Asia Pacific Journal of Marketing and Logistics

Advertising strategy and its effectiveness on consumer online search in a defaming product-harm crisis
Sungha Jang, Jinsoo Kim, Reo Song, Ho Kim,

Article information:

For Authors

About Emerald www.emeraldinsight.com

Advertising Strategy and Its Effectiveness on Consumer Online Search in a Defaming Product-Harm Crisis

Abstract

Actual product-harm crises pose significant challenges to firms, but so can defaming product-harm crises, which are defined as crises caused by false or malicious rumors made by consumers or competing firms. Unlike typical product-harm crises, in defaming product-harm crises, the truth often emerges only after substantial damage has been done to the victim firm. Thus, crisis management strategies in these two cases may be different. Using a defaming product-harm crisis that involved two competing firms, this paper examines how the firms changed their advertising strategies and how the changes affected consumers' online search behaviors regarding the two firms. Our analyses show that after the crisis, the offending firm sensitively reacted to its own and the victim firm's advertising levels, but the victim firm did not react to the offending firm's advertising as it had previously. The effectiveness of advertising on consumers' online searches weakened for both firms after the crisis. Our paper provides a new insight about marketing strategies and their effectiveness in the product-harm crisis literature.

Introduction

A product-harm crisis is a discrete event in which a product is found to be defective and therefore dangerous to at least part of the product's customer base (Cleeren et al., 2017). Incidents involving Firestone Tire (2000), Kraft Peanut Butter (2007), Mattel (2007), Domino's Pizza (2009), Toyota (2010), and Volkswagen (2015) are just a few recent examples in which customers and the companies were seriously imperiled by faulty products (Ackman, 2001; Clifford, 2009; *Consumer Reports*, 2016; Goldman and Reckard, 2007; van Heerde et al., 2007; *USA Today*, 2004). Such crises are seemingly increasing in number due to ever-changing market environments, greater product complexity, closer scrutiny by business-monitoring organizations and government regulators, and stronger customer demands for high-quality and safe products (Ahluwalia et al., 2000; Berman, 1999; Dawar and Pillutla, 2000). A product-harm crisis endangers the well-being of customers and is a devastating threat to companies (Dawar and Pillutla, 2000; van Heerde et al., 2007); it can negatively affect sales, advertising effectiveness, and firm value (Chen et al., 2009; Cleeren et al., 2013; van Heerde et al., 2007; Zhao et al., 2011).

Accordingly, many researchers have examined the antecedents and consequences of product-harm crises and developed advertising and pricing strategies to provide managerial insights on these proliferating crises (Cleeren et al., 2017). Prior studies have drawn insights mainly based on one or two fictitious product-harm cases in lab experiments (e.g., Whelan and Dawar, 2016) or on product recalls publicly announced in empirical settings (e.g., Liu et al., 2017). Existing studies on product-harm crises are still limited in that because product recalls are caused by the focal firms only, studies focus on a few dominant industries (e.g., automobile or consumer packaged goods (CPG) industries), and recall information is mostly available in developed countries due to stronger regulations and law enforcement. These facts suggest a gap in the literature, including a variety of causes of product-harm crisis in various industries and

geographic areas (Cleeren et al., 2017). We aim to fill at least a part of this gap by studying a crisis caused by defamation, in which two Korean bakery firms are involved.

In addition to actual product-harm crises, firms sometimes suffer from product-harm crises due to malicious rumors about their products triggered by consumers or competitors (van Heerde et al., 2007). For example, in March 2005 a customer in the San Francisco Bay Area reported that she had found a human fingertip in a bowl of beef chili at a Wendy's store, leading Wendy's stock price to drop almost 10% and sales in the area to fall by about 30%. However, the claim turned out to be false, and a month later the woman was arrested for attempted grand larceny (*NBC News*, 2005). A defamation campaign by a competitor can take place online as well. For example, Samsung caused a defaming product crisis by spreading fake news online (*Verge*, 2013). Taiwan's Fair Trade Commission announced that two local marketing firms associated with Samsung used a large number of hired writers and designated employees to post false praise for Samsung and negative comments about competitors (e.g., HTC) in Taiwanese forums. Samsung was fined $340,000 for these fake online comments.

The aforementioned type of crisis, which is the focus of the current study, is caused by false or malicious rumors made by consumers or competing firms. This type of crisis is different from an actual product-harm crisis in several ways and the two should be distinguished from one another. We call a crisis caused by false or malicious rumors made by consumers or competing firms a *defaming product-harm crisis*. Unlike in an actual crisis, a firm suffering from a defaming crisis (i.e., the victim firm) is initially and mistakenly regarded as the firm causing the product-harm (i.e., the offending firm). It takes a decent amount of time until the truth emerges. In the Wendy's case, it took 31 days to charge the person with felony (*NBC News*, 2005). In the Samsung case, Taiwan's Fair Trade Commission started the investigation into the allegations in

April 2013 and completed it in October 2013 (*Verge*, 2013). After the truth is revealed, the victim firm may be free from blame and rapidly recover consumer trust (e.g., Cleeren et al., 2013), while the offending firm may be harshly evaluated and have difficulty rebuilding its brand image (e.g., van Heerde et al., 2007; Zhao et al., 2011). These dynamics of consumer responses and crisis management by the firms may be different from those in typical product-harm crises. Relatedly, one can ask whether advertising strategies, as one of the key crisis management strategies (Liu et al, 2017), of the victim firm and the offending firm differ after the defaming product-harm crisis and whether the effectiveness of those strategies changes.

Though defaming product-harm crises can occur commonly by malicious rumors or fake news and spread fast on the Internet (e.g., Borah and Tellis, 2016), defaming product-harm crises are less explored in the existing literature. A possible reason is that it is difficult to obtain a dataset about such crises because the offending firms may not be identified. However, defaming events happen very often in many areas including business and politics. For an example of political campaigns, when John McCain won the New Hampshire primary against George W. Bush, there were false claims such that McCain had fathered a child out of wedlock, was gay, and was married to a drug addict. Those rumors had McCain withdraw from the race soon thereafter. The Bush campaign strongly denied any involvement in those attacks even though it supposedly benefited from the rumors. (*The New York Times*, 2007; *Vanity Fair*, 2004). Therefore, an investigation into a case in which the offending and victim firms are clearly identified is necessary to help victim firms develop crisis management plans and prevent offending firms from implementing such unethical tactics.

We use a case study of a defaming product-harm crisis that arose from a malicious action caused by a competitor's franchisee that was clearly identified and accused later. In this case,

because the two firms account for over 90% of the market share (*Korea Herald*, 2013), it is logical for the dominant market player to set its advertising budget in relation to the advertising spending of its direct competitor to maintain its share of voice in the media. Therefore, we empirically examine the two firms' advertising reactions to one another and the advertising effectiveness on consumer online search for each firm. First, we found that the offending firm reacted to its own and the victim's advertising amount more than it previously did, whereas the victim firm did not pay as much attention to the offending firm's advertising amount as it had previously. The offending firm might increase its advertising to regain its reputation, and the victim firm might respond less sensitively to prevent a possible spillover. Second, the effect of the victim firm's advertising on online search volume became insignificant, implying that advertising did not effectively generate consumer interest. In addition, the effect of the offending firm's advertising on online search became insignificant and, in some cases, even negative.

With our approach and findings, we made two main contributions. First, we examined the competitive reactions regarding advertising in a defaming product-harm crisis, a special case of product-harm crises. Three main streams exist in the product-harm crises literature: studies on descriptive cases (e.g., Mitroff, 2004), lab experiments regarding the effect of hypothetical crises on brand evaluations (e.g., Ahluwalia et al., 2000), and studies on the effects of crises on performance (van Heerde et al., 2007). However, research on reactions to competitors' marketing mixes is scarce although it is necessary to better understand a competitive relationship between firms (Cleeren et al., 2017). By examining different advertising responses of the offending firm and the victim firm, we extend our understanding of advertising strategy in product-harm crises.

Second, we investigated the effect of advertising on consumers' online search as a mediating factor between advertising and firm performance. While online search volume has

been shown to improve predictive accuracy (e.g., Choi and Varian, 2009), it can also explain the impacts of advertising and other marketing instruments on customer interest and behavior (Hu et al., 2014). By showing the weakened advertising effects on online search after the defaming product-harm crisis, our study contributes to the body of research that uses online search as an important consumer behavior measure. The substantive findings regarding online search show that firms need to pay more attention to consumers' online search behaviors in an effort to create and effectively manage online search after the defaming product-harm crisis.

Literature

In their review paper, Cleeren et al. (2017) summarize the crisis research of real-life cases in various industries and fictitious product-harm cases in lab experiments, the determinants and effects of product recalls, marketing mixes for crisis management, and analysis approaches. Trends in product-harm crisis research show that secondary data studies (e.g., Liu et al., 2017) have increased compared to lab studies (e.g., Whelan and Dawar, 2016) and analytical studies (e.g., Rubel et al., 2015). Also, firms and investors have been increasingly popular as the subjects of research (e.g., Gao et al., 2015; Liu et al., 2017), while consumers are still the main subjects (e.g., Borah and Tellis, 2016; Cleeren et al., 2008; Zhao et al., 2011). Cleeren et al. (2017) point out that the social network aspect (e.g., online word of mouth) and competitive reactions in product-harm crises are under-researched. We examine competitive reactions of advertising and their effects on online search using a defaming product-harm crisis, which is new to literature, to fill the gap in this research stream.

Cleeren et al. (2013) provide a useful conceptual framework for product-harm crisis management. They set up relationships between marketing variables (i.e., advertising and price)

and purchase behaviors (i.e., brand share and category purchases) before and after product-harm crises. From this framework, we investigate how the level of advertising of a firm affected its own and its competitor's advertising decisions and how advertising effectiveness on consumer search changed after a defaming product-harm crisis. Our analysis framework is a subset of the comprehensive product-harm crisis analysis model proposed by Cleeren et al. (2017), in which advertising is one of the focal main effects, and competitor- and consumer-level consequences are examined.

Competitive reaction regarding advertising

The concept of competitive reaction has been used to describe how firms in oligopoly industries make their decisions. Jedidi et al. (1999) examined four brands in a mature nonfood product category and found positive advertising reactions between pairs of brands. Leeflang and Wittink (1996) developed a framework to distinguish competitive situations such as under-reaction, no competition, or over-reaction by categorizing combinations of a firm's own and cross market share effects and competitive reaction effects. The level of a marketing instrument affecting or being affected by levels of other marketing instruments can be summarized in a generalized reaction matrix (Hanssens, 1980). Our study examines competitive reactions regarding advertising amounts between the two firms (the offending firm and the victim firm) in a defaming product-harm crisis. Many researchers (Borah and Tellis, 2016; Cleeren et al., 2013; Roehm and Tybout, 2006) have examined the advertising effectiveness of each firm in the category, respectively, after product-harm crises. However, few studies have examined how a firm changes advertising and how other firms react to the firm's advertising changes after the crisis.

In the context of a product-harm crisis, the focal firm's advertising can be an effective means to restore its positive image, create awareness about the comeback, and regain trust from risk-averse consumers (Cleeren et al., 2013; van Heerde et al., 2007). Similarly, advertising can also be an effective tool in a defaming crisis, especially for an offending firm. Negative information about a brand resulting from a product-harm crisis can be considered diagnostic or informative to classify the brand as low in quality (Ahluwalia et al., 2000). Thus, the offending firm may increase advertising support to rebuild consumers' trust in the firm. On the other hand, the offending firm might consider reducing its advertising expenditure and hope that the public ultimately will forget about the product-harm crisis.

The advertising decision of the offending firm may be more complicated. van Heerde et al. (2007) found that both the short-run and the long-run advertising effectiveness of the firm that recalled its product decreased after the crisis. Liu et al. (2017) examined how advertising affects the relationship between recall volumes and abnormal stock returns. Regarding the relationship between recall volume and short-term abnormal returns (between two days before and two days after product recall announcement date), they found that brand advertising has a negative effect on the relationship, while promotion advertising has a positive effect. In contrast, when it comes to the relationship between recall volume and long-term abnormal returns (one year portfolio-level returns after announcement), brand advertising has a positive effect on the relationship, but promotion advertising has a negative effect. These findings suggest that the offending firm needs to use the proper advertising type, depending on its short- and long-term goals.

While implementing its strategy, regardless of increasing or decreasing advertising, the offending firm is likely to actively reflect the responses of the victim firm and the public, which leads to a more sensitive reaction. Also, as the offending firm has already lost consumers' trust

and advertising effectiveness (e.g., van Heerde et al., 2007; Zhao et al., 2011), it may be more sensitive to competitive activities to recover from its current status, enhance brand attitude and customer loyalty, and mitigate the negative effects of the crisis. Finally, the increased vulnerability to competitive actions such as competitors' price cuts and advertising hikes can make the offending firm more actively responsive (Liu et al., 2017).

The victim firm can also change its advertising strategy, but for different reasons. First, it might increase its advertising expenditure to take advantage of the situation in which the victim firm is free of responsibility. In the peanut butter contamination crisis in Australia, Sanitarium, which did not cause the crisis in the category, spent 36 times more on weekly advertising during the crisis than it had before (van Heerde et al., 2007). Second, however, the victim firm may not need to make marketing efforts if consumers feel sympathy for the victim firm, depending on the cause of the crisis, and choose the victim firm over the offending firm (Kim and Choi, 2014). Third, on the contrary, the victim firm may be cautious to increase its advertising strategy because this action can cause the negative impact of the crisis to spill over to other brands, such as when the Enron scandal created negative spillover for the entire energy sector (Roehm and Tybout, 2006).

Feldman and Lynch's (1988) accessibility-diagnosticity framework suggests that if the offending firm and the victim firm are jointly accessed in the consumer's memory (accessibility) and the offending firm causes the consumer to think of the victim firm (diagnosticity), crisis spillover will occur. Indeed, Borah and Tellis (2016) found that negative online chatter about product recalls of a focal brand increases negative online chatter about rival brands. Therefore, the victim firm may make an effort so that it is not jointly accessed with the offending firm or so that the crisis is not perceived as diagnostic for the victim firm or the category (Roehm and

Tybout, 2006). Therefore, the victim firm will try to make the crisis unique only to the offending firm by not responding to the offending firm's advertising, hoping that the crisis is not extended to the victim firm. This motivation may lead the victim firm to a less sensitive reaction to the offending firm's advertising. These arguments regarding advertising reactions of the offending firm and the victim firm propose the following hypotheses:

> *H1a: The offending firm's advertising reaction will be larger after a defaming product-harm crisis.*

> *H1b: The victim firm's advertising reaction will be smaller after a defaming product-harm crisis.*

Effectiveness of advertising on online search

Vakratsas and Ambler (1999) propose a framework for studying how advertising works, in which advertising input, such as media scheduling and repetition, affects consumer cognition, affect, and experience and eventually affects market outcomes such as sales, market share, and brand choice. Among their advertising models, persuasive hierarchy models discuss that advertising evokes consumer involvement, which drives consumer search, information seeking, and information processing. That is, consumer search is an intermediate between advertising and purchase behavior. Recently, many scholars have used online search as a leading indicator of sales (e.g., Borah and Tellis, 2016; Du et al., 2015) and as an indicator of consumer interest (Hu et al., 2014; Stephen and Galak, 2012; Panaligan and Chen, 2013).

In the online search literature, Du et al. (2015) improved the sales prediction model by adding feature search trends (e.g., search trends of fuel economy and acceleration in the automobile industry) after controlling the marketing mix. Regarding consumer interest, Panaligan and Chen (2013), assuming that Google search is a reflection of interest and intent, found movie-related search activity in a given weekend is highly positively related to the box

office. Hu et al. (2014) argue that advertising drives sales by making consumers interested to seek product information and converting information seeking consumers to buyers. Using Google search data as a proxy for consumer interest, they show the impacts of advertising on consumer interest and convertibility of consumer interest to purchase. That is, consumer search, a proxy measure of consumer interest in products, plays an important role to understand the effectiveness of advertising in the pre-purchase stage.

Following these studies, we use consumer online search to trace the effectiveness of advertising. Online search is particularly relevant in product-harm crises because consumers actively seek information about the risk of using the products, and online search capacities enable the damage from the product-harm crises to spread more extensively (Laufer and Coombs, 2006). In addition, an online search index is publicly available at brand level in many search engines (e.g., Google Trends). Therefore, an online search index can be a good alternative measure of brand sales when it is hard to obtain sales information at the brand level. Finally, online search reflects the recent trend of the time displacement of old media (e.g., TV, radio, or newspaper) by online media, a phenomenon that has consumers spending more time on new media (Lee et al., 2016). In the search literature, for example, Jang et al. (2017) found that Internet search substitutes significantly for traditional information sources in automobile purchases. Thus, using online search volume can reflect consumers' recent information search patterns.

Increased advertising might increase consumers' interest in the brand and thereby their online search about that brand (Joo et al., 2014; Kim and Hanssens, 2017). However, many studies have reported that the effectiveness of advertising decreases after product-harm crises (e.g., van Heerde et al., 2007; Zhao et al., 2011). Consumers are likely to get less involved, have

a negative attitude, and pay less attention to the brands involved in the crises. For these reasons, consumer interest and online search volumes are likely to decrease for the offending firm and the victim firm. Also, consumers are uncertain about the product quality conveyed by advertising; thus, the effectiveness of advertising can severely decrease during and after a crisis. For example, the firms involved in the peanut butter contamination crisis suffered reduced advertising effectiveness after the crisis (Zhao et al., 2011).

In the case under investigation, it is likely that the two firms had different advertising effectiveness after the crisis. Previous literature (e.g., Cleeren et al., 2008) has found that the negative publicity effect is attenuated when consumers are familiar with the brand. Similarly, commitment, a dimension of attitude strength, is a moderator of negative information effects (Ahluwalia et al., 2000). Because the victim firm was falsely accused, the level of consumer familiarity and commitment toward its brand were likely to be maintained. Due to these reasons, consumers may show more positive attitudes toward the victim firm's advertising than the offending firm's advertising. Those arguments lead to our second hypothesis:

> H2: After a defaming product-harm crisis, the effectiveness of advertising on online search of the victim firm will be larger than that of the offending firm.

Empirical Context

To test our hypotheses, we turn to a case of a defaming product-harm crisis that involved two competing firms that account for over 90% of the market share. On December 23, 2010, a man posted on a famous Korean blog site a picture of a loaf of bread with a rotten rat in it. The bread was purchased from a franchise store of the largest bakery in Korea (hereafter, Firm P). This incident appeared to be a typical crisis, and people criticized Firm P for this awful product defect. But on December 31 (eight days later), information emerged that the man who posted the

picture owned a franchise store of a competing firm, the second largest bakery in Korea (hereafter, Firm C). He had his son purchase the bread from the Firm P store that was near his own store, and then put the rat in it in an attempt to damage the sales of the competing store. Although the crisis period was short, sales for both companies dropped significantly, an estimated 17–18% during the 2010 Christmas season, compared with the previous year (*Chosun Ilbo*, 2011). Note that the Christmas season accounts for more than 30% of the bakery industry's annual sales.

Unlike actual product-harm crises, in this case the view of Firm P as the offending firm was mistaken; it was actually the victim firm. The corporate level of Firm C was involved in the crime, even if indirectly, and was faulted for failing to immediately admit its responsibility or take appropriate action to resolve the issue with the franchise owner. In this defaming product-harm crisis, this study considers the relationships between the two firms' advertising strategies and consumers' online search behaviors for both firms.

Models

We set up a series of vector autoregressive (VAR) models, which have appeared extensively in prior marketing literature, to find empirical evidence of dynamic relationships among variables (e.g., Dekimpe and Hanssens, 1995; Pauwels and Weiss, 2008). We also conduct Chow tests, considering the potentially different covariance matrices before and after the defaming product-harm crisis, to determine whether any structural change took place (Lütkepohl and Krätzig, 2004). The conceptual models with equations, derived in the following subsections, are as follows:
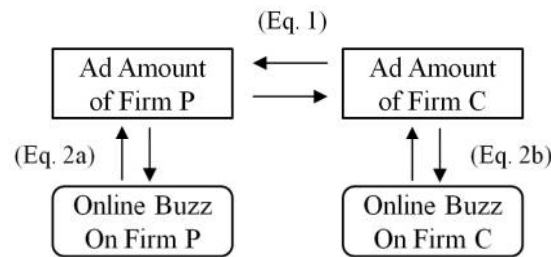
Figure 1 depicts the time series of the advertising amounts (panel A) and keyword search index, a measure of consumers' online search (panel B), for both firms. In each series, the variances of the advertising amounts and keyword search volumes gradually increased over time, with peaks in Decembers. We took the square root of the original values to reduce the heteroskedasticity in the time series variables and included 12-month lagged variables to control for seasonality. According to the Dickey-Fuller unit root tests, Firm P's keyword time series before the crisis was trend stationary; that is, there existed a deterministic trend. We added a trend variable to make the series stationary in the relevant models but did not report the trend coefficients here to avoid clutter and maintain consistency across the estimation results tables. To check for structural breaks, we split the data: before the crisis (2005–2010 for the advertising model and 2007–2010 for the advertising-keyword search models as keyword search information was only available beginning in 2007) and after the crisis (2011–2013).

<Insert Figure 1 About Here>

Advertising model

We set up a competitive reaction function in which competitors react to advertising. Because firms' advertising typically exhibit inertia (Dekimpe and Hanssens, 1995; Hanssens, 1980), we consider own lagged advertising amount as one of the factors that affects advertising amount in the current month. Also, because firms typically react to their competitors' advertising

strategies (Steenkamp et al., 2005), it is necessary to include lagged advertising of competitors in modeling competitive reaction functions (Leeflang and Wittink, 1992). In other words, a firm's advertising amount at t likely depends not only on its own lagged advertising amount, but also on its competitors' lagged advertising amounts. In our data, a model with one-period lagged variables showed more significant results than models with multiple-period lagged variables. We also include Firm P's and Firm C's advertising amounts at $t - 12$ to control for seasonality (Figure 1). Our VAR model is as follows:

$$(1) \quad \begin{pmatrix} AdP_t \\ AdC_t \end{pmatrix} = \begin{pmatrix} \alpha_P \\ \alpha_C \end{pmatrix} + \begin{pmatrix} \beta_{11} & \beta_{12} \\ \beta_{21} & \beta_{22} \end{pmatrix} \begin{pmatrix} AdP_{t-1} \\ AdC_{t-1} \end{pmatrix} + \begin{pmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{pmatrix} \begin{pmatrix} AdP_{t-12} \\ AdC_{t-12} \end{pmatrix} + \begin{pmatrix} \varepsilon_{Pt} \\ \varepsilon_{Ct} \end{pmatrix},$$

where AdP_t and AdC_t are the square roots of the advertising amounts for the two firms (P and C) at t, and the α s are intercepts. The β matrix indicates the effects of Firm P's and Firm C's advertising amounts at $t - 1$. The γ matrix exhibits the effects of Firms P's and C's advertising amounts from 12 months prior. Finally, ε is a vector of error terms that follows a multivariate normal distribution, $N(0, \Sigma)$.

Advertising and keyword search models

To investigate the relationships between monthly advertising amounts and online search, measured by keyword search index, we set up the following VAR models:

$$(2a) \quad \begin{pmatrix} AdP_t \\ KwP_t \end{pmatrix} = \begin{pmatrix} \alpha_{AdP} \\ \alpha_{KwP} \end{pmatrix} + \begin{pmatrix} 0 & 0 \\ \varphi_{21} & 0 \end{pmatrix} \begin{pmatrix} AdP_t \\ KwP_t \end{pmatrix} + \begin{pmatrix} \beta_{11} & \beta_{12} \\ \beta_{21} & \beta_{22} \end{pmatrix} \begin{pmatrix} AdP_{t-1} \\ KwP_{t-1} \end{pmatrix} + \begin{pmatrix} \gamma_{11} & 0 \\ 0 & \gamma_{22} \end{pmatrix} \begin{pmatrix} AdP_{t-12} \\ KwP_{t-12} \end{pmatrix} + \begin{pmatrix} \varepsilon_{AdPt} \\ \varepsilon_{KwPt} \end{pmatrix}$$

$$(2b) \quad \begin{pmatrix} AdC_t \\ KwC_t \end{pmatrix} = \begin{pmatrix} \alpha_{AdC} \\ \alpha_{KwC} \end{pmatrix} + \begin{pmatrix} 0 & 0 \\ \varphi_{21} & 0 \end{pmatrix} \begin{pmatrix} AdC_t \\ KwC_t \end{pmatrix} + \begin{pmatrix} \beta_{11} & \beta_{12} \\ \beta_{21} & \beta_{22} \end{pmatrix} \begin{pmatrix} AdC_{t-1} \\ KwC_{t-1} \end{pmatrix} + \begin{pmatrix} \gamma_{11} & 0 \\ 0 & \gamma_{22} \end{pmatrix} \begin{pmatrix} AdC_{t-12} \\ KwC_{t-12} \end{pmatrix} + \begin{pmatrix} \varepsilon_{AdCt} \\ \varepsilon_{KwCt} \end{pmatrix},$$

where KwP_t and KwC_t are the square roots of the keyword search volume for Firm P and Firm C at t, respectively.

Our model specifications are based on previous literature. First, extant studies have shown that advertising spending has both contemporaneous and carryover effects on the online search volume of related keywords (Kim and Bruce, 2018; Kim and Hanssens, 2017). We capture these two effects with the parameters φ_{21} and β_{21} in Equations 2a and 2b, respectively. Studies in this area have generally reported insignificant cross-effects of advertising (e.g., Hu et al., 2014; van Heerde et al., 2007). Thus, we do not consider the effect of advertising of a firm on the keyword search volume of the other firm. Second, prior research has revealed inertia in firms' advertising practices (Dekimpe and Hanssens, 1995; Hanssens, 1980) such that current advertising amounts might be associated with past advertising amounts and the current keyword search volume should be associated with past keyword search volume. These lagged effects are captured by β_{11} and β_{22} in Equations 2a and 2b. Third, if firms adjust their advertising amount according to consumers' online search behavior in the previous period, a feedback loop may arise from past online search to current advertising spending. We model the feedback loop by the parameter β_{12}. Fourth, advertising and keyword search data show yearly seasonality (Figure 1), thus we include 12-month lagged variables for advertising and keyword search volume to control for seasonality effects (parameters γ_{11} and γ_{22}). Finally, some omitted variables may influence monthly advertising amounts and search volume simultaneously. We incorporate these effects by allowing correlations among error terms through a full covariance matrix.

Data

We gathered the advertising data of the two firms from a leading advertising agency in Korea. Firm P is the largest firm and Firm C is the second largest firm in the Korean bakery industry with sales in 2015 of approximately $1.5 billion from 3,316 franchisees and $0.5 billion

from 1,285 franchisees, respectively (*Newsprime*, 2016). Our data included the two firms'

monthly advertising amounts from January 2005 to December 2013, as we depict in Figure 1,

panel A.

We also obtained the keyword search index for the two firms from one of the largest

Internet portal sites in Korea, which has keyword search information available since 2007.

Therefore, to estimate Equations 2a and 2b, we used data from 2007 to 2013. Panel B in Figure 1

reveals the search volumes over this period. The search index reflects the query share, defined as

the ratio of the number of search queries for a particular period to the maximum number of

search queries over that period. The maximum query share in the time period is normalized to

100. To match weekly search volumes with monthly advertising amounts, we aggregated the

weekly keyword search volumes to the monthly level, such that the maximum monthly keyword

search volume could exceed 100. The vertical lines in Figure 1 represent the time of the

defaming product-harm crisis. Keyword search volumes for Firm P peaked in December 2010,

reflecting the initial news that Firm P was responsible for the product-harm incident. Keyword

search volumes also significantly increased each December or when there was news about the

firms, such as new product introductions or new stores opening in other Asian countries. Thus,

keyword search is closely related to consumers' interest in the firms, but it is not limited to the

crisis only.

The descriptive statistics of advertising amounts of the two firms in Table 1 reveal a

possible change in the two firms' advertising strategies, in terms of amount and scheduling. The

most remarkable change occurred in 2011, following the crisis in December 2010. For the first

three quarters of 2011, Firm P significantly reduced its advertising amounts, except in March and

April. The significant decrease in advertising in May 2011 is notable because May is the second

most profitable month for the industry after December. Firm P increased its advertising only in the last quarter of 2011. In contrast, Firm C started increasing its advertising in August 2011, much earlier than Firm P did. In 2012, Firm P increased its advertising mainly during the second and fourth quarters, while Firm C spent more on advertising than Firm P did in November and December. In 2013, both firms spent substantial amounts on advertising in January, which is unusual. In the second quarter, they increased their advertising amounts again. Finally, in December, Firm P allocated three times as much as Firm C to advertising, which is an opposite pattern compared with 2012.

<Insert Table 1 About Here>

In summary, the offending firm (Firm C) reduced its advertising immediately after the crisis and waited a period before significantly increasing its advertising. The victim firm (Firm P), instead, recovered its advertising pattern sooner and maintained this increased level for a while. Similar advertising patterns have occurred after other product-harm crises (e.g., Zhao et al., 2011).

Results

We present the estimation results in Tables 2–4 and interpret the results by focusing on the relationships between the advertising amounts of the two firms and the relationships between advertising amounts and online search volumes, as summarized in Figure 2.

<Insert Figure 2 About Here>

Advertising model

Table 2 contains the results of the advertising model. Before the crisis, the amount of Firm P's advertising was not affected by Firm C's advertising amount in the previous month, but

it was affected by Firm C's advertising amount 12 months prior ($\gamma = 0.289$). After the crisis, Firm P's advertising amount was no longer affected by Firm C's advertising. That is, Firm P did not respond to Firm C's advertising strategy. In both periods, the effects of Firm P's own advertising amount from 12 months ago were significantly positive, reflecting seasonality effects (i.e., $\gamma = 0.512$ and $\gamma = 0.548$, respectively).

<Insert Table 2 About Here>

Firm C's advertising strategy showed a different pattern. Before the crisis, its advertising amount was affected only by Firm P's 12-month prior advertising amount ($\gamma = 0.266$), possibly because Firm C is a follower in the industry and it mostly considered the market leader's advertising amount when choosing its own advertising amount. After the crisis, Firm C's advertising still depended on Firm P's advertising amount from 12 months ago, but the effect size increased ($\gamma = 0.418$). That is, Firm C, as the offending firm, became more sensitive to the victim firm's advertising.

Additionally, Firm C's advertising was also affected by its own advertising from the previous month ($\beta = 0.419$). That is, its current advertising amount might reflect the change in the market situation arising from its advertising in the previous month. There is no 12-month seasonal effect of Firm C's own spending. Taken together, our hypotheses regarding a smaller reaction of the victim firm and a larger reaction of the offending firm are supported (H1a and H1b).

In Figure 3, we present cumulative impulse response functions to examine the total accumulated effect of an increase in advertising amounts on each firm's advertising amount over a 12-month period. Before the crisis, a \$1,000 increase in Firm P's and Firm C's advertising led to \$1,690 and \$1,306 increases, respectively, in their own advertising amounts during the next 12

months. The cumulative cross-effects were not significant. That is, Firm P's responses to Firm C's advertising spending canceled out over the 12-month period and vice versa. After the crisis, these accumulative impulses became $1,618 and $1,831 for $1,000 increases in Firm P's and Firm C's advertising amounts, respectively. The cumulative cross-effects again were not significant. Regardless of own- and cross-effects before/after the crisis, the effect of an increase in advertising lasted for about three months and spiked after twelve months.

<Insert Figure 3 About Here>

These results indicate different patterns in the two firms' advertising strategies before and after the crisis; however, the Chow test showed that a structural break is not significant (p-value = 0.713). As a robustness check, we divided the pre-crisis period into two periods and found no structural break in these periods either (p-value = 0.402). The Lagrange multiplier (LM) tests for autocorrelation in the residuals were performed at lag 1 through 12 for before and after the crisis models. The null hypotheses of no autocorrelations were not rejected at the 0.01 level (the p-values ranged from 0.014 to 0.93) except for the lag of 9 in the before the crisis model (p-value=0.003). Overall, the assumption was satisfied.

Advertising and keyword search model

Table 3 shows the estimation results for Firm P. Before the crisis, Firm P's advertising amount was not affected by its keyword search volume from a month prior. The advertising amount in the current month had a positive impact on keyword search in the current month ($\phi = 0.041$). However, the advertising amount in the previous month had no impact on the keyword search in the current month.

<Insert Table 3 About Here>

After the crisis, the patterns changed. While keyword search a month prior did not affect current advertising as was true before the crisis, after the crisis advertising amount in the current month no longer affected keyword search in the current month. That is, after the crisis, Firm P's advertising did not trigger consumers' online search. Note that there were 12-month seasonality effects for both advertising amount and keyword search both before and after the crisis. The Chow test indicated a structural break in the relationship between advertising and keyword search before and after the crisis (p-value = 0.0046). According to the Lagrange multiplier (LM) tests, the null hypotheses of no autocorrelations were not rejected (the p-values ranged from 0.12 to 0.91) except for the lag of 12 in the before crisis model (p-value=0.003). Overall, the assumption was satisfied.

In Table 4, we provide the estimation results for Firm C. Before the crisis, its advertising amount was negatively affected by keyword search in the previous month (β = -6.204, $p < 0.1$). Regarding keyword search, the effect of the advertising amount in the current month on keyword search in the current month was positive (ϕ = .012), but we found no effect of advertising amount from the previous month. Keyword search from 12 months ago had a positive effect on keyword search in the current month.

<Insert Table 4 About Here>

After the crisis, advertising amount was not affected by keyword search from the previous month, nor was keyword search affected by the advertising amount in the current month as before. However, keyword search was negatively affected by advertising in the previous month (β = -0.006). This negative effect of the offending firm supports our second hypothesis (H2) that advertising effectiveness of the victim firm will be larger than that of the offending firm, as the victim firm had only insignificant effects. We found 12-month seasonality effects for

both advertising amount and keyword search after the crisis. The Chow test showed a structural break in the relationship between advertising and keyword search for Firm C before and after the crisis (p-value = 0.0031). The Lagrange multiplier (LM) tests showed that the null hypotheses of no autocorrelations were not rejected for all the lags in the models (the p-values ranged from 0.06 to 0.91).

Discussion

The results from the advertising model fill the gap in the literature in terms of competitive reactions. The existing studies on the product-harm crises use advertising as a determinant of sales (e.g., van Heerde et al., 2007), market share (e.g., Liu and Shankar, 2015), or abnormal returns (e.g., Liu et al., 2017), but they do not look into competitive advertising strategy. Different advertising responses of the offending firm and the victim firm can contribute to the product-harm crisis literature by extending our understanding of the interrelationships between firms (Cleeren et al., 2017). Specifically, after the crisis, the offending firm increased its advertising amount and changed its advertising schedule as shown in Figure 1. These changes may be a reflection of the offending firm's persistent advertising reaction in response to the changes in the effects of the offending firm's advertising amount in the previous month and the victim firm's advertising amount a year ago. The results imply that the offending firm might intend to restore its positive image and regain trust from consumers possibly through brand advertising. In contrast, the victim firm did not reactively change its advertising amount and schedule but implemented advertising plans based only on its advertising amount a year ago, a pattern different from that of the offending firm. The victim firm's less sensitive reaction to the

offending firm's advertising may be related to its intention to be not associated with the offending firm or the crisis.

The results of the advertising and keyword search model show that advertising effectiveness decreased after the product-harm crisis, which is similar to the results of other product-harm crises studies (e.g., Liu and Shankar, 2015; van Heerde et al., 2007; Zhao et al., 2011). The ineffectiveness of the victim firm's advertising after the crisis implies that advertising no longer influenced consumers' online search. Thus, the peaks in December of 2011 and 2012 might represent a temporary interest in cake during the high demand season. In the case of the offending firm, the trend of keyword search volume was decreasing, with small peaks in December of both 2011 and 2012. This decline is surprising in that the offending firm spent a lot of money on advertising. In general, the effect of the crisis on advertising ineffectiveness lasted long, and it was more severe for the offending firm possibly because of losing consumers' brand trust.

Conclusion

A defaming product-harm crisis, resulting from a false claim about a firm's product, requires a unique response strategy. In the case we studied, the true victim firm and offending firm were revealed after eight days. During this period, though, the bakery industry's peak season sales dropped significantly and it received strong negative responses from the public. When the truth emerged that the other firm was actually responsible, public opinion and consumers' responses changed. Using this defaming product-harm crisis, we examined the changes in competitive reactions of the two firms, as well as the relationships between advertising and consumer online search behavior.

Our findings show that a defaming product-harm crisis can prompt changes in the relationships. First, the defaming product-harm crisis changed two firms' advertising spending patterns. The offending firm irregularly and significantly changed its advertising amount and scheduling, reflecting the victim firm's advertising amount. However, the victim firm became insensitive to the offending firm's advertising amount, possibly because the offending firm had significantly changed its strategy while the victim firm retained its existing advertising pattern. Second, relationships between advertising amount and online search volume changed as well. Notably, the effects of advertising amount in the current month on online search in the current month became insignificant for both firms after the crisis. Considering that online search is an important indicator of sales, the effect of advertising on sales was likely reduced after the crisis.

Our findings provide important managerial implications to restore brand performance to pre-crisis levels. First, the decreased advertising effectiveness on keyword search volume is more severe to the offending firm, even though that firm increased its advertising amount after the crisis. In fact, belated blame acknowledgement and irresponsible responses of the top management at the offending firm resulted in anger of the public and a huge loss of franchisees' profits (e.g., 72 franchisees went out of business in the first three months after the crisis (*Maeil Business Newspaper*, 2011). Regarding the effect of the top management, Kashmiri and Brower (2016) found that the presence of a chief marketing officer can reduce product-harm crisis occurrences, and Kashmiri et al. (2017) showed that marketing department power and customer orientation tendency mitigate the negative effects of CEO narcissism on product-harm crises. That is, a high emphasis on brand value and customer satisfaction can reduce the likelihood of the occurrence of product-harm crises. In other words, after the crisis, the top management and

the marketing department need to make more prompt efforts to recover consumer trust by taking more responsible actions than just increasing their advertising amounts.

Second, a different marketing approach may be needed for the victim firm. The reduced search volume and insignificant advertising effect imply that the negative effect of the crisis spilled over to the victim firm in the same industry. Nevertheless, as the victim firm did not cause the crisis, its recovery management, other than advertising amount, should be more effective than that of the offending firm. For example, Whelan and Dawar (2016) claim that consumers with different attachment styles respond to a crisis differently when fault is ambiguous. In their experiment, the participants with the secure style (low anxiety and low avoidance) attributed less blame to the brand than the participants with the fearful style (high anxiety and low avoidance). If the victim firm can prime the secure style via marketing activities, consumer evaluation on the victim firm would be more favorable. Xie and Keh (2016) found that both post-crisis donation and price discount are effective for high reputation brands, while post-crisis donation is more effective than price discount for moderately reputable brands. In our case, the victim firm is the leading brand in the market and may implement various types of promotion programs.

Limitations and Future Research

One case may not fully represent defaming product-harm crises. As with many other general product-harm crisis studies that focused on one case (e.g., Cleeren et al. (2008), van Heerde et al. (2007), and Zhao et al. (2011) used one recall case of two Australian peanut butter brands due to salmonella poisoning), the current study may have limited external validity. However, it aims to make a unique contribution to the existing marketing literature. Especially,

this exploratory case study opens up a new arena of study by providing the first empirical evidence from a defaming product-harm crisis case. It is our hope that our study provides other researchers and practitioners with better directions for similar types of crisis management and future research.

First, it is necessary to systematically collect defaming product-harm crises to understand generalized findings. This type of crisis has not been uncommon, but it is anticipated that more frequent defaming product-harm crises occur and spread online. Therefore, information about these defaming product-harm crises and penalties will be helpful for firms to be cautious and prevent a trial of defamation. Second, information about the firms' other marketing activities is necessary to comprehensively understand the effect of the marketing mix. For example, a previous study (Liu et al. 2017) showed that promotional advertising is more effective in a short term, while brand advertising is more effective in a long term. Price change and PR activities are also important determinants of consumer behavior. More direct performance measures (e.g., stock prices or sales volumes), consumer interest, and the valence of consumer opinions on social media can increase research validity. Third, the crisis period in our data was just eight days, and we had access to only monthly advertising data. The lack of data from shorter periods prevented us from studying immediate decisions by the two firms. Future studies should look at this issue. If daily online search volume was available, additional studies should focus on the dynamics of consumers' online responses. Finally, the monthly advertising spending data did not give us sufficient data points to check the structure break in the advertising model, especially due to 12-month seasonality. The post-crisis period of three years may be too short to affirm structural changes. For other situations, data collected over longer periods may be necessary to test for long-term structural changes before and after the crisis.

References

Ackman, D. (2001), "Tire trouble: the Ford-Firestone blowout", *Forbes*, 20 June, available at: http://www.forbes.com/2001/06/20/tireindex.html.

Ahluwalia, R., Burnkrant, R.E. and Unnava, H.R. (2000), "Consumer response to negative publicity: the moderating role of commitment", *Journal of Marketing Research*, Vol. 37 No. 2, pp. 203–214.

Berman, B. (1999), "Planning for the inevitable product recall", *Business Horizons*, Vol. 42 No. 2, pp. 69–78.

Borah, A. and Tellis, G.J (2016), "Halo (spillover) effects in social media: do product recalls of one brand hurt or help rival brands", *Journal of Marketing Research*, Vol. 53 No. 2, pp. 143-160.

Chen, Y., Ganesan, S. and Liu, Y. (2009), "Does a firm's product-recall strategy affect its financial value? an examination of strategic alternatives during product-harm crises", *Journal of Marketing*, Vol. 73 No. 6, pp. 214-226.

Choi, H. and Varian, H.R. (2009), "Predicting the present with Google Trends", available at: https://static.googleusercontent.com/media/www.google.com/en//googleblogs/pdfs/google_predicting_the_present.pdf.

Chosun Ilbo (2011), "Blown-off Christmas sales of all bakeries due to the 'rat bread' crisis that intended to reduce competitors' sales", 1 January, available at: http://news.chosun.com/site/data/html_dir/2010/12/31/2010123101675.html.

Cleeren, K., Dekimpe, M.G. and Helsen, K. (2008), "Weathering product-harm crises", *Journal of the Academy of Marketing Science*, Vol. 36 No. 2, pp. 262-270.

Cleeren, K., Dekimpe, M.G. and van Heerde, H.J. (2017), "Marketing research on product-harm crises: a review, managerial implications, and an agenda for future research", *Journal of the Academy of Marketing Science*, Vol. 45 No. 5, pp. 593-615.

Cleeren, K., van Heerde, H.J. and Dekimpe, M.G. (2013), "Rising from the ashes: how brands and categories can overcome product-harm crises", *Journal of Marketing*, Vol. 77 No. 2, pp. 58-77.

Clifford, S. (2009), "Video prank at Domino's taints brand", *The New York Times*, 15 April, available at: http://www.nytimes.com/2009/04/16/business/media/16dominos.html?_r=0.

Consumer Reports (2016), "Volkswagen diesel emissions scandal", 27 October, available at: http://www.consumerreports.org/cars/vw-diesel-emissions-recall.

Dawar, N. and Pillutla, M.M. (2000), "Impact of product-harm crises on brand equity: the moderating role of consumer expectations", *Journal of Marketing Research*, Vol. 37 No. 2, pp. 215–226.

Dekimpe, M.G. and Hanssens, D.M. (1995), "The Persistence of marketing effects on sales", *Marketing Science*, Vol. 14 No. 1, pp. 1-21.

Du, R.Y., Hu, Y. and Damangir, S (2015), "Leveraging trends in online searches for product features in market response modeling", *Journal of Marketing*, Vol. 79 No. 1, pp. 29-43.

Feldman, J.M. and Lynch Jr, J.G. (1988), "Self-generated validity and other effects of measurement on belief, attitude, intention, and behavior", *Journal of Applied Psychology*, Vol. 73 No. 3, pp. 421-435.

Gao, H., Xie, J., Wang, Q. and Wilbur, K.C. (2015), "Should ad spending increase or decrease before a recall announcement? the marketing-finance interface in product-harm crisis management", *Journal of Marketing*, Vol. 79 No. 4, pp. 80-99.

Goldman, A. and Reckard, E.S. (2007), "Tactics differ for 2 firms in crises", *Los Angeles Times*, 18 August, available at: http://articles.latimes.com/2007/aug/18/business/fi-pr18.

Hanssens, D.M. (1980), "Market response, competitive behavior, and time series analysis", *Journal of Marketing Research*, Vol. 17 No. 4, pp. 470-485.

Hu Y., Du, R.Y. and Damangir, S. (2014), "Decomposing the impact of advertising: augmenting sales with online search data", *Journal of Marketing Research*, Vol. 51 No. 3, pp. 300-319.

Jang, S., Prasad, A. and Ratchford, B.T. (2017), "Consumer search of multiple information sources and its impact on consumer price satisfaction", *Journal of Interactive Marketing*, Vol 40 No. November, pp. 24-40.

Joo, M., Wilbur, K.C., Cowgill B. and Zhu Y. (2014), "Television advertising and online search", *Management Science*, Vol. 60 No. 1, pp. 56-73.

Jedidi, K., Mela, C.F. and Gupta, S. (1999), "Managing advertising and promotion for long-run profitability", *Marketing Science*, Vol. 18 No. 1, pp. 1-22.

Kashmiri, S. and Brower, J. (2016), "Oops! I did it again: effect of corporate governance and top management team characteristics on the likelihood of product-harm crises", *Journal of Business Research*, Vol. 69 No. 2, pp. 621-630.

Kashmiri, S., Nicol, C.D. and Arora, S. (2017), "Me, myself, and I: influence of CEO narcissism on firms' innovation strategy and the likelihood of product-harm crises", *Journal of the Academy of Marketing Science*, Vol. 45 No. 5, pp. 633-656.

Kim, H. and Bruce, N. (2018), "Should sequels differ from original movies in pre-launch advertising schedules? lessons from consumers' online search activity", *International Journal of Research in Marketing* Vol. 35 No. 1.

Kim, S. and Choi, S.M. (2014), "Is corporate advertising effective in a crisis?: the effects of crisis type and evaluative tone of news coverage", *Journal of Promotion Management* Vol. 20 No. 2, pp. 97-114.

Kim, H. and Hanssens, D.M. (2017) "Effects of advertising and word-of-mouth on pre-launch consumer interest and initial sales", *Journal of Interactive Marketing*, Vol. 37, pp. 57-74.

Korea Herald (2013). "French chain to take on Paris Baguette" available at http://khnews.kheraldm.com/view.php?ud=20131028000576&md=20131031004608_BL&kr=1

Laufer, D. and Coombs, W.T. (2006), "How should a company respond to a product-harm crisis? the role of corporate reputation and consumer-based cues", *Business Horizons*, Vol. 49 No. 5, pp. 379-385.

Lee, S.Y., Lee, S.W. and Kim, C. (2016), "Time displacement effect of online video services on other media in South Korea", *Telematics and Informatics*, Vol. 33 No. 2, pp. 247-255.

Leeflang, P.S.H and Wittink, D.R. (1992), "Diagnosing competitive reactions using (aggregated) scanner data", *International Journal of Research in Marketing*, Vol. 9 No. 1, pp. 39-57.

Leeflang, P.S.H. and Wittink, D.R. (1996), "Competitive reaction versus consumer response: do managers overreact", *International Journal of Research in Marketing*, Vol. 13 No. 2, pp. 103-119.

Liu, Y. and Shankar, V. (2015), "The dynamic impact of product-harm crises on brand preference and advertising effectiveness: an empirical analysis of the automobile industry", *Management Science*, Vol. 61 No. 10, pp. 2514-2535.

Liu, Y., Shankar, V. and Yun, W. (2017), "Crisis management strategies and the long-term effects of product recalls on firm value", *Journal of Marketing*, Vol. 81 No. 5, pp. 30-48.

Lütkepohl, H. and Krätzig, M. (2004), *Applied Time Series Econometrics*, Cambridge University Press, Cambridge, UK.

Maeil Business Newspaper (2011). "Why did 70 stores of CJ Tous les Jours go out of business?" 12 April, available at: news.mk.co.kr/v3/view.php?year=2011&no=232188.

Mitroff, I. (2004), *Crisis Leadership: Planning for the Unthinkable*, John Wiley & Sons, New York, NY.

NBC News (2005), "Wendy' hopes arrest will bring back customers", 23 April, available at: http://www.nbcnews.com/id/7594873/ns/business-us_business/t/wendys-hopes-arrest-will-bring-back-customers/#.WjqePGinFaQ.

Newsprime (2016), "Domestic and international sales performance of bakery companies", 9 December, available at: http://www.newsprime.co.kr/news/article.html?no=357551.

Panaligan, R. and Chen, Andrea. (2013) "Quantifying movie magic with google search", *Google Whitepaper*, June, pp. 1-11.

Pauwels, K. and Weiss, A. (2008) "Moving from free to fee: how online firms market to change their business model successfully", *Journal of Marketing*, Vol. 72 No. 3, pp. 14-31.

Roehm, M.L. and Tybout, A.M. (2006), "When will a brand scandal spill over, and how should competitors respond", *Journal of Marketing Research*, Vol. 43 No. 3, pp. 366–373.

Rubel, O., Naik, P.A. and Srinivasan, S. (2011), "Optimal advertising when envisioning a product-harm crisis", *Marketing Science*, Vol. 30 No. 6, pp. 1048-1065.

Steenkamp, J.E.M., Nijs, V.R., Hanssens, D.M. and Dekimpe, M.G. (2005), "Competitive reactions to advertising and promotion attacks", *Marketing Science*, Vol. 24 No. 1, pp. 35-54.

Stephen, A.T. and Galak, J. (2012), "The Effects of traditional and social earned media on sales: a study of a microlending marketplace", *Journal of Marketing Research*, Vol. 49 No. 5, pp. 624-639.

The New York Times (2007), "Confronting ghosts of 2000 in South Carolina", 19 October, available at http://www.nytimes.com/2007/10/19/us/politics/19mccain.html?_r=0.

USA Today (2004), "Tylenol can't cure all crises", 17 March, available at: http://usatoday30.usatoday.com/news/opinion/editorials/2004-03-17-dezenhall_x.htm.

Vakratsas, D. and Ambler, T. (1999), "How advertising works: what do we really know", *Journal of Marketing*, Vol. 63 No. 1, pp. 26-43.

van Heerde, H.J., Helsen, K. and Dekimpe, M.G. (2007), "The Impact of a product-harm crisis on marketing effectiveness", *Marketing Science*, Vol. 26 No.2, pp. 230–45.

Vanity Fair (2004), "The trashing of John McCain", November, available at www.vanityfair.com/news/2004/11/mccain200411.

Verge (2013), "Samsung fined $340,000 for faking online comments", 24 October, available at: https://www.theverge.com/2013/10/24/5023658/samsung-fined-340000-for-posting-negative-htc-reviews.

Whelan, J. and Dawar, N. (2016), "Attributions of blame following a product-harm crisis depend on consumers' attachment styles", *Marketing Letters*, Vol. 27 No. 2, pp. 285-294.

Xie, Y. and Keh, H.T. (2016), "Taming the blame game: using promotion programs to counter product-harm crises", *Journal of Advertising*, Vol. 45 No. 2, pp. 211-226.

Zhao, Y., Zhao Y. and Helsen, K. (2011), "Consumer learning in a turbulent market environment: modeling consumer choice dynamics after a product-harm crisis", *Journal of Marketing Research*, Vol. 48 No. 2, pp. 255-267.

Table 1. Advertising Amount ($1,000)

A. Firm P

Month	2005	2006	2007	2008	2009	2010	2011	2012	2013
1	0	0	0	0	0	38	17	24	1246
2	0	0	20	0	27	73	32	116	112
3	0	0	0	49	23	4	323	14	83
4	0	0	0	0	0	0	169	1390	2652
5	0	9	584	681	856	1123	252	1306	1644
6	0	0	529	88	856	1175	22	30	1468
7	0	0	446	0	283	422	28	10	99
8	0	0	168	237	1	458	12	0	8
9	24	939	0	374	951	338	34	1	0
10	4	645	0	16	772	321	1232	1386	209
11	312	323	610	242	357	17	714	85	19
12	1540	744	967	1391	1271	2184	1610	1725	1978
Total	1880	2659	3324	3077	5398	6153	4443	6088	9519

B. Firm C

Month	2005	2006	2007	2008	2009	2010	2011	2012	2013
1	304	351	0	0	0	40	63	5	1283
2	277	235	0	0	272	0	92	44	4
3	57	108	666	0	232	42	9	45	516
4	128	0	443	0	243	2	7	49	1538
5	167	324	454	1	235	18	8	32	383
6	0	438	0	729	1	65	6	3	1
7	0	337	177	758	13	0	9	3	0
8	0	0	47	0	0	0	1129	10	4
9	0	0	14	0	901	0	349	639	0
10	133	424	10	523	644	0	4	216	13
11	335	244	208	389	31	487	3	1329	32
12	303	224	1231	1197	1023	1164	1310	3405	654
Total	1705	2685	3250	3598	3596	1818	2989	5779	4429

Table 2. Advertising Model

Dependent Variable	Independent Variable	Before the Crisis (2005-2010)		After the Crisis (2011-2013)	
		Estimate	S.E.	Estimate	S.E.
AdP_t	$Intercept_1$	3.007	2.774	1.390	4.589
	AdP_{t-1}	0.147	0.109	0.126	0.159
	AdC_{t-1}	-0.053	0.129	0.285	0.172
	AdP_{t-12}	0.512***	0.114	0.548***	0.166
	AdC_{t-12}	0.289**	0.137	0.136	0.173
AdC_t	$Intercept_2$	6.729**	2.880	0.228	4.075
	AdP_{t-1}	-0.080	0.113	-0.120	0.141
	AdC_{t-1}	0.208	0.134	0.419***	0.153
	AdP_{t-12}	0.266**	0.118	0.418***	0.147
	AdC_{t-12}	0.035	0.142	0.219	0.153
Accumulative Impulse		AdP_t (S.E.)	AdC_t (S.E.)	AdP_t (S.E.)	AdC_t (S.E.)
AdP_{t+12}		1.69 (0.213)	0.209 (0.274)	1.618 (0.381)	0.662 (0.476)
AdC_{t+12}		0.146 (0.247)	1.306 (0.319)	0.196 (0.477)	1.831 (0.606)
BIC		9.94		10.760	
Univariate R^2		0.409 / 0.127		0.404 / 0.441	
Chow Test		χ^2 (d.f. = 13): 9.756 ($p = 0.713$)			

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 3. Firm P's Advertising and Keyword Search Model

| Dependent Variable	Independent Variable	Before Crisis (2007-2010)		After Crisis (2011-2013)	
		Estimate	S.E.	Estimate	S.E.
AdP_t	$Intercept_1$	4.764	8.806	10.361	11.249
	AdP_{t-1}	0.100	0.153	0.272*	0.151
	KwP_{t-1}	-0.001	1.502	-1.220	1.755
	AdP_{t-12}	0.679***	0.137	0.614***	0.160
KwP_t	$Intercept_2$	1.524	1.253	3.412***	0.834
	AdP_t	0.041**	0.021	-0.0004	0.009
	AdP_{t-1}	-0.011	0.020	-0.007	0.008
	KwP_{t-1}	0.200	0.204	0.116	0.097
	KwP_{t-12}	0.555***	0.196	0.311***	0.097
Accumulative Impulse		AdP_t (S.E.)	KwP_t (S.E.)	AdP_t (S.E.)	KwP_t (S.E.)
AdP_{t+12}		1.790 (0.282)	-0.001 (2.272)	2.007 (0.437)	-1.924 (0.794)
KwP_{t+12}		-0.008 (0.02)	1.805 (0.154)	-0.011 (0.021)	1.458 (0.185)
BIC		6.07		5.383	
Univariate R^2		0.464 / 0.407		0.355 / 0.278	
Chow Test		χ^2 (d.f. = 11): 26.968 ($p = 0.0046$)			

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4. Firm C's Advertising and Keyword Search Model

Dependent Variable	Independent Variable	Before Crisis (2007-2010)		After Crisis (2011-2013)	
		Estimate	S.E.	Estimate	S.E.
AdC_t	$Intercept_1$	36.670[**]	15.345	25.721	18.712
	AdC_{t-1}	0.369[**]	0.178	0.483[***]	0.146
	KwC_{t-1}	-6.204[*]	3.265	-5.075	4.236
	AdC_{t-12}	0.013	0.124	0.321[**]	0.150
KwC_t	$Intercept_2$	1.347[**]	0.604	0.673	0.457
	AdC_t	0.012[***]	0.004	-0.0003	0.003
	AdC_{t-1}	0.003	0.006	-0.006[**]	0.003
	KwC_{t-1}	0.081	0.111	0.172[**]	0.080
	KwC_{t-12}	0.628[***]	0.072	0.667[***]	0.082
Accumulative Impulse		AdC_t (S.E.)	KwC_t (S.E.)	AdC_t (S.E.)	KwC_t (S.E.)
AdC_{t+12}		1.489 (0.401)	-9.147 (3.605)	2.404 (1.32)	-12.727 (9.162)
KwC_{t+12}		0.011 (0.011)	1.558 (0.134)	-0.015 (0.018)	1.965 (0.24)
BIC		3.31		3.108	
Univariate R^2		0.094 / 0.759		0.289 / 0.681	
Chow Test		χ^2 (d.f. = 11): 28.08 ($p = 0.0031$)			

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Figure 1. Advertising Amount and Keyword Search Volume (Monthly)
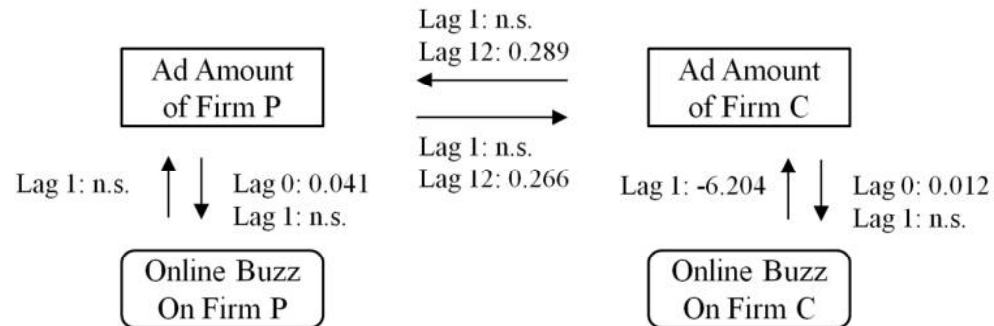A. Advertising Amount ($1,000)
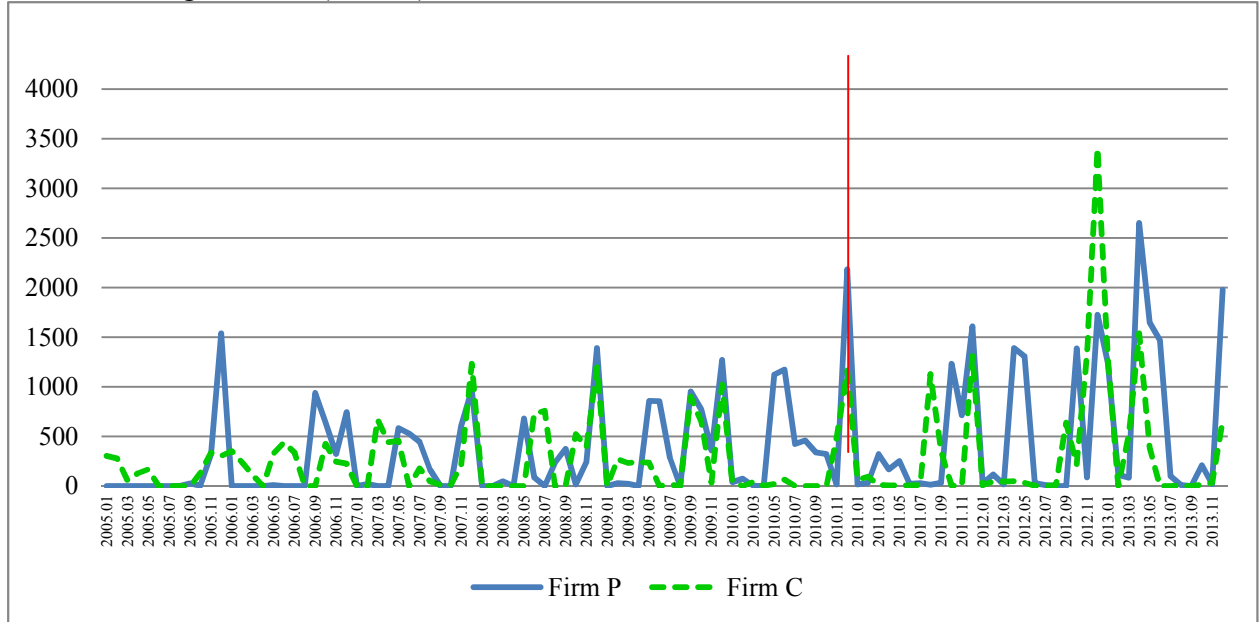
Note: The vertical line in December 2010 represents the time of the defaming product-harm crisis.
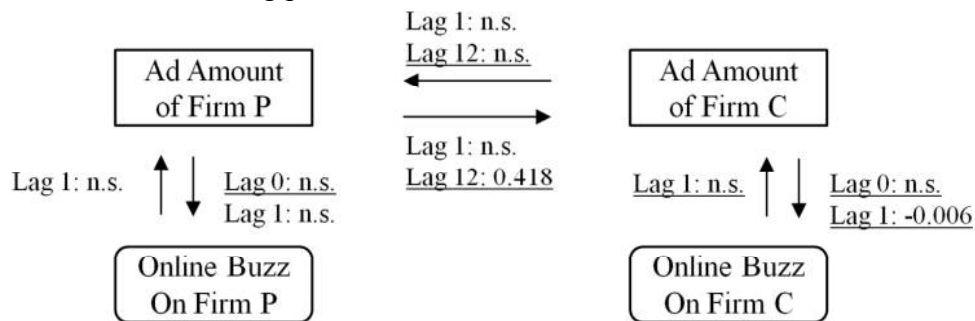
B. Keyword Search Volume
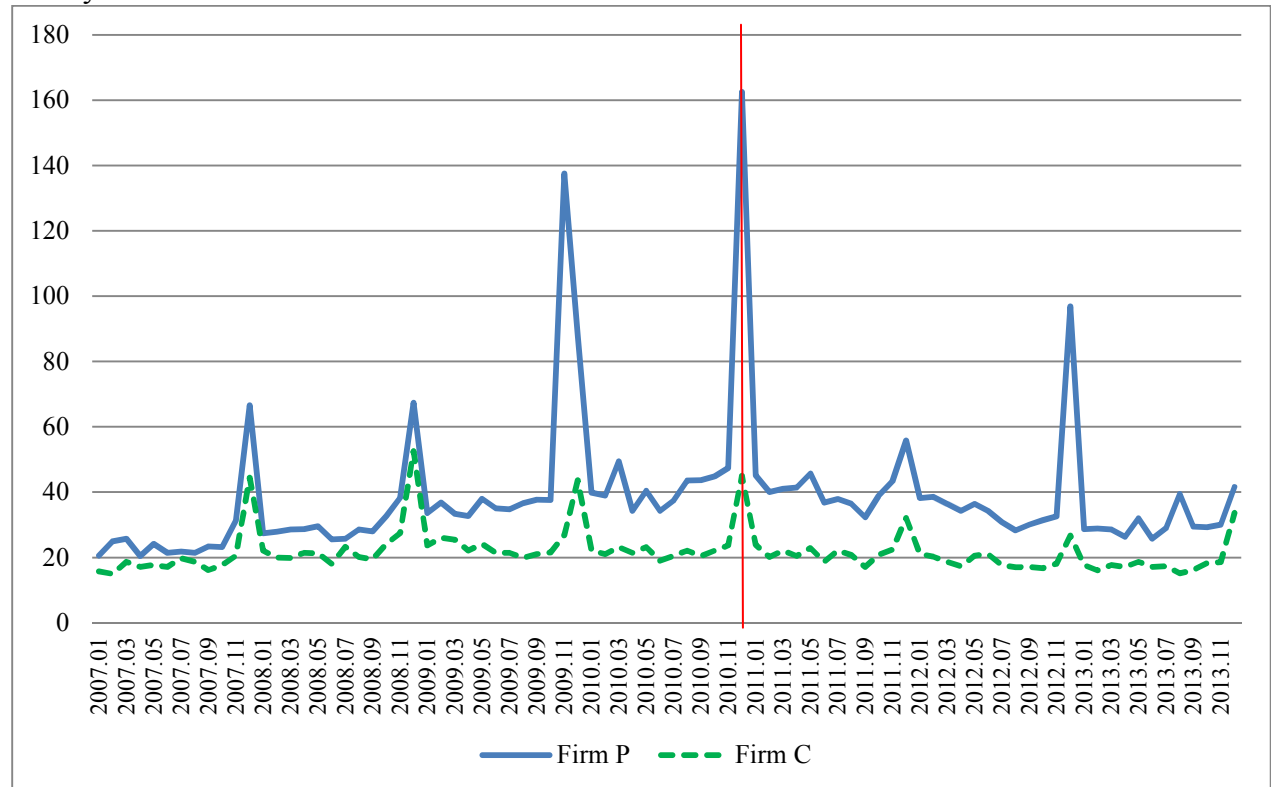
Note: The vertical line in December 2010 represents the time of the defaming product-harm crisis.

Figure 2. Main Estimation Results
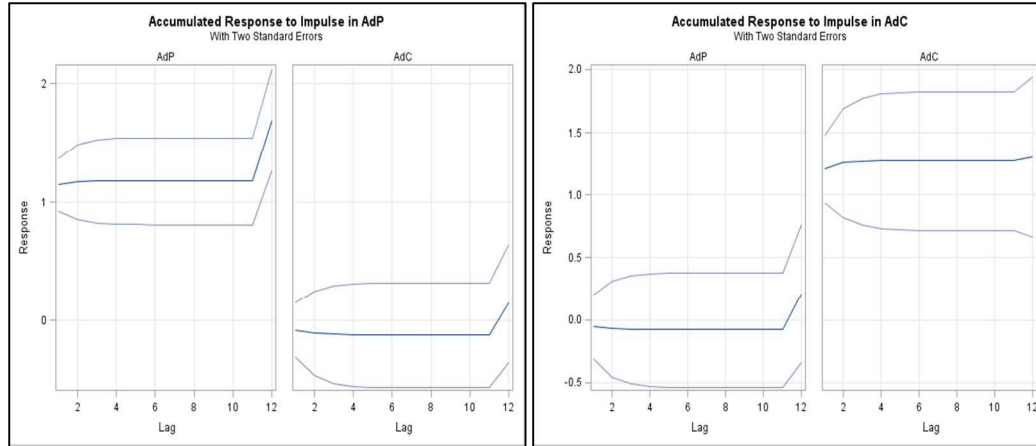A. Before the defaming product-harm crisis



B. After the defaming product-harm crisis

Note: Lag indicates the number of lags of the independent variables. The coefficients underlined in panel B mean that there are changes to the coefficients before and after the crisis, in terms of significance or magnitude.

Figure 3. Cumulative Impulse Response Functions for Advertising
A. Before the defaming product-harm crisis

B. After the defaming product-harm crisis
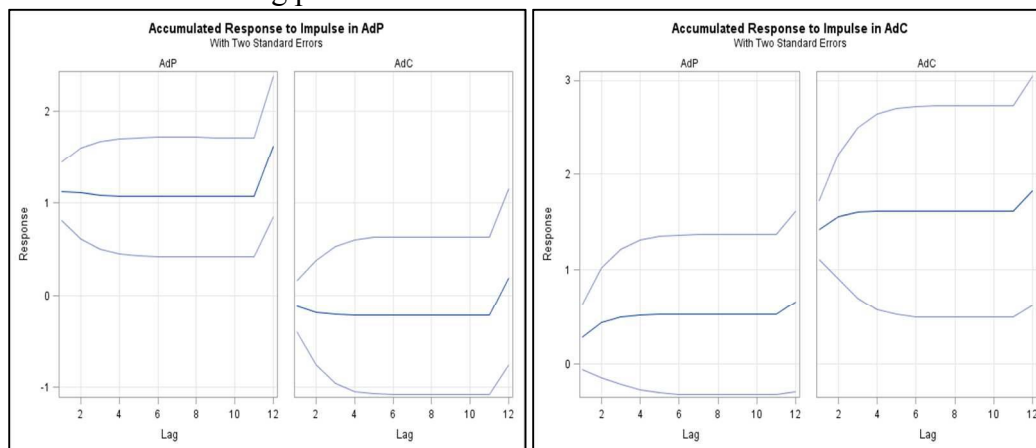
About the authors

Sungha Jang is an Assistant Professor of Marketing at Kansas State University. His research interests include choice modeling, consumer search behavior, and advertising by utilizing Bayesian estimation and text mining techniques. His research has been published in *International Journal of Research in Marketing* and *Marketing Letters*.

Jinsoo Kim is an Assistant Professor at the Rhode Island College, Providence, Rhode Island in the United States. His research interest includes agenda-setting and agenda-building theory, risk communication, and the influence of eWOM (electronic Word of Mouth) on consumer behavior. His research has been published in *International Journal of Strategic Communication*, *Public Relations Review*, and *Korean Journal of Advertising*.

Reo Song is an Assistant Professor of Marketing at California State University, Long Beach. His research interests include social media, digital marketing, business analytics, customer relationship management (CRM), and advertising. His research has been published in the *Journal of the Academy of Marketing Science, Journal of Retailing, Marketing Letters, Journal of Advertising Research, Journal of Interactive Marketing*, and *European Journal of Marketing*.

Ho Kim is an Assistant Professor of Digital and Social Media Marketing at University of Missouri – St. Louis. His research interests include online word-of-mouth, online search, pricing of online content, dynamic advertising effectiveness, content analysis, and econometric modeling. His research has been published in *Journal of Interactive Marketing, Omega, International Journal of Innovation Management, Korean Management Science Review, Korean Society for Internet Information Journal,* and *The Journal of Korean Information and Communication Society*.