

# Marketing research on product-harm crises: a review, managerial implications, and an agenda for future research

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**Abstract** A product-harm crisis is a discrete event in which products are found to be defective and therefore dangerous to at least part of the product's customer base. Product-harm crises are not only dangerous for consumers; they also represent a major threat to the reputation and equity of brands or companies, which often struggle with how to best respond. The marketing literature has witnessed a surge in interest on the consequences of product-harm crises for a variety of stakeholders, including consumers, the brand or company itself, its investors, as well as competitors. This article offers a systematic review of research on product-harm crises in the marketing literature. We discuss the antecedents and consequences of product-harm crises, their moderators and mediators, and the theories and methodologies used. We identify commonalities and differences between the studies, as well as gaps in the literature and avenues for future research. Finally, we synthesize the managerial implications across studies.

**Keywords** Product-harm crisis · Product recall · Marketing drivers · Crisis context

## Introduction

A product-harm crisis occurs when products fail to meet certain safety standards (which could be mandatory or voluntarily adopted by the industry), or contain a defect that could cause serious harm to consumers (Liu et al. 2012). Well-known examples include the Samsung Galaxy Note 7 that could catch fire while charging, and Toyota's problem with unintended acceleration. Both cases received widespread publicity<sup>1</sup> and led to costly recalls (in the case of Toyota), and even to a discontinuation of the product (in the case of Samsung).<sup>2</sup>

Product-harm crises are not only dangerous for consumers; they also represent a major threat to the reputation and equity of brands or companies, which often struggle with how to best respond. The last two decades have witnessed a considerable increase in the number of product-harm crises (Cleeren et al. 2013; Borah and Tellis 2016). This has been attributed to the increasing complexity of products, the closer scrutiny by manufacturers and policy makers, the growing outsourcing and globalization of production which makes quality control more difficult, the higher demands by consumers, and a heightened media attention that makes crises more visible to the general public (van Heerde et al. 2007; Liu et al. 2012).

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<sup>1</sup> See, for example, <https://www.cnet.com/news/5-biggest-takeaways-from-samsungs-note-7-battery-fire/>; <http://abcnews.go.com/Blotter/toyota-pay-12b-hiding-deadly-unintended-acceleration/story?id=22972214>.

<sup>2</sup> Product-harm crises are one of the most-often studied forms of marketing crises, which according to Clark (1988) have the following characteristics: (1) they threaten marketing goals, (2) they reduce the marketer's ability to control or direct the marketing environment, and (3) decision or response time is short.

The marketing literature has witnessed a parallel surge in interest on the consequences of product-harm crises for a variety of stakeholders, including consumers, the brand or company itself, its investors, as well as competitors (which can either benefit from the misfortune of their rivals or can be seen as “guilty by association” and suffer from a reduced category demand). This literature has addressed a wide variety of research questions based on various theories, using a wide set of research methods, in a very diverse range of settings. This diversity, however, makes it difficult to grasp the core themes and findings, and makes it hard to see what gaps remain in the current knowledge base.

The goal of this article is to offer a systematic review of research on product-harm crises in the marketing literature. To determine the scope of this research, we need a precise definition of a product-harm crisis. A commonly-used definition is that it is a discrete, well-publicized event in which products are found to be defective or even dangerous (see, e.g., Siomkos and Kurzbard 1994; Dawar and Pillutla 2000). Based on our review of the literature, we propose to tweak two aspects of this definition. First, product-harm crises vary in the extent to which they generate media attention on a continuum. However, the term “well-publicized” suggests a dichotomy, so we propose to drop this term from the definition, especially since the “coverage” need not be restricted to the more traditional (commercial) media, but may also come from word-of-mouth activity on social websites. Second, the “harm” that could be caused by the crisis need not apply to (be relevant to) all potential customers. For example, the erroneous labelling of certain ingredients may be inconsequential to most customers, yet can well be lethal to those customers experiencing an allergic reaction. Our proposed definition therefore is: *a product-harm crisis is a discrete event in which products are found to be defective and therefore dangerous to at least part of the product’s customer base.*<sup>3</sup>

Some further qualifications are called for. First, even though a product-harm crisis often leads to products being recalled from the distribution system, this is not a necessary condition. For example, the legal environment may not require the firm to recall its faulty products; it can instead opt to offer a free repair or replacement or to fully refund its customers (Liu et al. 2016). Similarly, there may be product recalls that are not caused by a product-harm crisis. For instance, a manufacturer may have inadvertently sent products with a foreign language label to a country where another language is spoken. This could lead to a product recall even though it is not a product-harm crisis. Hence product-harm crises and product recalls can be conceptualized as two sets in a Venn diagram that largely but not fully overlap. Still, in the empirical research reviewed for this paper, studies typically use product recalls as a way to identify and/or

operationalize product-harm crises. As a result, both sets tend to fully overlap. As such, we will also use “product recalls” and “product-harm crises” interchangeably in this review.

Second, a product-harm crisis is different from other brand crises such as country-of-origin-based crises (e.g., due to consumer animosity between countries) or endorser-based crises (e.g., Nike endorsing Lance Armstrong or Tiger Woods). The critical distinction is that for a product-harm crisis, the product itself needs to be defective, whereas for other types of brand crises, the product is typically without fault while its brand associations have gone awry.

A final delimiter of this research is that we review studies that have appeared in the marketing literature, as our interest is on how product-harm crises affect the interface between firms and consumers, which is the marketing field’s core domain. Since product-harm crises can have very severe consequences for firm performance and even threaten its survival, we also include studies in the marketing literature that look at firm value as captured through stock prices. We refrain from reviewing studies on product-harm crises that have an internal, management focus, a focus on operations, or a purely legislative focus.

With these qualifications in mind, we searched 11 leading marketing journals and present all identified studies that examined product-harm crises (more details in the following section). Next, we classify each article along a set of key dimensions. This enables us to identify systematic commonalities and differences between the studies, as well as gaps in the literature. Finally, we synthesize the managerial implications across studies. This synthesis allows us to point out where there is overlap and replication, and where there is disagreement and controversy, which, in turn, opens up possibilities for further research.

## Procedure

We reviewed all issues from 1970 onwards in the following leading marketing journals: *International Journal of Research in Marketing*, *Journal of Consumer Research*, *Journal of Marketing*, *Journal of Marketing Research*, *Journal of Retailing*, *Journal of the Academy of Marketing Science*, *Marketing Science*, *Journal of Consumer Psychology*, *Management Science*, *Marketing Letters*, and *Quantitative Marketing and Economics*.

This review summarizes all articles that focus on product-harm crises, as defined above. The review excludes studies with a focus on rumors (e.g., Kamins et al. 1997; Roehm and Tybout 2006), negative publicity (e.g., Ahluwalia et al. 2000; Einwiller et al. 2006; Pullig et al. 2006; Ein-Gar et al. 2012), unethical behavior (e.g., Trump and Newman 2017), complaining behavior (e.g., Grégoire et al. 2009; Harmeling et al. 2015), or service failures (e.g., Aaker et al. 2004; Hess et al. 2007; Allen et al. 2015; Gijzenberg et al. 2015), given

<sup>3</sup> Even though the literature has conventionally focused on the bodily harm that could arise from product-harm crises, several of the concepts and insights may (as we discuss later) also be applicable to other forms of harm, such as psychological or financial harm.

that these types of crises do not involve products that are actually defective. Also, we do not consider studies that focus on the legal aspects of liability cases (e.g., Sheffet 1983; Morgan 1988). Still, these studies, as well as studies published in related disciplines, are added throughout the text to complement the discussion whenever relevant.

## Review of prior research: empirical setting

Our search resulted in 25 articles, which we review on a number of dimensions (e.g., industry, geography). For each dimension, we discuss the current state of the literature as well as avenues for future research. We first review the empirical setting of the papers. Because of clear differences between studies using (predominantly) artificial cases in lab experiments on the one hand, and the literature that uses empirical data on real cases on the other hand, we present them in two separate tables: Table 1 for the experimental literature and Table 2 for articles based on real-life cases. In the subsequent two tables, we focus on the research design and the underlying conceptual frameworks, again distinguishing between experimental literature (Table 3) and empirical papers (Table 4). In the final table (Table 5), we summarize the main findings.<sup>4</sup>

Figure 1 illustrates the evolution over time, starting from the influential 2000 study by Dawar and Pillutla. We divide the subsequent period in three intervals of six years each, and observe three patterns. First, there is clear evidence of a growing interest in the research topic. Second, initially, half of the studies used lab experiments to gain insights in some key processes. As better empirical data became available, this proportion drops considerably in the subsequent period. Yet, recent years show a renewed interest in the underlying mechanisms for some empirically observed phenomena. This clearly illustrates the interaction between Theory and Empirics that Bass and Wind (1995) identify as a key factor to academic progress. Finally, while the focus was initially mostly on the impact that product-harm crises have on consumers of the product, attention gradually shifts to also consider the impact on the firm (and its key decision makers). In line with a broader interest in the marketing-finance interface (see, for example, Srinivasan and Hanssens 2009) in the last decade, also the impact on the investor community has gained popularity. Other potential stakeholders, such other parties in the supply chain or governmental institutions, in contrast, have (as discussed in more detail later) received little, if any, research attention.

Figure 2 offers a visual overview of some of the typical variables studied in product-harm crisis research in marketing. More details on these variables are discussed in the text below.

<sup>4</sup> In Table 5, we also add the insights from the recent game-theoretic paper of Bala et al. (2017). As this paper uses neither experimental nor secondary data, we do not include this study in Tables 1, 2, 3, & 4.

## Industry

A wide range of industries has been studied (see Tables 1 and 2), although some industries have been especially popular, such as the *automobile* industry (studied in Haunschild and Rhee 2004; Rubel et al. 2011; Kalaignanam et al. 2013; Gao et al. 2015; Liu and Shankar 2015; Borah and Tellis 2016; Eilert et al. 2017; Liu et al. 2017), the *Consumer Packaged Goods* (CPG) industry (studied, among others, in van Heerde et al. 2007; Cleeren et al. 2008; Zhao et al. 2011; Cleeren et al. 2013),<sup>5</sup> and the *medical/pharmaceutical drugs* industry (Dowdell et al. 1992; Thirumalai and Sinha 2011).

The focus on specific industries can be attributed to the high frequency of crises/recalls in those industries (Liu et al. 2012; Borah and Tellis 2016), and/or to the availability of good data sources in these sectors.<sup>6</sup> For example, the National Highway Traffic Safety Administration (NHTSA) tracks safety issues related to motor vehicles, child safety seats and tires, and was used as data source in many studies, both in marketing (see Table 2) and a number of related disciplines.<sup>7</sup> As for the CPG sector, retail and consumer panel data are often available, tracking consumers' reactions to product-harm crises. Interestingly, a number of studies (see, e.g. Pruitt and Peterson 1986; Davidson and Worrell 1992; Chen et al. 2009) have intentionally looked at non-automotive industries to create a sample that is not dominated by automotive product recalls.

**Future research** Some sectors, even some characterized by regular product recalls, have received much less attention. Examples include consumer electronics (e.g., fire danger in smartphones and laptops), toys (e.g., Mattel's recent China toy recall),<sup>8</sup> clothing (see, e.g., [www.parents.com/product-recalls/clothing](http://www.parents.com/product-recalls/clothing)), and furniture (see, e.g., <http://wemakeitsafer.com/Furniture-Recalls>). This precludes the study of a richer set of industry-specific moderators to the reactions of consumers, investors, and media to product crises and recalls.<sup>9</sup> For example, is the media coverage more extensive in certain sectors (as, for example, the toy industry)? Do more frequent product recalls in the industry attenuate or amplify the reaction of consumers and/or investors? And how does the concentration rate and power asymmetry in the industry

<sup>5</sup> Given that three of these studies considered the same Australian product-harm crisis faced by Eta and Kraft peanut butter, the actual product scope is more limited than suggested by the mere number of articles.

<sup>6</sup> Interestingly, experimental studies tend to focus on the same subset of categories as well (see Table 1).

<sup>7</sup> See, for example, Jarrell and Peltzman (1985) or Rhee and Haunschild (2006).

<sup>8</sup> See <http://www.nytimes.com/2007/08/15/business/worldbusiness/15imports.html> and <http://www.cbsnews.com/news/mattel-toy-recall-list/>, among others.

<sup>9</sup> Outside of marketing, some of these industries have received more attention. The toy industry, for example, was studied in Hora et al. (2011) and Freedman et al. (2012).

**Table 1** Empirical setting of papers using (predominantly) lab experiments to study product-harm crises

Authors	Industry	Geography	No. of cases	Crisis description
Dawar and Pillutla (2000)	Field study: CPG	Europe	1	Fragments of glass in canisters of instant coffee.
	Lab study: CPG		1	Fictitious product recall of rusted cans of soft drink.
	Lab study: Laptops		1	Fictitious product recall of exploding laptops for two brands.
Klein and Dawar (2004)	Lab study: Lubricants		1	Fictitious crisis of oil lubricants that caused engine damage.
Lei et al. (2008)	Lab study: CPG		1	Fictitious crisis of existing brands of ice cream that made consumers fall ill because of quality problems.
Lei et al. (2012)	Lab study: CPG		1	Fictitious product recall of beer after a few consumers reported to feel ill from drinking the beverage.
Puzakova et al. (2013)	Lab study: health supplement & orange juice		2	Existing health supplement and fictitious brand of orange juice following a backlash of negative publicity.
	Lab study: smoothy maker & iron		2	Two fictitious brands faced with negative information in consumer reports.
	Lab study: digital camera		1	Fictitious brand faced with negative information in consumer report.
Germann et al. (2014)	Lab study: Mobile phone		2	Fictitious product recall of mobile phone because of faulty battery or because it causes brain haemorrhages.
	Field study: Automobile (2001–2009)	US	55	Different product recalls of automobiles.
Whelan and Dawar (2016)	Lab study: Automobile		1	Fictitious product-harm crisis related to back injuries caused by a fictional brand's new car.

moderate the optimal reaction of competitors to the misfortune of one's rivals?

### Geography

Empirical research on product-harm crises has been restricted to developed countries (e.g., U.S., Western Europe, Australia). One reason is that these countries tend to have more rules and regulations on product-harm crises, which facilitates their identification. Another reason is that data on the consequences of product-harm crises (e.g., consumer surveys, purchase or sales data, stock prices) tend to have better availability in developed countries. Finally, many of the scholars contributing to the literature tend to be located in these countries, facilitating local data collection.

**Future research** Even though a similar bias toward developed countries is observed in many marketing domains (Steenkamp 2005; Burgess and Steenkamp 2006), it is crucial to also consider the implications of product-harm crises in emerging economies, for a variety of reasons.

First, different countries may have different product-safety regulations (Liu et al. 2012), which may affect the threshold for product recalls, their frequency and scope. Also, they may differ in their “rule of law,” which

could affect the actual enforcement of these regulations (Steenkamp and Geykens 2014). Second, consumers from different cultures may react differently to product-harm crises and the ensuing recalls. For example, it may take longer to restore brand trust following a crisis/recall in risk-averse societies. Also, firms that operate internationally may be more likely to receive damaging consumer reactions to negative publicity on humanized brands in individualist cultures than in collectivist cultures (Puzakova et al. 2013). Similarly, investors' behavior in emerging economies, and their reactions to corporate wrong-doing, may differ from U.S. or European investors. Third, many products are produced in emerging economies, assembled in another country, and sold/consumed in yet another one. As a result, the imposition of consistent safety standards becomes complicated (Liu et al. 2012), the attribution of blame less obvious, and cross-country spillovers more likely, as evidenced in the 2007 recalls by Mattel of close to 20 million toys made in China.<sup>10</sup> For all these reasons, there is a lot of opportunity for generating new insights by studying product-harm crises across a wider range of countries.

<sup>10</sup> See <http://www.nytimes.com/2007/08/15/business/worldbusiness/15imports.html>.

**Table 2** Empirical setting of papers using empirical data to study product-harm crises

Authors	Industry	Geography	No. of cases	Time	Crisis description
Pennings et al. (2002)	Beef	Germany The Netherlands US	1	2001	The Bovine Spongiform Encephalopathy (BSE), or mad cow disease that led to several product recalls in the beef industry.
Haunschild and Rhee (2004)	Automobile	US	2287	1966–1999	All product recalls by automakers that sold passenger cars in the US from NHTSA reports during the reported timespan.
van Heerde et al. (2007)	CPG	Australia	1	1995–1999	Product recall of peanut butter because of a salmonella contamination.
Cleeren et al. (2008)	CPG	Australia	1	1996–2000	Product recall of peanut butter because of a salmonella contamination.
Chen et al. (2009)	Various (non-automotive)	US	153	1996–2007	Product recalls by the US Consumer Product Safety Commission (CPSC).
Rubel et al. (2011)	Automobile	US	1	1996–2002	Ford recalled the Explorer sports utility vehicle (SUV) because it consistently displayed tendencies to roll over.
Thirumalai and Sinha (2011)	Medical devices	US	223	2002–2005	Recalls of medical devices reported in the weekly enforcement reports on the FDA website.
Zhao et al. (2011)	CPG	Australia	1	1995–1997	Product recall of peanut butter because of a salmonella contamination.
Cleeren et al. (2013)	CPG	UK, NL	60	2000–2007	All major product recalls announced on the specialized governmental and consumer organizations' websites during the observation window.
Kalaignanam et al. (2013)	Automobile	US	459	1995–2011	Product recalls from the National Highway Traffic Safety Administration (NHTSA).
Gao et al. (2015)	Automobile	US	110	2005–2012	All vehicle safety recalls from the six largest automakers as reported by the National Highway Traffic Safety Administration (NHTSA).
Liu and Shankar (2015)	Automobile	US	359	1997–2002	All product recalls in the US passenger car market as reported by the NHTSA.
Borah and Tellis (2016)	Automobile	US	34	2009–2010	All recalls of automobiles announced in the Office of Defects Investigation (ODI) database of the brands Toyota, Honda, Chrysler and Nissan during the observation window.
Hsu and Lawrence (2016)	Various industries (drugs, food, toys, automotive parts,...)	US	185	2010–2012	Product recalls by the US Centers for Disease Control and Prevention (CDC), National Highway Traffic Safety Administration (NHTSA) and Consumer Product Safety Commission (NHTSA).
Liu et al. (2016)	Different types of consumer goods	US	170	1996–2007	All recalls for publicly traded companies as reported by CPSC.
Eilert et al. (2017)	Automobile	US	381	1999–2012	All investigations of the NHTSA of safety issues related to passenger vehicles within the observation window.
Liu et al. (2017)	Automobile	US	280	2005–2015	Product recalls by US automobile industry's manufacturers reported by the NHTSA.

### Number of cases

The number of cases studied is highly dependent on the focus of the study, the method used, and data availability. While lab experiments tend to use (different versions of) one or two fictitious product-harm cases (see, e.g., Dawar and Pillutla

2000; Klein and Dawar 2004; Puzakova et al. 2013), event studies typically study many cases in a particular sector using *publicly available stock market data*. For example, Thirumalai and Sinha (2011) study 223 product-harm crises at listed companies that produce medical devices, and Hsu and Lawrence (2016) investigate the stock market response to 185 product



**Table 3** Research design and frameworks of papers using (predominantly) lab experiments to study product-harm crises

Authors	Window of analysis	Focus	Theory	Analysis approach	Dependent variable(s) <sup>a</sup>	Focal main effect(s) <sup>b</sup>	Mediator(s)	Interaction effects
Dawar and Pillutla (2000)	After	Consumers	Selective information processing theory	<ul style="list-style-type: none"> <li>Regression</li> <li>ANOVA</li> </ul>	<ul style="list-style-type: none"> <li>Awareness of the crisis (field study)</li> <li>Purchase intention (field study)</li> <li>Brand equity (experiments)</li> </ul>	<ul style="list-style-type: none"> <li>Firm response (P)</li> <li>Prior expectations (H)</li> </ul>	<ul style="list-style-type: none"> <li>Locus of behavior</li> <li>Stability of behavior</li> <li>Controllability of behavior</li> <li>Attribution of blame</li> </ul>	<ul style="list-style-type: none"> <li>Firm response * Prior expectations</li> </ul>
Klein and Dawar (2004)	During	Consumers	Attribution theory	<ul style="list-style-type: none"> <li>ANOVA</li> <li>SEM</li> </ul>	<ul style="list-style-type: none"> <li>Brand evaluation</li> <li>Buying intentions</li> </ul>	<ul style="list-style-type: none"> <li>Corporate social responsibility (B)</li> <li>Importance of CSR (H)</li> </ul>	<ul style="list-style-type: none"> <li>CSR * Importance of CSR</li> </ul>	
Lei et al. (2008)	During	Consumers	Associative network theory	ANOVA	<ul style="list-style-type: none"> <li>Composite brand-evaluation score based on multi-item Likert scale for Brands associated with affected brand</li> </ul>	<ul style="list-style-type: none"> <li>Strength of the association (e.g. between affected sub-brand and parent brand, other sub-brands) (H)</li> <li>Symmetry of association strength (H)</li> <li>Similarity to other crises (P)</li> <li>Frequency of crises in the industry (C)</li> <li>Prior beliefs about the brand (H)</li> </ul>		<ul style="list-style-type: none"> <li>Frequency of crises in the industry * Similarity to other crises</li> <li>Frequency of crises in the industry * prior beliefs about the brand</li> </ul>
Lei et al. (2012)	During	Consumers	Attribution theory	ANOVA	<ul style="list-style-type: none"> <li>Blame assignment</li> <li>Brand trustworthiness</li> <li>Brand evaluation</li> <li>Discounting of subsequent crises</li> </ul>			<ul style="list-style-type: none"> <li>Brand anthropomorphization *</li> </ul>
Puzakova et al. (2013)	During	Consumers	<ul style="list-style-type: none"> <li>Brand anthropomorphization</li> <li>Implicit theory of personality</li> </ul>	<ul style="list-style-type: none"> <li>ANOVA</li> <li>Regression</li> </ul>	<ul style="list-style-type: none"> <li>Attitude to and trust in the brand</li> <li>Purchase intentions</li> </ul>	<ul style="list-style-type: none"> <li>Brand anthropomorphization (B)</li> </ul>	<ul style="list-style-type: none"> <li>Brand responsibility</li> <li>Attribution of the cause</li> <li>Stability of negative performance</li> <li>Typicality of negative performance</li> </ul>	<ul style="list-style-type: none"> <li>Brand anthropomorphization *</li> <li>Implicit theory</li> <li>Brand</li> <li>Brand anthropomorphization *</li> <li>Brand</li> </ul>
Germann et al. (2014)	After-before	Consumers	<ul style="list-style-type: none"> <li>Brand commitment theory</li> <li>Expectancy-disconfirmation &amp; incongruity effect</li> </ul>	<ul style="list-style-type: none"> <li>Regression</li> </ul>	<ul style="list-style-type: none"> <li>Consumer attitude score measured on multi-item Likert scale (lab)</li> <li>Abnormal stock returns (field)</li> </ul>	<ul style="list-style-type: none"> <li>Brand commitment (H)</li> <li>Severity of the crisis (P)</li> </ul>	<ul style="list-style-type: none"> <li>Counter-arguments</li> <li>Incongruity thoughts</li> <li>Attribution of controllability</li> <li>Attribution of stability</li> </ul>	<ul style="list-style-type: none"> <li>Brand commitment *</li> <li>Severity of the crisis</li> </ul>
Whehan and Dawar (2016)	During	Consumers	<ul style="list-style-type: none"> <li>Attribution theory</li> <li>Attachment theory</li> </ul>	<ul style="list-style-type: none"> <li>Moderated mediation analysis</li> </ul>	<ul style="list-style-type: none"> <li>Attribution of blame</li> </ul>	<ul style="list-style-type: none"> <li>Attachment style of the relationship: anxiety and avoidance (H)</li> </ul>		

<sup>a</sup> The dependent variable is for the affected brand, unless indicated otherwise

<sup>b</sup> P Product-harm crisis characteristic, B brand/firm characteristic, C category characteristic, M marketing driver, H household/consumer characteristic

**Table 4** Research design and frameworks of papers using empirical data to study product-harm crises

Authors	Window of analysis	Focus	Theory	Analysis approach	Dependent variable(s) <sup>a</sup>	Focal main effect(s) <sup>b</sup>	Interaction effect(s)
Pemings et al. (2002)	During	Consumers	Consumer risk behavior	Logistic regression	Whether or not consumption of product category has decreased	Risk perception (H) Risk attitude (H)	Risk perception * Risk attitude
Haunschild and Rhee (2004)	After	Firms	Organizational learning	Poisson regression	<ul style="list-style-type: none"> <li>Annual number of severe recalls</li> <li>Annual number of severe voluntary recalls</li> <li>Annual number of severe involuntary recalls</li> </ul>	Prior production experience (B) Cumulative number of voluntary and involuntary recalls (B)	Width of product range * proportion of voluntary recalls
van Heerde et al. (2007)	<ul style="list-style-type: none"> <li>Before</li> <li>During</li> <li>After</li> </ul>	Consumers, Firms		Dynamic Linear Model (DLM)	Sales: <ul style="list-style-type: none"> <li>Affected brand</li> <li>Non-affected brands (same and other company)</li> </ul>	Width of product range (B) Advertising (M) Price (M)	
Cleeren et al. (2008)	After	Consumers		Hazard model	Timing of first purchase after the crisis	Advertising (M) Loyalty (H) Familiarity (H) Usage (H)	Loyalty * Time
Chen et al. (2009)	Recall day	Investors	Efficient market hypothesis	Financial event study	Firm value: Abnormal returns (AR)	Recall strategy (proactive or not) (B)	
Rubel et al. (2011)	<ul style="list-style-type: none"> <li>Before</li> <li>After</li> </ul>	Firms, Consumers	Stochastic-control problem	State space model	Sales: <ul style="list-style-type: none"> <li>Affected brands</li> <li>Competitors</li> </ul>	Advertising (M)	Crisis likelihood*Advertising Damage rate*Advertising
Thirumalai and Sinha (2011)	Event window of [-10,+1] days	Firms, Investors	Efficient market hypothesis	<ul style="list-style-type: none"> <li>Negative binomial model</li> <li>Financial event study</li> </ul>	Firm value: <ul style="list-style-type: none"> <li>Abnormal Returns (AR)/Cumulative Abnormal Returns (CAR)</li> </ul>	Product scope (B) Growth prospect (B) Sales (B) Debt (B)	
Zhao et al. (2011)	<ul style="list-style-type: none"> <li>Before</li> <li>During</li> <li>After</li> </ul>	Consumers	Consumer learning	Choice model with consumer learning	Brand choice: <ul style="list-style-type: none"> <li>Affected brand</li> <li>Non-affected brands (same and other company)</li> </ul>	Recall experience (B) Advertising (M) Price (M)	
Cleeren et al. (2013)	After-before	Consumers, Firms		Regression model	Household's: <ul style="list-style-type: none"> <li>Brand share</li> <li>Category volume</li> </ul>	Risk aversion (H) Experienced quality (H) Advertising (M)	Advertising * Blame Price * Blame Advertising * Publicity Price * Publicity
Kalaignanam et al. (2013)	After-during	Firms	Organizational learning	Regression model	Future (next year)'s: <ul style="list-style-type: none"> <li>Product reliability<sup>c</sup></li> <li>Injuries</li> <li>Recall frequency</li> </ul>	Recall magnitude (P) Extent of shared assets (B) Prior brand quality (B)	Recall magnitude * Extent of shared assets Recall magnitude * Prior brand quality
Gao et al. (2015)	Event window of [0,+1] days	Investors	Efficient market hypothesis	Financial event study	Firm value: <ul style="list-style-type: none"> <li>Abnormal Returns (AR)/Cumulative Abnormal Returns (CAR)</li> </ul>	Newness of recalled product (P) Severity of hazard (P) Pre-recall advertising adjustments (M)	Pre-recall advertising adjustments * Newness of recalled product Pre-recall advertising adjustments * Severity of hazard
Liu and Shankar (2015)	<ul style="list-style-type: none"> <li>Before</li> <li>During</li> <li>After</li> </ul>	Consumers, Firms		State space model with random coefficients	Market share: <ul style="list-style-type: none"> <li>Affected brand</li> <li>Non-affected brands (same company)</li> </ul>	Publicity (P) Severity of the crisis (P) Expected quality of recalled brand (B)	Advertising * Publicity Advertising * Severity of the crisis

Table 4 (continued)

Authors	Window of analysis	Focus	Theory	Analysis approach	Dependent variable(s) <sup>a</sup>	Focal main effect(s) <sup>b</sup>	Interaction effect(s)
Borah and Tellis (2016)	<ul style="list-style-type: none"> <li>• Before</li> <li>• During</li> <li>• After</li> </ul>	Consumers, Investors	Associative network theory	Vector Auto-Regressive model (VARX)	<ul style="list-style-type: none"> <li>• Online chatter of affected and non-affected brands (same company and competitors)</li> <li>• Stock market performance of rival brands (same company and competitors)</li> <li>• Brand sales for rival brands (same company and competitors)</li> </ul>	<ul style="list-style-type: none"> <li>• Advertising (M)</li> <li>• Publicity (P)</li> <li>• Country of origin (B)</li> <li>• Brand dominance (B)</li> <li>• Advertising (M)</li> </ul>	<ul style="list-style-type: none"> <li>• Advertising * Expected quality of the recalled brand</li> </ul>
Hsu and Lawrence (2016)	Event window of [-1,+1] days	Investors	Efficient market hypothesis	Financial event study	Firm value: <ul style="list-style-type: none"> <li>• Abnormal Returns (AR)/Cumulative Abnormal Returns (CAR)</li> </ul>	Online WOM: Volume, Valence, Growth rate, Breadth (P) Brand equity (B) Firm activity on social media (M)	Online WOM (volume/valence/growth rate/breadth) * Brand equity
Liu et al. (2016)	During	Firms		Probit model	Remedy choice (likelihood of providing a full remedy)	<ul style="list-style-type: none"> <li>• Severity of hazard (P)</li> <li>• Value of recalled products (P)</li> <li>• CEO compensation (B)</li> <li>• CEO tenure (B)</li> </ul>	<ul style="list-style-type: none"> <li>• Value of recalled products * CEO compensation</li> <li>• Value of recalled products * CEO tenure</li> <li>• Severity of hazard * CEO compensation</li> </ul>
Eilert et al. (2017)	During After	Firms, Investors	<ul style="list-style-type: none"> <li>• Behavioral firm theory</li> <li>• Efficient market hypothesis</li> </ul>	<ul style="list-style-type: none"> <li>• Financial event study</li> <li>• Hazard model</li> </ul>	<ul style="list-style-type: none"> <li>• Time to recall</li> <li>• Firm value: Abnormal Returns (AR)/Cumulative Abnormal Returns (CAR)</li> </ul>	<ul style="list-style-type: none"> <li>• Problem severity (P)</li> </ul>	<ul style="list-style-type: none"> <li>• Severity of hazard * CEO tenure</li> <li>• Brand reliability*problem severity</li> <li>• Brand diversification*problem severity</li> <li>• Past recall intensity*problem severity</li> </ul>
Liu et al. (2017)	<ul style="list-style-type: none"> <li>• Event window of [-2,+2] days</li> <li>• One year following the event</li> </ul>	Investors	<ul style="list-style-type: none"> <li>• Efficient market hypothesis</li> <li>• Investor behavior theory</li> </ul>	<ul style="list-style-type: none"> <li>• Financial event study</li> <li>• Calendar portfolio analysis</li> </ul>	Abnormal returns across short- and longer-run windows	<ul style="list-style-type: none"> <li>• Recall volume</li> <li>• Brand advertising</li> <li>• Promotional advertising</li> <li>• Recall initiation strategy</li> </ul>	<ul style="list-style-type: none"> <li>• Recall volume*brand advertising</li> <li>• Recall volume*promotional advertising</li> <li>• Recall volume*recall initiation strategy</li> <li>• Recall volume*post-recall remedy</li> </ul>

<sup>a</sup>The dependent variable is for the affected brand, unless indicated otherwise

<sup>b</sup>P Product-harm crisis characteristic, B brand/firm characteristic, C category characteristic, M marketing driver, H household/consumer characteristic

<sup>c</sup>The paper also tests the mediating role of this variable



**Table 5** Main findings in the marketing literature on product-harm crises

Authors	Main Findings
Dawar and Pillutla (2000)	Post-crisis brand equity depends on the fit between consumers' prior expectations and firm response.
Pennings et al. (2002)	Decoupling risk-response behavior of consumers into the separate components of risk perception and risk attitude allows for a more robust conceptualization and better prediction of consumers' reactions.
Haunschild and Rhee (2004)	Voluntary recalls result in more learning than mandated recalls, as it leads to a higher reduction in subsequent recalls.
Klein and Dawar (2004)	Corporate social responsibility (CSR) decreases attributions of blame in a product-harm situation. This effect is only found for consumers who find CSR important.
van Heerde et al. (2007)	A product-harm crisis may represent a quadruple jeopardy: (i) loss of baseline sales, (ii) loss of effectiveness of own marketing instruments, (iii) increased cross-sensitivity to competitors' marketing instruments, and (iv) decreased cross impact of own marketing instruments.
Cleeren et al. (2008)	Pre-crisis brand loyalty and category usage form a buffer against a product-harm crisis. Advertising is an effective instrument to convince consumers to repurchase the affected brand.
Lei et al. (2008)	The magnitude of spillovers following a crisis is a function not only of the strength of brand associations, but also of their directionality.
Chen et al. (2009)	Proactive strategies have a more negative effect on firm value than more passive strategies.
Rubel et al. (2011)	The optimal pre-crisis advertising level decreases, while the optimal post-crisis advertising level increases as the crisis likelihood (or damage rate) increases.
Thirumalai and Sinha (2011)	The financial-market penalties for medical-device recalls are not significant: at the aggregate level, the costs of poor quality are not severe. The magnitude of financial consequences of device recalls is affected by the product scope, sales, growth prospects, and the capital structure of a firm. Firms that develop broader product portfolios, have a higher likelihood of device recalls. The likelihood of recalls decreases with prior recall experience.
Zhao et al. (2011)	Consumers become more risk averse during and after a product-harm crisis. Consumers' sensitivity to experienced quality increases, while the sensitivity to advertising and price decreases in the aftermath of the crisis.
Lei et al. (2012)	The effect of the base-rate information (i.e., the frequency of recalls in the industry) on blame attributions depends on the consumers' prior beliefs about the brand and the similarity of the focal crisis to other crises in the industry. This information may also influence blame attribution of subsequent crises.
Cleeren et al. (2013)	The effectiveness of advertising and price following a product-harm crisis depends on blame and publicity.
Kalaignanam et al. (2013)	Increases in recall magnitude lead to decreases in the future number of injuries and recalls. This effect is partially mediated by future changes in product reliability, is positively moderated by the extent of shared product assets, and negatively moderated by prior quality.
Puzakova et al. (2013)	Consumers who believe in personality stability (i.e., entity theorists) view anthropomorphized brands that undergo negative publicity less negative than nonanthropomorphized brands. Consumers who advocate personality malleability (i.e., incremental theorists) are less likely to devalue an anthropomorphized brand in case of negative publicity. A compensation strategy (vs. denial or apology) is the only effective strategy among entity theorists.
Germann et al. (2014)	High levels of brand commitment attenuate negative consumer responses in low-severity product recalls, but augment them in high-severity product recalls.
Gao et al. (2015)	Adjustments to a firm's pre-recall advertising expenditure can either mitigate or amplify the negative effect of the recall on stock market value, depending on the newness of the recalled products and the severity of the hazard.
Liu and Shankar (2015)	Consumers respond more negatively to product recalls with greater media attention, more severe consequences, and higher perceived product quality. Sub-brand advertising effectiveness declines by a greater amount than parent-brand advertising and the decline in effectiveness of the recalled sub-brand's advertising spills over to other sub-brands under the same parent brand.
Borah and Tellis (2016)	Negative online chatter on a product recall spills over to rival brands, both within the same parent brand as across brands, and affects stock market performance and brand sales of

**Table 5** (continued)

Authors	Main Findings
	these brands. The halo effect is stronger from a dominant brand to a less dominant one, is stronger between brands of the same country, and higher when apology advertising is being used.
Hsu and Lawrence (2016)	The volume, valence and growth rate of online WOM exacerbate the negative effect of a product recall on firm value. The negative effect of volume and valence is lower for high-equity brands. Company involvement in social media does not mitigate the negative effect.
Liu et al. (2016)	Companies prefer to avoid full remedy when remedy cost is high, yet they are more likely to provide full remedy for more severe product hazards. CEOs' personal interests interfere with remedy decisions: full remedy is less likely when the CEO receives greater cash compensation or less equity incentive, and when the CEO has longer tenure in the position. The CEO's financial interests further moderate the effects of remedy cost and consumer harm.
Whelan and Dawar (2016)	Individuals primed with the secure attachment style and individuals primed with the fearful attachment style attribute the least amount of blame to the brand following an ambiguous product-harm crisis. These effects occur via unique mechanisms. Whereas the secure attachment style decreases attributions of controllability, the fearful attachment style decreases attributions of stability.
Eilert et al. (2017)	While problem severity increases time to recall, this relationship is weaker when the brand has a) a strong reputation for reliability and b) experienced severe recalls in the recent past. The relationship between problem severity and time to recall is stronger when the brand is diverse. Recall delays are punished by stock markets.
Bala et al. (2017)	Whether or not competitors of a firm that is facing a product recall should invest in post-recall sales efforts for different categories, depends on the potential cross-category economies of scope, the size of the loyal segment, the cross-category price, and the probability of the recall.
Liu et al. (2017)	The negative impact of product recall volume lingers over time. Moderating effects of voluntary recall initiation and post-recall remedial efforts differ between short- and long-run evaluation windows.

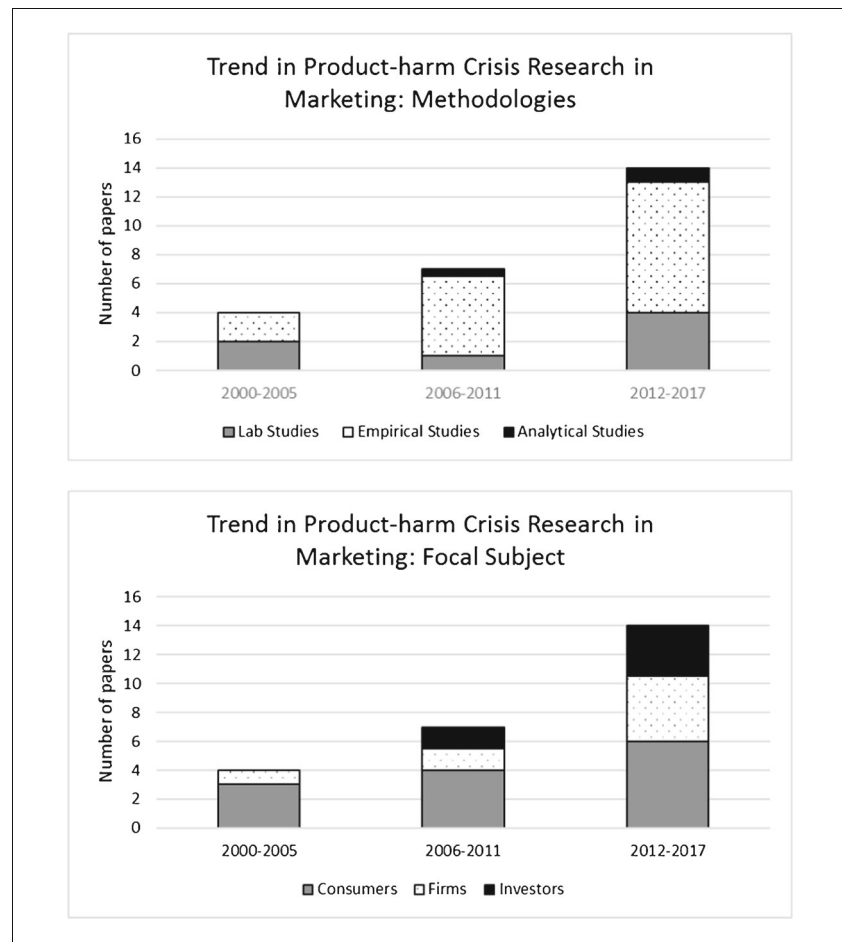
recalls in the automobile industry. Also studies that investigate *other publicly available information* – such as the number of recalls and the remedy choice – typically investigate their hypotheses in a multitude of cases. Examples include the 2287 automobile recalls used in Haunschild and Rhee (2004), the 170 recalls reported by the Consumer Product Safety Commission (CPSC) discussed in Liu et al. (2016), and the 280 automobile recalls studied in Liu et al. (2017). The use of many cases not only allows researchers to form empirical generalizations on the investigated effects, they also allow for the discovery of boundary conditions that are linked to characteristics of the affected brand and/or particular crisis case.

Papers that study the *sales* consequences of product-harm crises, in contrast, are usually based on much fewer cases because of data constraints. Not only do many studies in the area focus on one case (e.g., Pennings et al. 2002; Rubel et al. 2011), but several are even based on the same product-harm crisis, i.e., the recall of two Australian peanut butter brands because of salmonella poisoning (see van Heerde et al. 2007; Cleeren et al. 2008; Zhao et al. 2011). This can

raise questions on the generalizability of the results obtained in this area. Fortunately, researchers have recently started to also compile larger databases with more cases when investigating the sales (market-share) effects of a product-harm crisis (see, for example, Cleeren et al. 2013 and Borah and Tellis 2016 who investigate 60 and 34 cases, respectively).

**Future research** The recent literature has improved the generalizability of the findings by increasing the number of product-harm crises that is studied, which is a trend we hope will continue. Still, many of the moderators and mediators suggested in prior work have been tested in only a few, potentially idiosyncratic, settings. Another concern is that these more extensive samples tend to be concentrated in just one or two industries, i.e., CPG (Cleeren et al. 2013) and cars (Borah and Tellis 2016). A more diverse and extensive sample across multiple industries would allow the generation of more systematic and reliable insights on industry or category factors that moderate the findings.

**Fig. 1** Trends in product-harm crisis research in marketing over time



## Review of prior research: research design

We now discuss various aspects of the research design, starting with the window of analysis the studies focus on. Next, we discuss the main theories that have been used, after which we move on to the analysis method that has been adopted. Table 3 summarizes the research design for the experimental literature, and Table 4 for the empirical papers.

### Window of analysis

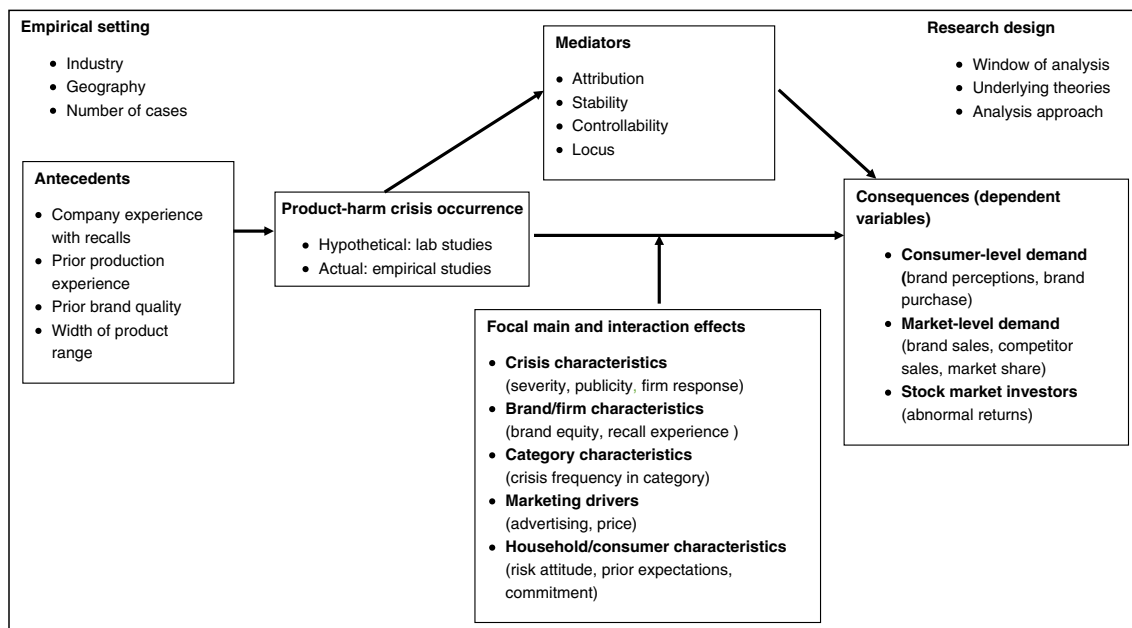
To study the impact of a product recall/crisis, most studies contrast a situation with and without the event. In virtually all empirical studies, this is achieved by using a difference approach, in which the pre-recall period is compared to the post-recall period. Given that a crisis often affects all potential customers, a control group is typically hard (if not impossible) to find, making a difference-in-difference approach infeasible (Cleeren et al. 2013). In lab experiments, the contrast is commonly achieved through a between-subject design, where the treatment group is exposed to information about the recall, and the control group is not. By looking at different hypothetical scenarios (lab studies) or empirically observed cases

(empirical studies), prior studies have drawn insights on factors that affect the post-crisis impact of recalls, including marketing-mix variables.

Two studies that do not explicitly include pre-recall observations are Cleeren et al. (2008) and Dawar and Pillutla (2000). Cleeren et al. (2008) focus on the timing of the first purchase after the crisis, and Dawar and Pillutla (2000) study post-crisis consumer-based brand equity ramifications.

There is quite some earlier *descriptive* work on preparing for a product-harm crisis (i.e., before a crisis actually takes place). Most of them are case-based studies recommending which strategies work in the marketplace. These studies typically provide checklists detailing the appropriate managerial actions to avoid product crises, and how to respond when they occur (e.g., Mitroff and Kilmann 1984; Weinberger et al. 1993; Smith et al. 1996; Berman 1999; Rupp and Taylor 2002; Mitroff 2004).

There is less research using *analytical or empirical* approaches to study the pre-recall period. One exception is Rubel et al. (2011), who offer an analytical approach to prescribe how to act before a recall strikes. This paper addresses the question how a forward-looking manager should plan advertising if they envision a product-harm crisis



**Fig. 2** Overview of typical variables studied in product-harm crisis research in marketing

that may or may not occur in the future. Gao et al. (2015) study the related question of what a firm should do in terms of their advertising spend when they know they have to issue a product recall announcement.

**Future research** Much of the current research has focused on (or contrasted) the post-recall and pre-recall periods. Less work has focused on what happens *during* a product recall. Quite some time may elapse between the announcement of the recall, the actual recall, and the moment that the product is deemed safe again and available to consumers. For example, the recall in the case of salmonella poisoning in peanut butter in Australia lasted 21 weeks (van Heerde et al. 2007). In those 21 weeks, the two affected brands (Eta and Kraft) were not on the shelves, which offered competitors the opportunity to grab market share. Rather than discarding this recall period in the analyses, van Heerde et al. (2007) use dynamic updating of the model parameters to understand the market response dynamics during this period, while Borah and Tellis (2016) include this period in their analysis on online chatter. Additional research to better understand consumer and firm/competitor actions during the recall period would be valuable, especially when this period is rather long. A recent example involves Samsung washing machines, where there are reports of some of these catching fire, even three years after they were recalled due to a fire hazard.<sup>11</sup> In addition, many consumers may not be aware of the recall announcement or unwilling or unable to act on it, which would

also influence their reactions during the recall period. No research has addressed this consumer aspect yet.

Importantly, many studies have focused on a fixed post-recall period. Still, recent research by Liu et al. (2017) finds differing effects for short- versus long-run windows in investors' reactions. It would be useful to explicitly consider how the reactions of different stakeholders evolve over time, and assess, for example, to what extent the crisis has only temporary or also persistent effects (which would constitute an example of hysteresis in the terminology of Dekimpe and Hanssens 1999).

### Underlying theories

Product-harm crises have been studied from different theoretical viewpoints. Following the influential work of Folkes (see, e.g., Folkes 1984; Folkes and Kotsos 1986), attribution theory has become one of the more frequently adopted angles in the experimental product-harm literature (see, for example, Klein and Dawar 2004; Lei et al. 2012; Whelan and Dawar 2016). In particular, researchers have relied upon Weiner's (1980) attribution model that identifies three causal dimensions of attribution that lead to an overall judgment of blame: (1) whether or not the locus/cause of the crisis is inferred internal or external to the firm, (2) whether the problem is perceived as stable rather than temporary, and (3) whether the problem occurred within or outside the control of the firm. This theory is relevant because the inferences consumers make about firms or brands that go through product-harm crises depend to a large extent on to whom or what the crisis is attributed.

The theories adopted by the empirical literature tend to depend on the focal subject of study. To investigate stock

<sup>11</sup> Source: <http://www.stuff.co.nz/business/industries/78200909/Samsung-washing-machines-still-bursting-into-flame-but-most-found>.

market responses to product-harm crises, the efficient market hypothesis is (not surprisingly) the leading principle. According to the efficient market hypothesis, stock prices reflect the impact of all publicly available information about a firm on its future cash flows (Mackinlay 1997). When a firm experiences a product-harm crisis, investors update their expectations of the firm's future cash flows and adjust the price of the firm's stock accordingly. The benefit of an event study to quantify this impact (see also Sorescu et al. 2017) is that it allows an inference of cause (the crisis) and effect (abnormal returns associated to the crisis) in a quasi-experimental setting (Srinivasan and Hanssens 2009). In a recent study, Liu et al. (2017) also looked at longer term abnormal returns by means of a calendar-time portfolio analysis.

Papers that study what firms do in response to product-harm crises, in turn, tend to draw from theories on organizational learning (Haunschild and Rhee 2004; Kalaignanam et al. 2013). Learning is often seen as emerging from an organization's experience in a path-dependent way, which becomes encoded in routines. This can, however, be punctuated by external events, such as product recalls, which offer an opportunity for the firm to learn from its failures and update its procedures. Product recalls, especially large ones, are then seen as a catalyst to stimulate learning in firms (Kalaignanam et al. 2013). Importantly, firms with different structural characteristics have been found to learn differently from such recall experiences, and also the learning rate from voluntary recalls has been found to differ from the one of involuntary recalls (Haunschild and Rhee 2004), which has been attributed to their differential level of volition.

Other theories have been used less in the literature, among which associative network theory and the theory of brand anthropomorphization. Associative network theory conceptualizes brand knowledge as consisting of a brand node to which a variety of associations (among which other brands) are linked (Keller 1993). Given that associations between brands express the relatedness between them, this theory has been used to investigate the spillover effects of a product-harm crisis to other brands in the brand portfolio (Lei et al. 2008), and to competitors in the category (Borah and Tellis 2016). Brand anthropomorphization theory, in turn, is used to unravel the impact of a product-harm crisis on a humanized brand (Puzakova et al. 2013). According to anthropomorphization theory, people have a tendency to attribute mind, intentions, effortful thinking, emotional states, and behavioral features to nonhuman objects such as brands (Aggarwal and McGill 2007). The humanizing of brands implies an attribution of mindfulness to these brands (Epley and Waytz 2009), which influences how consumers react to negative news about product failure (Puzakova et al. 2013).

We refer to Tables 3 and 4 for an account of other theories that have been used (albeit less frequently) in prior work.

**Future research** While a variety of theoretical frameworks have been used in the study of product-harm crises, other potentially relevant theories have been largely ignored. We identify three of them that we believe are particularly promising.

First, key unresolved questions involve what crisis characteristics lead to more versus less publicity, how consumers, intermediaries (such as retailers/distributors), and investors react to this added attention, and how this indirect effect unfolds for the different stakeholders over time. To address these questions, future research may want to rely on theories from the communication and journalism domains, such as *gatekeeper theory* (Lewin 1947; see also van Heerde et al. 2015). Journalists and editors not only determine what is talked about (and thereby have an agenda-setting role), but they can also have a major influence on how the public thinks about (the cause of) the crisis (and thereby have a framing role). Importantly, more research is also needed on how the affected firm can potentially influence these third parties who provide information (or infomediaries) (see, e.g., Zavyalova et al. 2012).

Second, product design and manufacturing activities are increasingly outsourced to other members of the supply chain. The cost and scale of many product recalls necessitates a better understanding of how quality improvement incentives should be aligned across multiple supply chain partners. This could involve a higher involvement of suppliers into the product development process, but also various cost-sharing agreements to increase the accountability of the various parties. *Supermodular game theory* was used to compare the equilibrium effort conditions of manufacturers and suppliers under different contractual arrangements in Chao et al. (2009). More research along these lines, especially when complemented with supporting empirical evidence, is called for. In general, most prior research on product-harm crises has taken place in a B2C setting. As with many domains in marketing (Lilien 2016), much less attention has been devoted to product crises in B2B markets, even though they may have a profound impact on interfirm linkages (see Grewal et al. 2007 for a conceptual discussion).

Third, most research looks at individual or aggregate consumer responses to product-harm crises. An angle that is relatively unexplored (notable exceptions are the recent studies of Borah and Tellis (2016) and Hsu and Lawrence (2016) on the role of online chatter) is to what extent *social networks* (facilitated, e.g., by social media) contribute to fueling a product-harm crisis. A failed product for one consumer may become viral via video-sharing sites, and become a major crisis for the brand overnight. *Social network theory* could be very useful to develop expectations on when and how individual product failures may or may not become viral. Indeed, with the internet, the potential for customers to get even with firms has grown exponentially. As such, companies



should not only try to avoid that their customers' love turns into *lasting* hate (Grégoire and Fisher 2008; Grégoire et al. 2009), but also that it turns in a *spreading* hate where entire groups of consumers start to actively boycott the product (Klein et al. 2004). Theories of customer engagement marketing (see, e.g. Harmeling et al. 2017) may offer useful insight on how to avoid that empowered customers move to this dark side of consumer engagement.

Finally, more research is needed on how to best use firm-generated content in social media to attenuate the negative consequences of a product-harm crisis. Lamberton and Stephen (2016) recently called for a comprehensive theory of mobile marketing. Product-harm crises could offer quasi-experimental settings to test such a theory.

### Analysis approach

Not surprisingly, ANOVA is the most frequently used method in the experimental papers, as summarized in Table 3. For the mediation tests, both the more traditional Baron and Kenny (1986) approach (see, e.g., Puzakova et al. 2013) and the more recent bias-corrected bootstrap test of Zhao et al. (2010) (see, e.g., Germann et al. 2014) have been used. Whelan and Dawar (2016), in turn, conduct a moderated mediation analysis to capture the interactive effect of anxiety and avoidance on blame directly, as well as indirectly through attributions of controllability and stability. Apart from ANOVA, also regression analyses have been used in a number of experimental studies (e.g., Puzakova et al. 2013; Germann et al. 2014).

There is more variation in the analysis methods used in the empirical papers (Table 4). Their analysis approach is largely driven by the nature of the dependent variable. We distinguish four broad classes: (1) aggregate demand (e.g., sales, market shares), (2) disaggregate demand (e.g., brand choice), (3) stock market performance, and (4) recall-related metrics (e.g., future recalls).

Studies that look at the impact of product-harm crises on *aggregate demand* typically use models from the regression family because the dependent variable is continuous. To account for response parameters that may change due to the product-harm crisis, several papers use state-space methods. These models are estimated either with Bayesian methods (i.e., Dynamic Linear models used in van Heerde et al. (2007) and Liu and Shankar (2015)) or with frequentist methods (e.g., Rubel et al. 2011). To account for the dynamic impact of product recalls on cross-brand sales and online chatter, Borah and Tellis (2016) use models in the VAR (Vector Autoregressive) model tradition, a procedure well suited to capture the multiple feedback loops likely to be at work among the variables considered.

Research that studies *disaggregate (consumer-level) responses* to product-harm crises mostly uses methods that account for the more discrete nature of the dependent

variables. For instance, Pennings et al. (2002) use logistic regression to analyze whether or not consumers have reduced their beef consumption following the mad cow disease. Cleeren et al. (2008) adopt a hazard model to capture the amount of time that passes until a household again buys a brand after a product recall. Zhao et al. (2011) use a brand-choice model with learning to understand how a product-harm crisis changes consumer learning. Cleeren et al. (2013) use continuous individual-level dependent variables (post- vs. pre-crisis brand share and category volume) that allow them to use regression analysis.

The papers that study the *stock market* ramifications of product recalls (Chen et al. 2009; Thirumalai and Sinha 2011; Gao et al. 2015; Hsu and Lawrence 2016) all use the event study methodology.<sup>12</sup> Based on the efficient market hypothesis, the premise is that monitoring changes in stock prices over a relatively short time window around an event (e.g., a product recall) captures the financial impact of the event on firm performance (Mackinlay 1997; Sorescu et al. 2017). The method requires an estimate of expected stock returns, which is then contrasted to actual returns to obtain abnormal (or excess) returns, AR. The time window around the event is typically a few days to avoid confounding events. The sum of the abnormal returns across the time window is the cumulative abnormal returns (CAR). In a next step, a cross-sectional regression analysis is used to explain variation in (cumulative) abnormal returns across different cases.

Research that explains *recall-related metrics* uses various methods, tailored to the nature of the metric. To account for the discrete nature of the number of product recalls, Haunshild and Rhee (2014) use a Poisson regression, whereas Thirumalai and Sinha (2011) use a Negative Binomial model. To model the type of recall (full versus partial remedy), Liu et al. (2016) use a probit model. Kalaignanam et al. (2013), in turn, use regression analysis to explain future recall frequency, product reliability, and injury rates.

### Advantages and drawbacks of different methodologies

While lab studies may have high internal validity, they offer less external validity (Winer 1999). Working with secondary data, in contrast, adds to the external validity, but is likely to offer less insights in the underlying processes at hand. Moreover, studies with secondary data often rely on external data sources to identify the different crises in their sample, and the inclusion criteria may well differ across countries, industries, and time. For example, the administration in power may impact considerably the number of recalls. Method

<sup>12</sup> Also outside the marketing literature, event studies have been used frequently to quantify the impact of product recalls on firm value, as in Bromiley and Marcus (1989), Davidson and Worrell (1992) and Chen and Nguyen (2013) in the management literature; Pruitt and Peterson (1986) and Govindaraj et al. (2004) in finance; and Jarrell and Peltzman (1985) and Hoffer et al. (1988) in the economics literature (see also Liu et al. 2012, Table 12.1).

triangulation, *within* and *across* studies, can offer greater confidence in the substantive findings and managerial recommendations (see also Hamilton 2016).

Importantly, some methods that have recently been put forward to improve causal inference from observational data may be hard to implement in a product-harm setting. For example, randomly assigning consumers to different harm scenarios may not be justified from an ethical point of view (Papies et al. 2017), while difference-in-difference approaches (see, for example, Ailawadi et al. 2010) may be impossible to implement when dealing with full (all batches across the entire country) product recalls (Cleeren et al. 2013).

A promising approach may be to create a quasi-experimental design by using a synthetic control approach (e.g., Abadie et al. 2010; Tirunillai and Tellis 2017). The core idea is that a researcher can create an artificial, or synthetic, control brand by using a weighted average of other brands, where the weights are chosen such that the control brand resembles the focal brand as much as possible before an event (in this case, the product-harm crisis). By comparing the performance trajectory of the focal brand and the synthetic control brand, one can (try to) infer what would have happened in the absence of the product-harm crisis. Importantly, the other brands need to be chosen carefully such that they are as similar as possible to the focal brand yet are unlikely to suffer or benefit from spillover effects due to the product-harm crisis. Fremeth et al. (2016) use a synthetic control approach to assess the impact of Toyota's acceleration crisis on Camry sales.

**Future research** As shown in the previous discussion, a multitude of methods has already been used to analyze the impact of product-harm crises, with the analysis approach (rightfully) determined by the research question and data at hand. As with many other areas, a key challenge will be to take this field of research into the big-data era. We refer to Wedel and Kannan (2016) for a general discussion on these challenges.

When a product-harm crisis erupts, a massive amount of, often unstructured, data is likely to erupt on social media. More research is needed on how to integrate multiple data sources, which are likely to also have different levels of temporal and entity aggregation. Also models that can adequately capture carryover and spillover effects across multiple media and devices will be needed. In addition, most research thus far has required extensive post-crisis information. More research is needed to inform managers on how to optimally adjust their actions in real time as the crisis unfolds, which would require a time-varying parameter approach (cf. van Heerde et al. 2007; van Heerde et al. 2010). Also, more research on models that would allow a personalization of the marketing mix in a brand's/firm's recovery efforts would be highly relevant. Finally, many studies have adopted either a more experimental approach or a more econometric approach. In line with the recent advice of Hamilton (2016), product-harm research as

topical area would clearly benefit from harnessing the power of multiple methods.

## Review of prior research: frameworks

We now discuss the frameworks that have been adopted to study product-harm crises. We distinguish between the dependent variables, the focal main effects and antecedents, interactions effects, and what mediators (if any) have been used. Table 3 summarizes the frameworks from the experimental literature, and Table 4 from the empirical papers.

### Dependent variable(s)

The literature has looked at different dependent variables (DVs) to measure the impact of product recalls. Not surprisingly, lab experiments have focused primarily on perceptual measures (Table 3), whereas empirical research considers actual responses (Table 4). In lab studies, we can categorize the predominant DVs according to the consumer decision process starting at awareness and leading to purchase intentions. In the context of product recalls, this corresponds to DVs ranging from crisis awareness (Dawar and Pillutla 2000), blame attribution (Lei et al. 2012; Whelan and Dawar 2016), to brand evaluations (Klein and Dawar 2004; Lei et al. 2008; Lei et al. 2012; Germann et al. 2014) and post-crisis purchase intentions (Dawar and Pillutla 2000; Klein and Dawar 2004).

DVs in empirical work can be classified into consumer responses, investor responses, and firm responses. The foremost DV for the impact of a product recall is consumer demand, either measured at the individual level (e.g., Zhao et al. 2011; Cleeren et al. 2013) or at the aggregate level (e.g., van Heerde et al. 2007; Liu and Shankar 2015). Investor response to recalls has also seen considerable research interest, with (cumulative) abnormal stock returns as focal DV (e.g., Chen et al. 2009; Thirumalai and Sinha 2011). Research on firm responses, in turn, has focused on the number of recalls (e.g., Haunschild and Rhee 2004; Thirumalai and Sinha 2011; Kalaiganam et al. 2013) and the type of recall as DV (e.g., Liu et al. 2016).<sup>13</sup>

Another important observation is that most papers have focused on the impact of the crisis on the affected brand or firm. Although several studies have indicated that the effect of a product-harm crisis may spill over to other, non-affected brands, less is known about the impact of the crisis on competitors. Exceptions are Pennings et al. (2002) and Cleeren et al. (2013), who study the impact of the crisis

<sup>13</sup> Please note that because this stream of research uses the occurrence of a product recall as the dependent variable, conceptually it studies the antecedents of product recalls. That is why in Fig. 2 this research is represented in the antecedents box and not in the dependent variables box.

on the entire product category, and van Heerde et al. (2007), Lei et al. (2008), Rubel et al. (2011), Zhao et al. (2011), and Borah and Tellis (2016) who also look at the impact on non-affected competitors (both of the same and of another company).

**Future research** As indicated before, the social network aspect of product-harm crises is under-researched. This can be studied with a plethora of dependent variables (see also Lambertson and Stephen 2016) that have received little or no attention thus far, such as online or offline WOM (word of mouth) on the crisis event, or consumers' receptiveness to stories about product-harm crises from other people in their social network.

In a similar vein, more attention to the role of the media can lead to a new set of DVs. For example, new research can study how much consumers believe/trust the news coverage of different media, and how well they can distinguish actual product-harm crises from hoaxes or fake news (which is very important in today's world). What has also not been studied extensively is how much attention the news media give to product-harm crises and relevant moderating (or mediating) factors in this respect. Also, to what extent do news media respond to (i.e., follow/mimic) each other, rely on press releases from companies, or track governmental agencies announcing imposed product recalls?

There is also relatively little research studying competitive reactions as a dependent variable. Under what conditions does a competitor decide to respond in one way or another to the focal firm's misfortune? Are there different reaction patterns to product-harm crises occurring with, respectively, national brands and private labels? And does the country-of-origin of the affected brand matter, or the extent of multi-market contact between the different brands?

Addressing these questions would allow us to better understand the interrelationship between the firm whose products are defective, its competitors, the focal consumer, his/her social network and the media.

### Focal main effects and antecedents

As outlined in Tables 3 and 4, the prior literature has looked at five different types of main effects, characteristics of (1) the studied households or consumers (acronym in Tables 3 and 4: H), (2) the affected brand or firm (B), (3) the affected category (C), (4) the product-harm crisis (P), and (5) marketing-mix drivers (M).

*Household or consumer characteristics* have mainly been studied in the experimental literature. A core theme in these lab studies is to what extent pre-recall consumer brand perceptions affect consumer responses to a recall (Table 3). These brand perceptions include, for example, prior expectations (Dawar and Pillutla 2000; Lei et al. 2012) and brand

commitment (Germann et al. 2014). The main premise is that pre-recall brand strength provides a buffer against the impact of a product-harm crisis (Germann et al. 2014). Pre-recall brand strength and related constructs sometimes also feature as an independent variable in empirical studies that use a more disaggregate analysis of the impact of a product-harm crisis. Examples include brand loyalty and brand familiarity (Cleeren et al. 2008) and experienced brand quality (Zhao et al. 2011). Other studies have also pointed at the importance of a household's risk perception and risk attitude during a crisis (Pennings et al. 2002; Zhao et al. 2011).

Brand equity in its role of buffer against a crisis also features as a *brand or firm characteristic* in several more aggregate empirical papers (e.g., Liu and Shankar 2015; Hsu and Lawrence 2016). Apart from brand equity, also the firm's size (Thirumalai and Sinha 2011) and corporate social responsibility (Klein and Dawar 2004) have been found to safeguard companies against the potential negative effects of a product recall. Apart from their effect on purchase volume or market share, researchers have also considered firm characteristics as antecedents when studying the effect of previous recalls (Haunschild and Rhee 2004; Kalaignanam et al. 2013) and firm size (Thirumalai and Sinha 2011) on future recall numbers. In addition, Liu et al. (2016) have recently demonstrated the importance of CEO compensation and tenure in the firm's response to a product-harm crisis.

In contrast to household/consumer and brand/firm characteristics, *category characteristics* feature much less frequently as focal independent variables. Not only do most studies focus on one category only, but papers that do include different categories include category characteristics more as control variables than as focal independent variables (e.g. Cleeren et al. 2013). A notable exception is Lei et al. (2012), who manipulate the frequency of crises in the industry to demonstrate its impact on blame attribution. Clearly, more research is needed to study the impact of category or industry characteristics in a product-harm context.

While the number of categories in a study is usually fairly limited, empirical researchers have started to include more crisis cases from a given industry or category in one study. This not only facilitates the derivation of empirical generalizations, the variability across cases also allows drawing conclusions on the impact of *crisis characteristics*. An often-researched and important crisis characteristic is the severity of the product recall, studied, among others, by Chen et al. (2009), Rubel et al. (2011), Germann et al. (2014), Liu and Shankar (2015), and Gao et al. (2015). The premise is that the more hazardous the recalled product, the more adverse the consumer and investor responses. Closely related to this factor is recall magnitude (Kalaignanam et al. 2013; Gao et al. 2015) and the amount of negative publicity (Cleeren et al. 2013; Liu and Shankar 2015; Borah and Tellis 2016) or electronic WOM that the recall generates (Hsu and Lawrence 2016).

Apart from these intrinsic crisis characteristics, also the role of firm conduct in the form of *marketing-mix* variables has been investigated. Firm conduct has mostly focused on the marketing variables advertising and price (e.g., van Heerde et al. 2007 and other papers listed in Table 4). Relatively little research has tried to typify the firm's response. Notable exceptions in this respect are Dawar and Pillutla (2000) who manipulate the nature of the firm's response to the crisis (varying between stonewalling and taking full responsibility), Chen et al. (2009) who distinguish between pro-active and other recalls, and Liu et al. (2016) who study under what circumstances a full remedy becomes more likely.

**Future research** An obvious extension would be to consider other relevant drivers in each of the aforementioned categories. For example, while the role of advertising and price has been studied in a number of studies, new product launches, assortment and distribution characteristics have been largely ignored. The same applies to country characteristics, such as rule of law, competitiveness or cultural characteristics. Also, working with more disaggregate measures (for example, media-specific advertising support rather than aggregate spending, or distinguishing between the effectiveness of online versus offline media when trying to recover from a product-harm crisis) would be useful, and also more qualitative metrics (like the type of advertising content most useful to restore trust) should be considered.

There is also a lot of scope for additional research on the role of firm conduct with regard to the actual recall. How much does it matter if the firm makes the recall hassle-free not only for consumers, but also for partners in the distribution chain? How active are firms in finding all customers that bought the defective product, and what role does this play? In addition, given that most studies have considered only a small subset of drivers, little is known about their relative effect sizes when considered in combination.

### Mediators and interaction effects

As shown in Tables 3 (lab studies) and 4 (empirical studies), the literature has looked at a range of mediators and moderators for the effect of product recalls on the dependent variable. The number of mediators (intervening variables) is more limited than the number of interaction effects, so that is why we briefly discuss mediators first. *Mediators* are more naturally measured in lab settings than in the real world, as researchers can monitor the underlying decision process better in the lab. A recurring mediator is the extent to which a consumer blames the firm for the defective or dangerous product (e.g., Klein and Dawar 2004; Puzakova et al. 2013; Whelan and Dawar 2016). Germann et al. (2014) study whether the impact of a product recall on consumer attitude is mediated by consumer counterarguments and incongruity thoughts, while Puzakova

et al. (2013) also assess the mediating role of the stability and typicality of the negative performance.

**Interaction effects** As discussed above, many studies have focused on establishing the main effect of different types of variables. Apart from these main effects, several studies have studied boundary conditions by including the interaction effect between (some of) these factors, as summarized in the sixth column of Tables 3 and 4. Several studies have investigated how the characteristics of the crisis (e.g., the severity of the crisis and firm response) moderate the impact of consumer or brand/firm characteristics. For example, Dawar and Pillutla (2000) study the interaction between firm response and prior consumer expectations, Germann et al. (2014) include the interaction between the severity of the crisis and a consumer's brand commitment, Liu et al. (2016) investigate the moderating impact of different firm characteristics (i.e., CEO compensation and CEO tenure) on the impact of the severity of the crisis, while Liu et al. (2017) show how the relationship between recall volume and long-term abnormal returns is affected by voluntary recall initiation and various post-recall remedial actions.

Next to this set of moderators, researchers have also looked at contingency effects with regard to the effectiveness of marketing-mix variables in different crisis situations. For example, Gao et al. (2015) have studied whether the newness of the recalled product and the severity of the hazard influence the effectiveness of pre-recall advertising, while Cleeren et al. (2013) have investigated the moderating impact of publicity and acknowledgement of blame on the effectiveness of advertising and price.

**Future research** There are numerous opportunities for new and exciting research into how processes around product-harm crises work (mediating effects) and the boundary conditions and contingency factors (moderating effects). More work is, for example, needed to assess whether the sheer number of product recalls actually numbs consumer responses to them or aggravates them. In the car industry for example, many manufacturers have several product recalls per year, so perhaps it is becoming a routine for customers to go back to the dealer and get the car fixed, and there is not much brand damage. Recalls could even be seen as a signal that the firm cares about the wellbeing of its consumers. Alternatively, the more prior recalls, the more the cumulative hassle for the consumer, and the deeper the potential dent in brand attitude. As for mediating variables, it would, for example, be interesting to distinguish between the pure quality-perception effect of a recall and the actual hassle of bringing the defective product back to the seller – it is not clear which of the two is the primary path that drives overall consumer attitude.



## Key insights

Table 5 summarizes the main findings of each study. Despite the diversity of settings, dependent variables, moderators and mediators, a number of general patterns emerge.

### No brand is immune

Even though a single best strategy may be to try to avoid product-harm crises by implementing careful business processes with appropriate checks and balances, firms do not have full control over their occurrence. Products are increasingly complex, with components resourced from many different (international) suppliers, which increases the potential risk of product harm (Chao et al. 2009). Also, competitive pressure and consumer demands may instill companies to cut corners – a case in point is the Samsung Galaxy Note 7's battery problem that was widely attributed to Samsung trying to stay ahead of competition in the race for ever-thinner devices.<sup>14</sup> Also, government regulations that are well-intended (e.g., U.S. emission standards) may have adverse consequences if firms try to meet them in an illegal way (Volkswagen's and Audi's cheating software for diesel cars).

Brands may not only face product-harm crises through their own wrong-doing but they may also be affected negatively by crises occurring with other brands in the company's portfolio (Lei et al. 2008; Borah and Tellis 2016) and/or their competitors (Cleeren et al. 2013; Borah and Tellis 2016). For example, Borah and Tellis (2016) find that negative online chatter on a product recall spills over to rival brands, both within the same parent brand and across brands, and affects stock market performance and brand sales of these brands. The halo effect is stronger from a dominant brand to a less dominant one, is stronger between brands of the same country, and higher when apology advertising is being used.

### The damage has many faces

**Effects on firms** The negative consequences of product-harm crises may reveal themselves in multiple ways. The most obvious way is reduced sales/market shares (Pennings et al. 2002; Rubel et al. 2011), which can take a long time to recover after the actual recall is over (van Heerde et al. 2007) or may not even recover at all. The magnitude of the drop in demand is driven by the severity of the product-harm crisis and media attention (Liu and Shankar 2015), whether the company is to blame (Cleeren et al. 2013), and negative online chatter (Borah and Tellis 2016).

In addition, a product-harm crisis may affect marketing effectiveness (e.g., van Heerde et al. 2007; Zhao et al. 2011; Cleeren et al. 2013; Liu and Shankar 2015). In particular, advertising effectiveness may be compromised, which means that a larger post-crisis advertising investment is required for the same sales effect (van Heerde et al. 2007; Liu and Shankar 2015). Product-harm crises are also found to make consumers more sensitive to price (e.g., van Heerde et al. 2007, Cleeren et al. 2013), which makes it harder to maintain or raise prices, but makes it easier to re-attract customers through price promotions.

Product-harm crises may also increase a brand's vulnerability to competitive actions (van Heerde et al. 2007). In particular, the brand's sales may suffer more from competitors' price cuts and advertising hikes. This offers non-affected competitors an opportunity to capitalize on the affected brand's misfortune.

Finally, product-harm crises cause investors to worry about future earnings, reducing stock prices (e.g., Chen et al. 2009; Gao et al. 2015), although the effects are not always significant (Thirumalai and Sinha 2011). The adverse effects are stronger when the volume, valence and growth rate of online WOM is higher (Hsu and Lawrence 2016). Adjustments to a firm's pre-recall advertising expenditure can either mitigate or amplify the negative effect of the recall on stock market value, depending on the newness of the recalled products and the severity of the hazard (Gao et al. 2015). Moreover, negative stock market implications may well linger on for an extended time period (Liu et al. 2017).

**Effect on stakeholders** Negative consequences can be experienced by multiple stakeholders, including consumers, firms/brands, and investors (Liu et al. 2012). As Fig. 1 shows, while earlier research mostly focused on consumers, more recent research has widened the focus to include firm actions and investor responses. To complicate matters further, remedial actions may work differently for different stakeholders (Chen et al. 2009). In particular, a firm may use a pro-active product-recall strategy where it responds to consumer complaints early, issues speed voluntary recalls and communicates extensively with consumers and other stakeholders and provides additional compensation beyond the legal requirement (Chen et al. 2009). Alternatively, a firm may use a passive strategy, delaying the recall process and/or trying to shift the responsibility to other firms or entities. While a pro-active strategy will typically elicit more favorable responses from consumers, it hurts a firm's financial value more than a passive recall strategy (Chen et al. 2009). The reason is that investors see the recall strategy as a signal to estimate the financial impact of recalls, and a pro-active strategy signals a more severe product hazard.

<sup>14</sup> <https://www.forbes.com/sites/maribellopez/2017/01/22/samsung-reveals-cause-of-note-7-issue-turns-crisis-into-opportunity/#26f93e5124f1>



### Brand equity to the rescue

Brand (firm) equity prior to the crisis acts as an important buffer to mitigate the negative consequences. Indeed, it helps the brand through stormy weather, mitigating the crisis' negative consequences in terms of consumer (e.g., Klein and Dawar 2004; Cleeren et al. 2008; Lei et al. 2012) and investor responses (Hsu and Lawrence 2016). More recently, however, evidence has emerged that highly committed consumers may, in some instances, react more negatively to a crisis because of a feeling of betrayal or breach of contract, especially when the crisis is very severe (Germann et al. 2014). In addition, brand equity does not extend automatically after the crisis, as it erodes over time (Cleeren et al. 2008) and can be severely affected by the crisis, depending on the firm's response to the crisis (Dawar and Pillutla 2000).

### Product quality is a double-edged sword

Obviously, high product quality is an important factor for many consumers in normal conditions. Also, a brand's pre-crisis perceived quality provides a buffer when a crisis happens, because higher quality brands are blamed less for the incidence of product recalls (Dawar and Pillutla 2000; Kalaignanam et al. 2013). On the other hand, consumers respond more negatively to the recall of a brand with higher quality, because such a negative event is inconsistent with their high prior expectations (Liu and Shankar 2015).

### Managers are not powerless

Managers can attenuate, through appropriate actions before, during, and after the crisis, its negative consequences (e.g., Zhao et al. 2011; Cleeren et al. 2013; Gao et al. 2015). Foremost, managers may want to take the appropriate precautions to avoid, as much as possible, the occurrence of a crisis with their brand. However, as indicated before, no brands are immune, and managers should be aware of different actions that they can take when confronted with a crisis to their brand or in their category. For example, managers may have some leeway in the extent to which they acknowledge blame (Cleeren et al. 2013), they can stall (delay) the recall (Eilert et al. 2017), they can opt for different remedies to fully or partially "correct" the defective product (Liu et al. 2016), they can decide to use apology advertising (Borah and Tellis 2016), and they can adjust their post-crisis price level and/or advertising support (Cleeren et al. 2008, 2013). Each of these actions, which are to a large extent under management control, has been shown to influence the severity of the ultimate impact. In addition, managerial actions such as voluntary recall initiation and several post-recall remedial efforts have been shown to positively moderate the impact of recall volume on long-term financial returns (Liu et al. 2017).

### Fix-all solutions are an illusion

The extent of the negative implications, but also the appropriateness of remedial actions, varies considerably across consumers (Dawar and Pillutla 2000; Puzakova et al. 2013; Whelan and Dawar 2016), across brands and categories (Cleeren et al. 2013), and across crises (Gao et al. 2015 2015; Germann et al. 2014; Liu and Shankar 2015). Cleeren et al. (2013), for example, showed how the post-crisis recommendations for both brand-level and category-level advertising and price differ considerably depending on whether or not blame had to be acknowledged and depending on the extent of negative publicity that accompanied the crisis, while other studies identified the moderating role of consumers' prior expectations (Dawar and Pillutla 2000) and the size of the loyal market segment (Bala et al. 2017), brand dominance (Borah and Tellis 2016), brand equity (Hsu and Lawrence 2016), and brand diversity (Eilert et al. 2017). This multitude of contingency factors poses a considerable managerial challenge.

### The role of (social) media

Product-harm crises, especially severe ones, are newsworthy and may entail a lot of attention in social and broadcast media. Borah and Tellis (2016) document that online chatter amplifies the negative effect of recalls on downstream sales by about 4.5 times. Firms also need to be aware that negative attention in the traditional broadcast media hurts brand sales, even after controlling for the severity of the product-harm crisis (Liu and Shankar 2015). On the flip side, the attention for the brand and category brought by front-page publicity about the crisis does have a beneficial side effect: brand and category advertising efforts become more effective in regaining brand share and category purchasing (Cleeren et al. 2013).

### Organizations can learn how to deal with product recalls

To end on a positive note, there is emerging evidence that companies learn from their mistakes (Thirumalai and Sinha 2011; Kalaignanam et al. 2013), especially if they issue voluntary recalls (Haunschild and Rhee 2004). If a product recall is inevitable, firms can also try to handle the spread of information in social media (Borah and Tellis 2016). An accommodating style of firm-initiated WOM may help contain the fallout from brand crises in general (Hewett et al. 2016) and a product-harm crisis in particular.

### Conclusion: areas for future research

Product-harm crises have gained increasing attention from marketing scholars over the last decades, and the number of articles published on the topic has grown substantially. This

paper reviewed and synthesized the current state of knowledge on the topic.

At the end of each of the (sub-)sections in this paper, we already discussed various, more specific, issues in need of more research. Several of these suggestions involved the need to *broaden* the empirical knowledge base, i.e., beyond the often-studied developed countries, beyond the often-studied (car and CPG) industries, and beyond the most often-included marketing-mix variables (price and advertising). Moreover, several of the identified moderators and mediators were only tested in one (or very few) studies. It would be useful to *replicate* the findings in other studies, not only to develop more reliable empirical generalizations, but also to get better insights in relevant contingency factors. Also, many findings were studied within only part of the relevant nomological network. This lack of *integration* precludes the identification of some relevant inter-relationship between the various constructs, but also makes it difficult to assess the relative effect sizes of key drivers/moderators.

We conclude with some suggestions to broaden the *conceptual scope* of product-harm research. First, in this review, we followed common practice and defined a product-harm crisis as a discrete event wherein *physical* products are found to be defective and dangerous to at least part of the customer base. However, the learnings from the product-harm literature may well have broader applicability. For example, Martin et al. (2017) consider the negative performance implications of data breaches. Even though there may be no physical harm, customers may still feel violated and/or lose trust. Similarly, in our review, we made abstraction of failures in (individual) service encounters. However, in case of mass service failures that affect a company's entire customer base (as the severe and enduring Internet connection problems experienced by BlackBerry owners in October 2011),<sup>15</sup> a situation similar to a large-scale product recall arises. Such events may act as transformational relationship events, and fundamentally alter the relationship of many customers with the brand or firm (Harmeling et al. 2015). Gijzenberg et al. (2015) studied the impact of such mass service failures on the perceived service quality, and found that losses not only loom larger, but also longer, than gains (with persistent negative effects of the initial short-term losses). It would be useful to consider whether similar asymmetries also hold in a *product-harm* and recall setting.

Most research thus far has focused on the performance implications for the focal firm or focal category. Little, if any, attention has been devoted to spillover effects *across categories*. The latter can occur for a variety of reasons, such as umbrella branding, complementarity or substitutability in

usage, comparability in inter-purchase times, common use of ingredients, and/or similarities in manufacturing procedures (Cleeren et al. 2013). As discussed in Keller et al. (2016), *cross-category* effects become especially relevant to retailers using a store banner branding strategy for their private labels. A product-harm crisis in one category can then spill over to all categories with that name, and tarnish the banner's overall image. To complicate matters further, retailers are often involved in buying groups to achieve better terms with suppliers (Geyskens et al. 2015). As such, production problems with a given supplier may spill over to multiple retailers across different countries. More research on how far, and how fast, an initial crisis within a single supplier may spread out in multiple directions (categories, retailers, countries) is called for.<sup>16</sup>

Finally, the empirical world around us keeps on generating new types of product recalls that could be highly interesting to study. For example, Volkswagen's Dieselgate (where it cheated to meet emission requirements) represents a case where the firm knowingly fiddled with the product specification, leading to mass-scale recalls and fines.<sup>17</sup> How do consumers respond to such a type of product recall versus one where a firm unknowingly created a flaw in the product? The distinction by Kim et al. (2006) between competence- and integrity-based trust violations may be a useful starting point in this respect. Recent research by Backhaus and Fischer (2016) suggests that the damage to brand strength due to corporate social irresponsibility may be deeper and cumulating to a larger total effect over time compared to product-harm crises.

Also, the surge in various allergies (e.g., gluten allergy), food choices (e.g., vegan, organic) and the importance of religiously prescribed or forbidden food ingredients or preparation procedures (e.g., halal) makes it increasingly hard for food manufacturers to get their product information right all the time. Many of the product recalls studied in Cleeren et al. (2013) were related to incorrect or incomplete label information. The question is whether psychologically/religiously unsafe foods that are recalled (e.g., a product was advertised as halal but it was not) have a stronger or weaker effect than a physically unsafe food product (e.g., the product had too many bacteria).

With this literature review, we summarize the existing marketing research on product-harm crises. We hope this review will be helpful for fellow researchers in the product-harm domain by identifying gaps in the literature. Given the increasing complexity of today's marketplace, many managers will

<sup>15</sup> See for example <http://www.telegraph.co.uk/technology/blackberry/8825661/BlackBerry-blackout-how-it-happened.html> and [http://money.cnn.com/2011/10/13/technology/blackberry\\_outage/](http://money.cnn.com/2011/10/13/technology/blackberry_outage/).

<sup>16</sup> A related problem may occur when components are shared across multiple products/categories (see, e.g., Ramdas and Randall 2008), even though this may, in itself, increase product reliability.

<sup>17</sup> See <http://www.autoexpress.co.uk/volkswagen/92893/vw-emissions-scandal-recalls-compensation-is-your-car-affected-latest-news> and <http://www.forbes.com/sites/greatspeculations/2015/09/24/dieselgate-scandal-could-cost-volkswagen-up-to-35-billion/#7134853b3b4d>.

surely face a product-harm crisis in the near or more distant future. Academic research can be helpful in providing the necessary guidelines on how to appropriately react to such a negative event.

## References

- Aaker, J., Fournier, S., & Brasel, S. A. (2004). When good brands do bad. *Journal of Consumer Research*, 31(1), 1–16.
- Abadie, A., Diamond, A., & Hainmueller, J. (2010). Synthetic control methods for comparative case studies: estimating the effect of California's tobacco control program. *Journal of the American Statistical Association*, 105(490), 493–505.
- Aggarwal, P., & McGill, A. L. (2007). Is this car smiling at me? Schema congruity as basis for evaluating anthropomorphized products. *Journal of Consumer Research*, 34(4), 468–479.
- Ahluwalia, R., Burnkrant, R. E., & Unnava, H. R. (2000). Consumer response to negative publicity: the moderating role of commitment. *Journal of Marketing Research*, 37(2), 203–214.
- Ailawadi, K. L., Zhang, J., Krishna, A., & Kruger, M. W. (2010). When Wal-Mart enters: how incumbent retailers react and how this affects their sales outcomes. *Journal of Marketing Research*, 47(4), 577–593.
- Allen, A., Brady, M., Robinson, S., & Voorhees, C. (2015). One firm's loss is another's gain: capitalizing on other firms' services failures. *Journal of the Academy of Marketing Science*, 43(5), 648–662.
- Backhaus, M., & Fischer, M. (2016). Brand damage from product harm and corporate social irresponsibility: how deep and how long? MSI working paper series, no 16–133.
- Bala, R., Bhardwaj, P., Chintagunta, P.K. (2017) Pharmaceutical product recalls, category effects and competitor response. *Marketing Science*, Forthcoming.
- Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: conceptual, strategic and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173–1182.
- Bass, F. M., & Wind, J. (1995). Introduction to the special issue: empirical generalizations in marketing. *Marketing Science*, 14(3\_supplement):G1–G5.
- Berman, B. (1999). Planning for the inevitable product recall. *Business Horizons*, 42(2), 69–78.
- Borah, A., & 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*, 53(2), 143–160.
- Bromiley, P., & Marcus, A. (1989). The deterrent to dubious corporate behavior: profitability, probability and safety recalls. *Strategic Management Journal*, 10(3), 233–250.
- Burgess, S. M., & Steenkamp, J.-B. E. M. (2006). Marketing renaissance: how research in emerging consumer markets advances marketing science and practice. *International Journal of Research in Marketing*, 23(4), 337–356.
- Chao, G. H., Irvani, S. M. R., & Savaskan, R. C. (2009). Quality improvement incentives and product recall cost sharing contracts. *Management Science*, 55(7), 1122–1138.
- Chen, Y., & Nguyen, N. H. (2013). Stock price and analyst earnings forecast around product recall announcements. *International Journal of Economics and Finance*, 5(6), 1–10.
- Chen, Y., Ganesan, S., & 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*, 73(6), 214–226.
- Clark, T. (1988). The concept of a marketing crisis. *Journal of the Academy of Marketing Science*, 16(2), 43–48.
- Cleeren, K., Dekimpe, M. G., & Helsen, K. (2008). Weathering product-harm crises. *Journal of the Academy of Marketing Science*, 36(2), 262–270.
- Cleeren, K., van Heerde, H., & Dekimpe, M. G. (2013). Rising from the ashes: how brands and categories can overcome product-harm crises. *Journal of Marketing*, 77(2), 58–77.
- Davidson, W. N., & Worrell, D. L. (1992). Research notes and communications: the effect of product recall announcements on shareholder wealth. *Strategic Management Journal*, 13(6), 467–473.
- Dawar, N., & Pillutla, M. N. (2000). Impact of product-harm crises on brand equity: the moderating role of consumer expectations. *Journal of Marketing Research*, 37(2), 215–226.
- Dekimpe, M. G., & Hanssens, D. M. (1999). Sustained spending and persistent response: a new look at long-term marketing profitability. *Journal of Marketing Research*, 36(4), 397–412.
- Dowdell, T. D., Govindaraj, S., & Jain, P. C. (1992). The Tylenol incident, ensuing regulation, and stock prices. *Journal of Financial and Quantitative Analysis*, 27(2), 283–301.
- Eilert, M., Jayachandran, S., Kalaignanam, K., & Swartz, T. A. (2017). Does it pay to recall your product early? An empirical investigation in the automobile industry. *Journal of Marketing*, 81(3), 111–129.
- Ein-Gar, D., Shiv, B., & Tormala, Z. (2012). When blemishing leads to blossoming: the positive effect of negative information. *Journal of Consumer Research*, 38(5), 846–859.
- Einwiller, S. A., Fedorikhin, A., Johnson, A. R., & Kamins, M. A. (2006). Enough is enough! When identification no longer prevents negative corporate associations. *Journal of the Academy of Marketing Science*, 34(2), 185–194.
- Epley, N., & Waytz, A. (2009). Mind perception. In S. T. Fiske, D. T. Gilbert, & G. Lindzey (Eds.), *The handbook of social psychology* (5th ed., pp. 498–541). New York: John Wiley and Sons.
- Folkes, V. S. (1984). Consumer reactions to product failure: an attributional approach. *Journal of Consumer Research*, 10(4), 398–409.
- Folkes, V. S., & Kotsos, B. (1986). Buyers' and sellers' explanations for product failure: who done it? *Journal of Marketing*, 50(2), 74–80.
- Freedman, S., Kearney, M., & Lederman, M. (2012). Product recalls, imperfect information, and spillover effects: lessons from the consumer response to the 2007 toy recalls. *The Review of Economics and Statistics*, 94(2), 499–516.
- Fremeth, A. R., Holburn, G. L., & Richter, B. K. (2016). Bridging qualitative and quantitative methods in organizational research: applications of synthetic control methodology in the US automobile industry. *Organization Science*, 27(2), 462–482.
- Gao, H., Xie, J., Wang, Q., & 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*, 79(5), 80–99.
- Germann, F., Grewal, R., Ross Jr., W. T., & Srivastava, R. K. (2014). Product recalls and the moderating role of brand commitment. *Marketing Letters*, 25(2), 179–191.
- Geyskens, I., Gielens, K., & Wuyts, S. (2015). United we stand: the impact of buying groups on retailer productivity. *Journal of Marketing*, 79(4), 16–33.
- Gijzenberg, M. J., van Heerde, H. J., & Verhoef, P. C. (2015). Losses loom longer than gains. Modeling the impact of service crises on perceived service quality over time. *Journal of Marketing Research*, 52(5), 642–656.
- Govindaraj, S., Jaggi, B., & Lin, B. (2004). Market overreaction to product recall revisited—the case of firestone tires and the ford explorer. *Review of Quantitative Finance and Accounting*, 23(1), 31–54.
- Grégoire, Y., & Fisher, R. J. (2008). Customer betrayal and retaliation: when your best customers become your worst enemies. *Journal of the Academy of Marketing Science*, 36(2), 247–261.



- Grégoire, Y., Tripp, T. M., & Legoux, R. (2009). When customer love turns into lasting hate: the effects of relationship strength and time on customer revenge and avoidance. *Journal of Marketing*, 73(6), 18–32.
- Grewal, R., Johnson, J. L., & Sarker, S. (2007). Crises in business markets: implications for interfirm linkages. *Journal of the Academy of Marketing Science*, 35(3), 398–416.
- Hamilton, R. (2016). Consumer-based strategy: using multiple methods to generate consumer insights that inform strategy. *Journal of the Academy of Marketing Science*, 44(3), 281–285.
- Harmeling, C. M., Palmatier, R. W., Houston, M. B., Arnold, M. J., & Samaha, S. A. (2015). Transformational relationship events. *Journal of Marketing*, 79(5), 39–62.
- Harmeling, C. M., Moffett, J. W., Arnold, M. J., & Carlson, B. D. (2017). Toward a theory of customer engagement marketing. *Journal of the Academy of Marketing Science*, 45(3), 312–335.
- Haunschild, P. R., & Rhee, M. (2004). The role of volition in organizational learning: the case of automotive product recalls. *Management Science*, 50(11), 1545–1560.
- Hess, R. L., Ganesan, S., & Klein, N. M. (2007). Interactional service failures in a pseudorelationship: the role of organizational attributions. *Journal of Retailing*, 83(1), 79–95.
- Hewett, K., Rand, W., Rust, R. T., & Van Heerde, H. J. (2016). Brand buzz in the Echoverse. *Journal of Marketing*, 80(3), 1–24.
- Hoffer, G. E., Pruitt, S. W., & Reilly, R. J. (1988). The impact of product recalls on the wealth of sellers: a reexamination. *Journal of Political Economy*, 96(3), 663–670.
- Hora, M., Bapuji, H., & Roth, A. V. (2011). Safety hazard and time to recall: the role of recall strategy, product defect type, and supply chain player in the U.S. toy industry. *Journal of Operations Management*, 29(7), 766–777.
- Hsu, L., & Lawrence, B. (2016). The role of social media and brand equity during a product recall crisis: a shareholder value perspective. *International Journal of Research in Marketing*, 33(1), 59–77.
- Jarrell, G., & Peltzman, S. (1985). The impact of product recalls on the wealth of sellers. *Journal of Political Economy*, 93(3), 512–536.
- Kalaignanam, K., Kushwaha, T., & Eilert, M. (2013). The impact of product recalls on future product reliability and future accidents: evidence from the automobile industry. *Journal of Marketing*, 77(2), 41–57.
- Kamins, M. A., Folkes, V. S., & Perner, L. (1997). Consumer responses to rumors: good news, bad news. *Journal of Consumer Psychology*, 6(2), 165–187.
- Keller, K. O., Dekimpe, M. G., & Geyskens, I. (2016). Let your banner wave? Antecedents and performance implications of retailers' private-label branding strategies. *Journal of Marketing*, 80(4), 1–19.
- Keller, K. L. (1993). Conceptualizing, Measuring, and Managing Customer-Based Brand Equity. *Journal of Marketing*, 57(1), 1.
- Kim, P. H., Dirks, K. T., Cooper, C. D., & Ferrin, D. L. (2006). When more blame is better than less: the implications of internal vs. external attributions for the repair of trust after a competence-vs. integrity-based trust violation. *Organizational Behavior and Human Decision Processes*, 99(1), 49–65.
- Klein, J. G., & Dawar, N. (2004). Corporate social responsibility and consumers' attributions and brand evaluations in a product-harm crisis. *International Journal of Research in Marketing*, 21(3), 203–217.
- Klein, J. G., Smith, N. C., & John, A. (2004). Why we boycott: consumer motivations for boycott participation. *Journal of Marketing*, 68(3), 92–109.
- Lamberton, C., & Stephen, A. T. (2016). A thematic exploration of digital, social media, and mobile marketing research's evolution from 2000 to 2015 and an agenda for future research. *Journal of Marketing*, 80(6), 146–172.
- Lei, J., Dawar, N., & Lemmink, J. (2008). Negative spillover in brand portfolios: exploring the antecedents of asymmetric effects. *Journal of Marketing*, 72(3), 111–123.
- Lei, J., Dawar, N., & Gürhan-Canli, Z. (2012). Base-rate information in consumer attributions of product-harm crises. *Journal of Marketing Research*, 49(3), 336–348.
- Lewin, K. (1947). Channels of group life; social planning and action research. *Human Relations*, 1(2), 143–153.
- Lilien, G. L. (2016). The B2B knowledge gap. *The International Journal of Research in Marketing*, 33(3), 543–556.
- Liu, Y., & 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*, 61(10), 2514–2535.
- Liu, Y., Chen, Y., Ganesan, S., & Hess, R. (2012). Product-harm crisis management and firm value. In S. Ganesan (Ed.), *Handbook of marketing and finance* (pp. 293–314). Cheltenham: Edward Elgar.
- Liu, A. X., Liu, Y., & Luo, T. (2016). What drives a firm's choice of product recall remedy? The impact of remedy cost, product hazard, and the CEO. *Journal of Marketing*, 80(3), 79–95.
- Liu, Y., Shankar, V., & Yun, W. (2017). Crisis management strategies and the long-term effects of product recalls on firm value. *Journal of Marketing*, Forthcoming.
- Mackinlay, A. C. (1997). Event studies in economics and finance. *Journal of Economic Literature*, 35(1), 13–39.
- Martin, K. D., Borah, A., & Palmatier, R. W. (2017). Data privacy: effects on customer and firm performance. *Journal of Marketing*, 81(1), 36–58.
- Mitroff, I. I. (2004). *Crisis leadership: planning for the unthinkable*. New York: John Wiley & Sons.
- Mitroff, I. I., & Kilmann, R. H. (1984). *Corporate tragedies: product tampering, sabotage, and other catastrophes*. New York: Praeger.
- Morgan, F. W. (1988). Tampered goods: legal developments and marketing guidelines. *Journal of Marketing*, 52(2), 86–96.
- Papies, D., Ebbes, P., & van Heerde, H. J. (2017). Addressing endogeneity in marketing models. In P.S.H. Leeftang, J.E. Wieringa, T.H.A. Bijmolt, & K.H. Pauwels, (Eds.) *Advanced methods in modeling markets*. Springer International Publishing.
- Pennings, J. M. E., Wansink, B., & Meulenberg, M. T. G. (2002). A note on modeling the consumer reactions to a crisis: the case of the mad cow disease. *International Journal of Research in Marketing*, 19(1), 91–100.
- Pruitt, S. W., & Peterson, D. R. (1986). Security price reactions around product recall announcements. *Journal of Financial Research*, 9(2), 113–122.
- Pullig, C., Netemeyer, R. G., & Biswas, (2006). Attitude basis, certainty, and challenge alignment: a case of negative brand publicity. *Journal of the Academy of Marketing Science*, 34(4), 528–542.
- Puzakova, M., Kwak, H., & Rocereto, J. F. (2013). When humanizing brands goes wrong: the detrimental effect of brand anthropomorphization amid product wrongdoings. *Journal of Marketing*, 77(3), 81–100.
- Ramdas, K., & Randall, T. (2008). Does component sharing help or hurt reliability? An empirical study in the automotive industry. *Management Science*, 54(5), 922–938.
- Rhee, M., & Haunschild, P. R. (2006). The liability of a good reputation: a study of product recalls in the U.S. automobile industry. *Organization Science*, 17(1), 101–117.
- Roehm, M. L., & Tybout, A. M. (2006). When will a brand scandal spill over, and how should competitors respond? *Journal of Marketing Research*, 43(3), 366–373.
- Rubel, O., Naik, P. A., & Srinivasan, S. (2011). Optimal advertising when envisioning a product-harm crisis. *Marketing Science*, 30(6), 1048–1065.

- Rupp, N. G., & Taylor, C. R. (2002). Who initiates recalls and who cares: evidence from the automobile industry. *The Journal of Industrial Economics*, 50(2), 123–149.
- Sheff t, M. J. (1983). Market share liability: a new doctrine of causation in product liability. *Journal of Marketing*, 47(1), 35–43.
- Siomkos, G., & Kurzbard, G. (1994). The hidden crisis in product-harm crisis management. *European Journal of Management*, 28(2), 30–41.
- Smith, N. C., Thomas, R. J., & Quelch, J. A. (1996). A strategic approach to managing product recalls. *Harvard Business Review*, 74(5), 102–112.
- Sorescu, A., Warren, N. L., & Ertekin, L. J. (2017). Event study methodology in the marketing literature: an overview. *Journal of the Academy of Marketing Science*, Forthcoming.
- Srinivasan, S., & Hanssens, D. M. (2009). Marketing and firm value: metrics, methods, findings, and future directions. *Journal of Marketing Research*, 46(3), 293–312.
- Steenkamp, J.-B. E. M. (2005). Moving out of the U.S. silo: a call to arms for conducting international marketing research. *Journal of Marketing*, 69(4), 6–8.
- Steenkamp, J.-B. E. M., & Geykens, I. (2014). Manufacturer and retailer strategies to impact store brand share: global integration, local adaptation and worldwide learning. *Marketing Science*, 33(1), 6–26.
- Thirumalai, S., & Sinha, K. K. (2011). Product recalls in the medical device industry: an empirical exploration of the sources and financial consequences. *Management Science*, 57(2), 376–392.
- Tirunillai, S., & Tellis, G. J. (2017). Does offline TV advertising affect online chatter? Quasi-experimental analysis using synthetic control. *Marketing Science*, Forthcoming.
- Trump, R. K., & Newman, K. P. (2017). When do unethical brand perceptions spill over to competitors? *Marketing Letters*, Forthcoming.
- van Heerde, H. J., Helsen, K., & Dekimpe, M. G. (2007). The impact of a product-harm crisis on marketing effectiveness. *Marketing Science*, 26(2), 230–245.
- van Heerde, H. J., Srinivasan, S., & Dekimpe, M. G. (2010). Estimating cannibalization rates for pioneering innovations. *Marketing Science*, 29(6), 1024–1039.
- van Heerde, H. J., Gijsbrechts, E., & Pauwels, K. (2015). Fanning the flames? How media coverage of a price war affects retailers, consumers, and investors. *Journal of Marketing Research*, 52(5), 674–693.
- Wedel, M., & Kannan, P. K. (2016). Marketing analytics for data-rich environments. *Journal of Marketing*, 80(6), 97–121.
- Weinberger, M. G., Romeo, J. B., & Piracha, A. (1993). Negative product safety news: coverage, responses, and effects. *Business Horizons*, 34(3), 23–31.
- Weiner, B. (1980). *Human motivation*. New York: Holt, Reinhart, and Winston.
- Whelan, J., & Dawar, N. (2016). Attributions of blame following a product-harm crisis depend on consumers' attachment styles. *Marketing Letters*, 27(2), 285–294.
- Winer, R. S. (1999). Experimentation in the 21<sup>st</sup> century: The importance of external validity. *Journal of the Academy of Marketing Science*, 27(3), 349–358.
- Zavyalova, A., Pfarrer, M. D., Reger, R. K., & Shapiro, D. L. (2012). Managing the message: the effects of firm actions and industry spills on media coverage following wrongdoing. *Academy of Management Journal*, 55(5), 1079–1101.
- Zhao, X., Lynch Jr., J. G., & Chen, Q. (2010). Reconsidering Baron and Kenny: myths and truths about mediation analysis. *Journal of Consumer Research*, 37(3), 197–206.
- Zhao, Y., Zhao, Y., & Helsen, K. (2011). Consumer learning in a turbulent market environment: modeling consumer choice dynamics in the wake of a product-harm crisis. *Journal of Marketing Research*, 48(2), 255–267.