures, and warranty index. In econometric models, it is a general rule of thumb to take the natural log of variables, which have positive dollar amount and relatively large integer values (Wooldridge, 2003). Perceived quality and third-party rating scores were standardized as they were measured with different interval scales.

Findings revealed that the direction of the parameter estimates across three estimation methods was not changed, yet there were significant differences in coefficient estimates. For more consistent estimates due to the account for endogeneity in the empirical model, the hypothesis testing results based on 2SLS estimates were reported. First, the main effects of third-party quality ratings and marketing signals on perceived quality were examined and we found that an increase in third-party quality ratings increased the perceived quality of a brand.
Further, it was found that an increase in the price (β = 1.747, ρ < .001) and advertising expenditures (β = .374, ρ < .05) significantly improved the perceived quality. On the other hand, an increase in the brand warranty had a detrimental effect on the brand’s perceived quality (β = −3.434, ρ < .05).

When the main effects of marketing signals and third-party ratings across different estimation methods were compared, it was observed that not controlling for endogeneity caused an underestimation of effect sizes (e.g., Elberse and Eliashberg, 2003). For example, effect of warranty was −.394 in POLS and −.321 in fixed-effects estimation. Findings supported the previous literature regarding signaling roles of third-party product ratings and marketing-controlled signals on perceived quality with one surprising main effect, which is the negative signaling role of warranty. This result is counterintuitive to the signaling hypothesis proposing warranty to be a credible signal for the consumer to differentiate a high-quality product from a low-quality product (e.g., Boulding and Kirmani, 1993). This result addresses that when a company offers a longer and better warranty than industry average in the automotive industry, consumers perceive this strategy as another way of advertising car brand instead of serving an assurance role against product failure. Intuitively, car purchasers might tend to think that those car brands already known for superior quality and high reputation do not need to offer longer warranties to attract more consumers because both car manufacturers and consumers already have high confidence in those cars. Supporting this fact, the data set reveals that automakers already known to offer high-quality vehicles generally do not offer more than the industry average warranty (e.g., Ford’s limited warranty on their F-150 model). Further, the negative effect of brand warranty might be contextual to the automotive industry as new entrants or firms trying to increase reputation have attempted to signal quality through longer warranties. It is possible that in the auto industry, consumers associate increased warranties with low brand equity, thus explaining the negative effect. However, the central premise of this study is that individual positive main effects of quality ratings or marketing signals cannot be a diagnostic conclusion about their signaling roles since multiple signals operate simultaneously in the marketplace (Basuroy et al., 2006). Next, two-way interaction effects of similar and dissimilar marketing signals were examined to test H1a, H1b, and H2.

According to Kirmani and Rao’s (2000) framework, an interaction between complementary signals is expected to be positive, whereas an interaction between substitutive signals is expected to be negative on perceived quality. Results supported this framework and showed that while “Price and Advertising” (i.e., price and advertising are both default-independent signals) together have a negative and significant impact (β = −2.337, ρ < .05), both “Price and Warranty” (i.e., price is default-independent and warranty is default-contingent) (β = 2.902, ρ < .05) and “Advertising and Warranty” (i.e., advertising is default-independent and
warranty is default-contingent) ($\beta = .904, \rho < .05$) affect perceived quality, positively and significantly. Therefore, H1a, H1b, and H2 were supported. According to the results, “price and advertising” acted in a substitutive manner and deteriorated each other’s signaling role. Specifically, this result implies that price and advertising expenditure, both being credible and strong signals of quality individually, can attenuate each other’s signaling power when presented together. Ultimately, this suggests that firms that price their vehicles highly receive less of a lift in perceptions of quality from increased investments in advertising. On the other hand, “price and warranty” and “advertising and warranty” sending qualitatively different signals about the car brand are found to act complementarily, and hence strengthen each other’s signaling role. When coefficients of interaction effects were compared across models, similar to the main effects, it was found that they would be underestimated in POLS

Table 3. Parameter Estimates

<table>
<thead>
<tr>
<th>Variables</th>
<th>POLS</th>
<th>Fixed Effects</th>
<th>2SLS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main effects</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QualityRating</td>
<td>.228***</td>
<td>.092***</td>
<td>2.21**</td>
</tr>
<tr>
<td></td>
<td>(.044)</td>
<td>(.018)</td>
<td>(.072)</td>
</tr>
<tr>
<td>Price</td>
<td>1.471***</td>
<td>.394***</td>
<td>1.747***</td>
</tr>
<tr>
<td></td>
<td>(.082)</td>
<td>(.111)</td>
<td>(.163)</td>
</tr>
<tr>
<td>Advertising</td>
<td>.330***</td>
<td>.240***</td>
<td>.374**</td>
</tr>
<tr>
<td></td>
<td>(.047)</td>
<td>(.044)</td>
<td>(.150)</td>
</tr>
<tr>
<td>Warranty</td>
<td>−.394***</td>
<td>−.321***</td>
<td>−3.434**</td>
</tr>
<tr>
<td></td>
<td>(.151)</td>
<td>(.116)</td>
<td>(1.097)</td>
</tr>
<tr>
<td><strong>Interaction effects</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Price × Advertising</td>
<td>−.145**</td>
<td>−.301***</td>
<td>−2.337**</td>
</tr>
<tr>
<td></td>
<td>(.066)</td>
<td>(.063)</td>
<td>(1.114)</td>
</tr>
<tr>
<td>Price × Warranty</td>
<td>.303**</td>
<td>.146**</td>
<td>2.902**</td>
</tr>
<tr>
<td></td>
<td>(.138)</td>
<td>(.057)</td>
<td>(1.064)</td>
</tr>
<tr>
<td>Advertising × Warranty</td>
<td>.209**</td>
<td>.092**</td>
<td>9.04**</td>
</tr>
<tr>
<td></td>
<td>(.099)</td>
<td>(.035)</td>
<td>(4.00)</td>
</tr>
<tr>
<td>QualityRating × Price</td>
<td>−.062**</td>
<td>−.090**</td>
<td>−1.59**</td>
</tr>
<tr>
<td></td>
<td>(.025)</td>
<td>(.042)</td>
<td>(0.72)</td>
</tr>
<tr>
<td>QualityRating × Advertising</td>
<td>−.050**</td>
<td>−.042**</td>
<td>−0.55*</td>
</tr>
<tr>
<td></td>
<td>(.021)</td>
<td>(.020)</td>
<td>(0.28)</td>
</tr>
<tr>
<td>QualityRating × Warranty</td>
<td>.334***</td>
<td>.306***</td>
<td>.386**</td>
</tr>
<tr>
<td></td>
<td>(.104)</td>
<td>(.064)</td>
<td>(1.78)</td>
</tr>
<tr>
<td><strong>Controls</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Sales</td>
<td>.378**</td>
<td>.488**</td>
<td>2.306**</td>
</tr>
<tr>
<td></td>
<td>(.146)</td>
<td>(.183)</td>
<td>(1.072)</td>
</tr>
<tr>
<td>USA</td>
<td>−.356**</td>
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<td>−4.33**</td>
</tr>
<tr>
<td></td>
<td>(.118)</td>
<td>n/a</td>
<td>(2.27)</td>
</tr>
<tr>
<td>Japan</td>
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<td>n/a</td>
<td>−1.57**</td>
</tr>
<tr>
<td></td>
<td>(.126)</td>
<td>n/a</td>
<td>(0.87)</td>
</tr>
<tr>
<td>Germany</td>
<td>.268**</td>
<td>n/a</td>
<td>2.01*</td>
</tr>
<tr>
<td></td>
<td>(.111)</td>
<td>n/a</td>
<td>(1.03)</td>
</tr>
<tr>
<td>Korea</td>
<td>−.770***</td>
<td>n/a</td>
<td>−1.268**</td>
</tr>
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<td>(.205)</td>
<td>n/a</td>
<td>(7.16)</td>
</tr>
<tr>
<td>UK</td>
<td>.136</td>
<td>n/a</td>
<td>.172</td>
</tr>
<tr>
<td></td>
<td>(.238)</td>
<td>n/a</td>
<td>(2.45)</td>
</tr>
<tr>
<td>Constant</td>
<td>−12.522***</td>
<td>−7.152***</td>
<td>−6.885**</td>
</tr>
<tr>
<td></td>
<td>(1.217)</td>
<td>(1.298)</td>
<td>(1.341)</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>.77</td>
<td>.71</td>
<td>.65</td>
</tr>
<tr>
<td>Number of observations</td>
<td>337</td>
<td>337</td>
<td>337</td>
</tr>
</tbody>
</table>

*Indicate a significance level of <.001, <.05, and <.10, respectively.

All variables except the country of origin dummies are lagged 1 year with respect to the PQ variable.

Standard errors in parentheses are robust to heteroskedasticity and serial correlation.

Interaction terms are mean-centered.

Country-of-origin effects are dropped in fixed-effects estimation since they do not change over time.

POL, pooled ordinary least squares; 2SLS, two-stage least squares.
and fixed effects without controlling for the endogeneity in the marketing signals that were entered into the interaction term. For instance, the negative main effect of warranty was indeed diminished to a greater extent by the credibility of price or advertising under 2SLS. A complementary effect of this degree would not be possible if the endogeneity of marketing signals was not controlled for in the model.

Regarding two-way interaction effects between marketing signals and third-party quality ratings, competing hypotheses proposed that the credibility of marketing signals is attenuated or strengthened when presented with third-party quality ratings. Except for the interaction between “QualityRating and Warranty” (β = .386, ρ < .05), interactions between “QualityRating and Price” (β = -.159, ρ < .05) and “QualityRating and Advertising” (β = -.055, ρ < .10) had a negative effect on perceived quality. Of these negative effects, the interaction between quality ratings and price was more significant, which strongly supported the substitutive relationship (e.g., H3a) between marketing-controlled signals and nonmarketing-controlled signals. This finding implied that even though price individually had a positive signaling role, the existence of relevant, third-party information weakened its effect on perceived quality. Meanwhile, the interaction effect between quality ratings and warranty enhanced perceived quality of a brand. This result, on the contrary, provided a strong support to a complementary relationship (e.g., H3b) between marketing signals and third-party ratings. It suggested that supportive third-party quality ratings strengthened the credibility of warranty signal on perceived quality. Overall, these findings lent partial support to both H3a and H3b with different-type marketing-controlled signals.

2SLS results for the interaction effects between marketing signals and nonmarketing-controlled signals again showed that they would be underestimated with POLS and fixed effects. Another trend that occurred across the results of the three estimation techniques was the higher standard errors in 2SLS. Normally, standard errors are expected to increase with 2SLS due to the inclusion of IVs in the estimation. As the correlation between endogenous variables and IVs decreases (i.e., the quality of the IV estimator diminishes), 2SLS estimates become less efficient. Yet, in this case, the correlation between marketing signals and their IVs was always above .7, and hence did not cause a threat on the efficiency of 2SLS estimates.

Regarding the control variables, first, it was found that unit sales of a car brand had a positive effect on consumers’ quality perceptions (β = 2.306, ρ < .05). Second, some interesting findings for the country of origin variables were found. It was demonstrated that German cars present a positive and significant increase in quality perceptions, whereas American, Japanese, and Korean cars have diminishing effects on consumer perceptions. Third, regarding the year dummy variables, with 1990 as the base year, perceptions of car brand quality had a decreasing trend across years. The literature on the country of origin effects on product evaluations has been established well (Bilkey and Nes, 1982; Elliot and Cameron, 1994; Teas and Agarwal, 2000). The results of this research provided some contribution to prior research with real industry data. Finally, the model fit was satisfactory across three estimation procedures, with the highest adjusted R-squared in POLS (77%) and the lowest in 2SLS (65%), which was expected since by definition OLS estimates coefficients by minimizing the sum of squared residuals.

General Discussion and Conclusion

This empirical research examines (1) the interaction effects of similar and dissimilar marketing-controlled signals, and (2) the interaction effects of third-party product review information with marketing-controlled signals on perceived quality. The U.S. automotive industry was chosen as the context to analyze these relationships. A longitudinal data set of annual brand-level observations of all car brands that have existed in the U.S. auto industry between 1990 and 2007 was compiled. Results demonstrate that when multiple market signals are simultaneously present in the marketplace, their effects on perceived quality are dependent on each other, and that singular approaches that only consider a quality signal in isolation are not diagnostic any more. Moreover, interactions between various quality signals are more complex than some prior models would suggest. As a result, automotive firms attempting to signal product quality to the market need to account for the interdependencies across various quality signals, including price, advertising, warranty, and third-party ratings.

This study contributes several interesting empirical facts to the research and practice of market signaling. In the marketing literature, this is one of the few studies that empirically examines interactions of various quality signals using real industry data over time. A key contribution is the examination of the interactive effects of marketing signals with third-party quality ratings on con-

1 For parsimony reasons, we did not specifically show the coefficient of each year dummy in Table 3. These findings can be requested from the corresponding author.
sumer perceptions of quality. Prior research examining the interaction of third-party product information and marketing-controlled signals has been scarce and mostly focused on product performance. However, perceived quality is a more persistent performance measure directly affected by marketing signals and third-party information, and is also a major driver of product success in the marketplace. This study contributes also to a relatively underresearched area via analyzing how various marketing-controlled signals of similar and dissimilar nature interact and affect perceived quality.

Despite mixed findings in the literature, results support the role of price and advertising as credible signals that have a positive effect on perceived quality. Yet they suggest that increases in warranty of a car negatively affect consumer perceptions. It suggests that extended warranty strategy claims may result in consumers to perceive the brand as advertising its quality and distinguishing itself from other brands instead of emphasizing the real insurance role of warranty against failure (e.g., Chu and Chintagunta, 2009; Cooper and Ross, 1985). This perception devalues the actual warranty offering in consumers’ eyes and affects the quality perceptions, negatively. Related to this, survey results of more than 8000 CR readers revealed that extended warranties only sell expensive “peace of mind” for future repairs that probably will not occur, and 75% of all respondents do not think it is a good value.2

While an increased warranty claim has a deteriorating main effect on perceived quality, it significantly and positively interacts with third-party quality ratings as well as other marketing-controlled signals. The interaction of warranty and third-party quality ratings supports a complementary relationship, suggesting that when warranty information is supported by high third-party quality ratings of a car brand, consumers are more likely to perceive warranty signal as credible. This finding is also parallel to arguments in Balachander (2001) and Cooper and Ross (1985) that a positive and strong relationship between warranty and perceived quality is more likely to occur for brand names having a high reputation for quality products. As far as the interaction of warranty with other marketing-controlled signals, results show that warranty can serve as a stronger signal of quality when presented with price signal. Price and warranty having a positive interaction is an indicator supporting the complementary relationship between two dissimilar signals. In the conceptual framework, price is a default-independent signal because setting an introductory pricing scheme to stimulate the purchase of a product can incur some costs for the firm independent of whether the firm defaults on its quality claims. On the other hand, warranty is a default-contingent signal because it entails costs only when the firm does not hold onto its claims. Compared with the credibility of the warranty signal by itself, warranty signals in conjunction with price sends a more credible commitment in terms of the company’s confidence in product quality. Similar results also hold for warranty and advertising signals as they are also of different type, hence synergistic signals in the conceptual framework. Yet advertising strengthens the signaling role of warranty to a lesser degree than price.

Considering the interactive relationship between similar-type marketing signals, in line with the conceptual framework, a substitutive relationship is found between price and advertising (i.e., both default-independent signals). This finding agrees with previous literature, which suggests that managers may choose not to simultaneously use price and advertising to signal quality because a signal loss is possible when they are presented together (Hertzendorf, 1993). Also, it is found that both price and advertising expenditure are credible and strong signals of quality, and being strong individually can attenuate each other’s signaling power when presented together.

Finally, for the interaction of price and advertising with nonmarketing-controlled signals, results demonstrate that signaling power of price is attenuated with the existence of third-party quality ratings. This finding supports the substitutive role of third-party information as it reduces consumers’ need for price cues to learn about brand quality. On the other hand, as discussed above, findings show an evidence of a complementary role of third-party information for warranty. It suggests that interaction between third-party quality ratings and default-independent marketing signals (i.e., price and advertising expenditure) is negative, whereas the interaction between third-party quality ratings and default-contingent signals (i.e., warranty) is positive on perceived quality. Partial support to these competing hypotheses provides preliminary evidence that the interaction effect between marketing-controlled and nonmarketing-controlled signals on perceived quality might differ based on the type of the marketing-controlled signal. Overall, these findings provide unique insights into market signaling and provide clear implications for managers in crafting strategies when simultaneously investing in marketing signals in the presence of independent third-party product review information.

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Managerial Implications

The automotive industry has several examples showing how automakers craft marketing strategies to affect consumers’ quality perceptions (e.g., GM increasing the price of Cadillac CTS sedan by $8000 over the prior CTS, or Hyundai offering a 10-year and 100,000-mile warranty to move the brand to a whole new place in consumers’ minds). Study findings imply that overall car manufacturers can benefit from such signaling strategies with an interesting exception. While a car manufacturer might benefit from high prices and advertising expenditures in increasing quality perceptions, it should be more careful in offering above industry average warranties to elevate perceived quality of a car brand. With the possibility of being contextual to automotive industry, this counterintuitive finding to signaling theory suggests that consumers may feel that high-quality brands do not need to offer an extra assurance with a better warranty. They indeed might perceive an above-average warranty as a mask for an underlying problem or just another advertising tool. However, findings also imply that without considering the interdependence between various marketing signals, car manufacturers might make flawed assumptions about the potential benefits of marketing efforts as some signals can attenuate or strengthen each other’s signaling power. Hence, to better understand when increases in warranty lead to an increase in quality perceptions, situations where warranty as a signal is presented with third-party quality ratings or other marketing-controlled signals are examined.

An improvement in the warranty offer might still be a viable signaling investment to enhance the perceived quality of a brand when it is supported by pricing or advertising strategy of the firm. In the automotive context, price and advertising are highly visible signals, through which automakers incur up-front expenditures regardless. Thus, consumers might perceive these default-independent signals as bolder moves by automakers representing higher confidence in the product compared with the relatively less-visible warranty signal where consumers only see whether the firm is behind its promise in the case of a future breakdown. Moreover, high-reputation firms can reap the benefits of an increased warranty signaling strategy better. In other words, before sending a warranty signal to the market, automakers should take into account the current perceptions of their brands. For a brand without any reputation or a poor reputation for quality products, provision of a better warranty as a quality signal is more likely to backfire.

Regarding the interactions of price and advertising with third-party ratings, findings imply that independent and credible third-party information can weaken the impact of price and advertising on consumer perceptions. Generally, being independent from automakers and publishing results based on in-depth research on the product, third-party infomediaries play an important role in attenuating the information asymmetry between buyers and sellers. Automakers need to understand that in the presence of third-party ratings, some of their strong marketing signals might lose value in consumer’s eyes. Hence, in employing a pricing and advertising strategy, firms should pay attention to integrate the quality message in these signals to achieve a more synergistic relationship between marketing-mix signals and nonmarketing-controlled information. Overall, study findings imply that the emergence of third-party product information introduces a new layer of complexity to the signaling process. Thus, in order to truly understand the impact of marketing-controlled signals on quality perceptions, automakers must account for the effects of third-party product reviews and integrate them to their marketing strategy where favorable.

As far as the relationship between similar-type marketing signals, automakers should consider that a high price tag and intense advertising expenditure have strong influences on the perceived quality, individually; thus, when they come together, they are likely to steal the signaling power from each other. As signals require a considerable amount of investment, given the limited resources of a company, an automaker needs to understand how to manage a portfolio of marketing signals especially with adverse effects.

Finally, the positive association between car sales and perceived quality supports the research stream emphasizing the positive effects of product performance indicators on consumers’ perceptions of quality (Hellofs and Jacobson, 1999), and implies that consumers might perceive higher sales or a higher market share as signals of better quality. This result creates additional incentives for firms to compete for sales and market share as they make every effort to influence consumers’ perceptions of quality. As far as the country of origin, the importance of this variable affecting the quality perceptions has been emphasized to a certain degree in the Japanese automotive industry. Although Lexus has been the top-selling luxury nameplate in the United States since 2000, it did not arrive in Japan until 2005, while German brands have

constituted an obsession in the high-end Japanese automotive industry. Accordingly, results show that German cars shift the perceived quality scores higher than any other brand nationality, whereas Korean brands cause the highest drop-in, followed by U.S and Japanese brands. Although an automaker cannot change its country of origin, this finding still suggests some implications in terms of which companies can benefit from emphasizing their origins versus tuning it down in their signaling strategy (e.g., emphasis on German engineering in VW advertisements).

Limitations and Directions for Future Research

The results, along with some limitations of this research, provide several opportunities for future research. First, industry data were used for empirical testing. However, as with any secondary data, the typical limitation is the issue of accurate representation and measurement of the conceptual variables. As much as the data set was compiled from well-known secondary data sources in the marketing literature, testing these relationships with other available data sources will be a good measure validation of the current study. Also, with the increasing popularity of Internet reviews or consumer-generated reviews, it would be interesting to compare the impact of CR ratings with new media reviews as nonmarketing-controlled signals. Second, including a variable measuring brand reputation across time can be a relevant addition to this context. Signaling literature discusses brand as a richer signal as it serves both a default-independent and default-contingent role (Kirmani and Rao, 2000). Hence, it would be noteworthy to empirically test its interaction effects with other marketing-controlled signals on perceived quality. Third, in a future study with sufficient car model level data availability, an interesting extension would be to analyze these relationships at the model level instead of the brand (i.e., make) level. Finally, it would be interesting to investigate how nonmarketing-controlled signals that are released prior to launch (e.g., reviews from the major automotive shows) may effectively signal product quality.

References


