

The More I Err, the Less I Pay: Effect of Firm Recall Experience, Firm Type, and Recall Severity on Remedy to Consumers

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Abstract

Purpose- This study investigates the effect of firm characteristics and product-harm crisis characteristics on remedies offered to consumers by firms in the event of a product recall crisis.

Design/methodology/approach- Published data on 868 product recalls in the U.S toy industry from 1988 to 2011 has been used to investigate the effects of firm experience in product recalls, type of firm (company versus intermediary, i.e. distributor/retailer) and product recall severity in predicting remedies offered to consumers in the event of a product recall.

Findings- The findings show that firm recall experience, firm type (company vs. intermediary), and recall severity are negatively associated with recall remedies offered. Specifically, firms offer lower remedies if they have higher recall experience, if they are more upstream companies in the supply chain (farther from consumers), and the recall is more severe.

Research limitations/implications- This study focuses on the toy industry and does not consider product complexity, firm reputation, and the role of external regulatory agencies in the prediction of remedies offered by firms. Future research may extend this study to other industries (such as automobiles and food) and factor the influence of product complexity, reputation, and the role of stakeholder pressures in remedial decision making by firms.

Practical implication- Offering a high remedy to consumers of a recalled product may be a responsible decision by a firm, but it may also attract stakeholder wrath. The study has implications in managing multiple goals in product recall crisis management.

Originality/value- Studies focused on issues of interest to consumers during a recall crisis, such as swift recalls and appropriate remedies, are limited. This study contributes to the understanding of the antecedents of recall remedies.

Keywords: Behavioral theory, Product recall, Recall remedy, Recall experience, Recall severity

1. Introduction

A product-harm crisis represents a situation in which a product violates a safety regulation, contains a defect that could pose substantial danger to consumers, or creates a risk of serious injury or death (Bapuji, 2011; Dawar and Pillutla, 2000). In the event of a crisis, firms need to take actions to eliminate or minimize the harm to consumers. This crisis, often leads to a product recall, in which the firm requests consumers to discontinue the use of a product in its original form (Chu *et al.*, 2005; Liu *et al.*, 2016). Recalls are costly for firms to execute, both in terms of direct costs such as providing remedies and indirect costs such as loss of reputation (Chen *et al.*, 2009; Hora *et al.*, 2011). As product recalls continue to increase, many questions have been raised about the antecedents and consequences of recalls, as well as the behavior of recalling firms, prompting researchers to study product recalls (Etayankara and Bapuji, 2009).

While research on product-harm crisis and product recalls has increased, majority of the scholarship has focused on empirically examining the negative consequences of recalls, such as effect of recalls on stock price, consumer reactions, and product sales (Davidson and Worrel, 1992; Liu and Shankar, 2015; Rhee and Hanuschild, 2006; Rubel *et al.* 2011; Thirumalai and Sinha, 2011; Zhao *et al.*, 2011). A few articles have also examined the antecedents of recalls, such as top management characteristics, governance, and plant operational parameters (Kashmiri and Brower, 2016; Shah *et al.*, 2016). While these studies have greatly advanced our understanding of the causes and consequences of product recalls, prior research has not adequately examined product recall processes, i.e., actual recall behavior of a company during a recall crisis (Eilert *et al.*, 2017; Ni and Huang, 2017).

Recall processes are important because they entail recall management strategies, i.e., appropriate advertising of the recall, initiating the recall, and offering remedies to consumers –

all of which help to mitigate the negative effects of product recalls (Liu et al., 2017). These strategies correspond to the key components of crisis management, i.e. appropriately communicate to stakeholders, quick response, and repair damage (Seeger *et al.* 1998; Tang 2008). While the role of advertising has been addressed in the literature (e.g. Cleeren *et al.*, 2008; 2013; Germann *et al.*, 2014; Liu and Shankar, 2015; Rubel *et al.*, 2011), studies focusing on recall management issues, such as swift recalls and appropriate remedies are limited (Hora *et al.*, 2011; Chen *et al.*, 2009; Liu *et al.*, 2017). In particular, remedies of the firm are very important as they exacerbate the decreases in the long-term returns of the firm due to recalls (Liu *et al.*, 2017). However, limited research has examined the antecedents of recall remedies (for an exception, please see Liu *et al.*, 2016).

Our study addresses the above gap and examines the question of what drives firms to provide a higher or lower recall remedy to consumers. Drawing on insights from the behavioral theory of the firm, we argue that a firm's previous recall experience, its position in the supply chain, and crisis characteristics (severity of the hazard) influence remedy decisions. We test our hypotheses using data on 868 toy recalls in the US issued between 1988 and 2011. Our findings show that firm characteristics such as higher recall experience and being farther from the consumer in the supply chain (upstream) tend to lower the probability of the firm offering a higher remedy to the consumer. Similarly, higher recall severity tends to lower the probability of firms offering a higher remedy to the consumer. Our results also show that the probability of offering a higher remedy in the case of severe recalls reduces when the issuing firm has higher recall experience.

Our key contribution to literature is as follows. While there is a growing number of studies that are adding to insights on the consequences and antecedents of recalls, few have

examined the factors that influence firm behavior during the recall management process, such as time to recall and recall remedy. Despite the importance of remedies offered by firms in product-harm crisis situations, there is limited research in this area. Our study fills this important gap, in extending the only study so far on the antecedents of remedies offered by the firm, by Liu et al. (2016). Our study adds to this literature by examining firm level (firm recall experience and firm type) and crisis level (crisis severity) antecedents of recall remedy. Also, we predict the moderating effects of crisis severity on these relationships. Further, we contribute to methodological rigour through a fine-grained categorization of remedies offered and robust operationalization of predictor variables.

The article is organized as follows. First, we discuss product recalls and remedies offered, to provide the necessary theoretical background that informed our study. Then, we develop our hypotheses, using insights from the behavioral theory of the firm. We then describe our empirical methods and present the results. Finally, we discuss the implications of our study for organisational research and practice.

2. Background: recall behavior of a firm

Crisis-management initiatives are organisational responses to mitigate the negative effects of a crisis and represent firm behavior during the crisis. In the context of a product-harm crisis, these initiatives include issuing a recall, appropriately communicating it to the affected stakeholders, and offering suitable remedies to consumers (Liu *et al.*, 2017). The role of communication and advertisement in moderating the negative effects of recalls on consumer behavior and sales has been studied in the extant literature. This research showed that the negative effects of recalls on consumer behavior and firm performance can be reduced by appropriate advertising (Cleeren *et al.*, 2008; Cleeren *et al.*, 2013; Germann *et al.*, 2014; Liu and Shankar, 2015; Rubel *et al.*, 2011).

Although time to recall and recall remedy are two important elements of crisis management, very little research has examined these. In contrast, the majority of previous research (please see table 1) has examined the antecedents and consequences of product recalls.

-----Please insert table 1 about here-----

As presented in table 1, a few recent studies began to examine the drivers of time to recall and remedies offered by the firm. Swift recalls or the time firms take to recall a defective product from the marketplace has been studied by scholars. While consequences of time to recall on stock market performance of the firm has been found to be negative (Eilert *et al.*, 2017; Wood *et al.*, 2017), scholars have shown that time to recall is influenced by firm-level factors (e.g., type of defects, supply chain position, recall strategy, and external agency pressure) and crisis factors (e.g., severity) (Eilert *et al.*, 2017; Hora *et al.*, 2011; Ni and Huang, 2017). Country of origin of imported products and components also were found to impact recall timing decisions (Majid and Bapuji, 2018; Muralidharan *et al.*, 2015).

While a few studies have examined time to recall, relatively fewer studies have examined the remedies offered in a recall. In the only study that examined antecedents of recall remedies, Liu *et al.* (2016), found that CEO incentives play a key role in deciding the remedy offered to the consumer. Two other studies examined the effect of remedy offered on stock market performance. While stock market performance was found to be more negative for full remedy (replace or refund) than it is for repair in the case of auto recalls (Davidson and Worrel, 1992). Further, post recall remedial efforts positively moderated the negative effects of recall volumes on stock market performance (Liu *et al.*, 2017).

2.1 Recall Remedies

Remedies offered to consumers in product recalls vary and may consist of (i) advising the

consumer to discard the product and discontinue its use, (ii) replace parts of the product or repair the product, (iii) replace the entire product, (iv) refund the cost of the product to the consumer, and (v) refund the cost of the product to the consumer, along with a bonus. Remedies offered by a firm following a recall can be part of key crisis management strategies. To differentiate firm crisis management strategies, extant research has classified them as “unambiguous support” versus “stonewalling” (Dawar and Pillutla, 2000), “proactive versus “passive” (Chen *et al.*, 2009), and “supereffort” versus “denial” (Siomkos and Kurzbard, 1994). In a similar vein, Liu et al. (2016) classified the remedies offered into two categories: “partial” versus “full remedy”. Full refund of purchase price and replacement of the defective product with a new product was considered as full remedy, and repair was considered a partial remedy (Liu *et al.*, 2016).

Building on the above and responding to the recommendation of Liu et al., (2016) to conceptualize remedies in a more fine-grained fashion, we classified remedies into three groups i.e. repair-based remedies (where the product is repaired by the firm to eliminate hazard or the customer is requested to discard the product), exchange-based remedies (where the product is exchanged or replaced by a defect-free product at no extra cost), and refund-based remedies (where monetary value of the product is returned to the consumer or monetary value is returned to the consumer plus an additional amount is offered, such as a gift card or something similar). We view these remedies in an increasing order of impact to both the firm and the consumer with repair-based solutions at the lower end and refund-based solutions at the higher end.

These solutions can be understood to range from offering the least benefit to the consumer (in the case of repair-based solutions) to the maximum benefit to the consumer (refund-based solutions). In both repair-based and exchange-based remedies, the consumer is constrained to remain with the firm for the particular transaction, although a recall has occurred.

In the refund-based remedy, as the entire amount for the transaction is refunded, the consumer has the option to go to another firm for the product. In the case of the firm, the least cost to the firm in regard to the recall may be the repair-based solution (where parts are replaced/repaired or the buyer is advised to discontinue use of the product). In the case of exchange-based remedy, the cost to the firm is just the direct cost of the product being replaced. In the case of refund-based remedy, there is a loss of the entire revenue from the transaction for which the recall has occurred, and the potential to lose future revenue (if the consumer does not go back to the firm).

Recall remedies impose direct and indirect costs on the firm. Direct costs include all the expenditure related to the recall process: expenses for repair or replacement, including the costs for retrieving the defective product (Jayaraman *et al.*, 2003). In the case of repair-based remedy, the majority of costs relate to labour and parts, whereas for exchange-based remedy, the cost is higher as it includes all labour and parts that go into making the product. In the case of refund-based solution, there will be a loss of existing revenue for the firm (in view of refund of the entire sales value) and also loss of potential future revenue. Such losses would affect both the short and potentially long-term cash flows for the firm. Remedies offered may also have indirect costs with declines in reputation and market performance because remedies directly affect stakeholder perceptions about the products' safety and reliability (Stahl *et al.*, 2012). So, in such situations, firms have to make decisions that meet multiple goals such as market share, brand reputation, profitability.

3.Theory and Hypotheses development

We use insights from the behavioral theory of the firm to develop our understanding of how firms make decisions on remedies. Behavioral theory suggests that firms selectively attend to market information and find satisficing solutions, where a satisficing solution involves striving to

meet multiple goals such as market share, brand reputation, and profit considerations (Cyert and March, 1992; Eilert et al., 2017). Accordingly, we suggest that faced with a product-harm crisis that involves direct and indirect costs and uncertain consequences, firms attempt to arrive at satisficing solutions. A firm's legal obligation during product recalls is to ensure that the defective products are withdrawn from the market and those which are already sold are either repaired or disposed off appropriately; beyond this obligation, the level of remedies offered (repair, exchange, or refund based) is influenced by the firm's goals and incentives (Liu *et al.*, 2016). Extant research suggests that a firm's responses in a product-harm crisis depend on the firm's motivation and ability (Chen and Hambrick, 1995; Smith *et al.*, 1991). We use these insights – the tendency of firms to find satisficing solutions that depend on their motivation and ability – to predict how remedies offered by a firm are influenced by the effect of firm-level factors such as recall experience and supply chain position, and crisis factors such as severity.

Increasing recalls experienced by a firm leads to increasing costs that affect cash flow and hence profitability. Under the U.S. Generally Accepted Accounting Principles, spending on remedies by firms has to be immediately expensed, which reduces the firm's reported earnings (Liu *et al.*, 2016). This reduces the motivation of firms to offer higher remedies and also places constraints on the firm's ability to bear costs of higher remedies in subsequent recalls. Also, different types of firms in the supply chain (upstream versus downstream firms) have different levels of motivation in managing customer expectations. Similarly, since severity signals inherent quality problems, firms may be less motivated to pursue solutions that would make them directly accountable for the crisis. We examine each of these factors – recall experience, firm type and recall severity – to predict their influence on remedies offered by firms in the event of a product recall.

3.1 Recall Experience and Remedy

Organisational-learning scholars have examined the ability of firms to learn from their experiences (Levitt and March, 1988; Huber, 1991). Two extremes of performance experience stimulate organisational learning: success and failure (Kim *et al.*, 2009). In fact, failure experience may be more valuable to learning than success experience because failures motivate firms to act and think in new ways (Kim and Miner, 2007; Madsen and Desai, 2010; Sitkin, 1992). In line with this understanding, researchers have studied the learning of firms from various failure events, such as near-failure events in the banking industry (Kim and Miner, 2007) and failures such as product recalls in the automobile industry (Haunschild and Rhee, 2004). This literature suggests that prior recall experience propels learning that might lead to a reduction in future recalls (Haunschild and Rhee, 2004; Thirumalai and Sinha, 2011). However, all firms may not learn equally because firms differ in their motivation and ability to learn (Boulding and Staelin, 1995; Cyert and March, 1963).

With increasing recalls, firms experience an increase in direct costs, which affect the cash flow and profitability of the firm. This, in turn, affects the ability of the firm to provide higher order remedies in subsequent recalls (such as a refund where there is a loss of sales revenue as opposed to only direct costs for the replaced product in the case of exchange-based remedies, or even lower costs in the case of repair-based remedies). Repeated recalls also signal inherent quality process problems to stakeholders which leads to indirect costs such as loss of reputation and potential shareholder reactions in the case of listed firms. As such, offering higher remedies increases the accountability of the firm for the recalls. Moreover, firms that provide higher remedies may experience negative abnormal returns, because shareholders view such recalls as indications of organisational inefficiencies and impending costs to the organisation (Davidson

and Worrell, 1992; Liu *et al.*, 2017). Therefore, firms have a lower motivation to provide higher order remedies in subsequent recalls.

Lack of motivation to offer higher remedies may also be a result of defensive behavior that arises as a result of failure experiences (Baumard and Starbuck, 2005). Acting defensively leads firms to avoid decisions, such as providing higher order remedies, which would incur increased costs and signal admission of responsibility for product recalls. Even if a decision in favour of a high remedy must be made, a defensive approach will mean that those decisions are made reluctantly. As recalls are failure events, firms tend to reluctantly and defensively offer lower remedies, rather than willingly and proactively offer higher remedies (Siomkos and Kurzbard, 1994). Further, firms with previous recall experiences would have incurred expenses to implement the remedies that they had offered in the past. Such historical expenses would have directly affected the cash flow and earnings of the firm, thus leading to resource-constraints, which may reduce their ability to offer higher order remedies (Eilert *et al.*, 2013).

In sum, firms who have issued several recalls in the past are likely to be resource-constrained due to decreased cash flows and increased shareholder wrath. Also, as recalls are failure events, firms may act defensively and offer lower remedies in a reluctant manner. Therefore, we hypothesize:

- H1.* In the event of a product recall, firms with higher recall experience have a higher probability of offering lower order remedies.

3.2 Type of Firm and Recall Remedy

In the product-returns literature, recalls fall into the category of “commercial returns,” wherein firms recall products due to defects that pose a safety hazard (Hora *et al.*, 2011). Further, product recalls make up an inevitable part of the transactions that occur between firms and their

end-consumers (Petersen and Kumar, 2009), and in view of this reality, supply chain entities attempt to improve customer satisfaction – and, therefore, customer loyalty – through competitive product-return policies (Cohen and Whang, 1997).

In the supply chain of consumer goods, brands may not only be owned by companies (ones who focus on design, development, production, and marketing) but also by intermediaries such as retailers and distributors (Hora *et al.*, 2011). For example, large retailers such as Walmart sell a variety of consumer goods with their own private labels (Narasimhan and Wilcox, 1998). Product recalls can be issued by any of these entities. While firms classified as companies issue recalls since they own the product brand, intermediaries also issue recalls as they would have sourced the product made by smaller manufacturers and supplied through private labels. Both these types of entities will have different levels of motivation to offer remedies to consumers in the event of a product recall.

Firms classified as companies are the ones who focus on design, development, production, and marketing and are considered farther away from the customer than are retailers and distributors (Hora *et al.*, 2011; Ni and Huang, 2017). Retailer/distributors also serve as the intermediaries between consumers and companies, and in this position, they perform an important advisory function for their consumers on a local basis (Standop and Grunwald, 2009). In terms of personal interaction, compared to companies, the intermediaries' position in the supply chain enables them to inform and advise consumers about a given product's characteristics and its potential applications, operations, and maintenance (Moreau *et al.*, 2001). These informational exchanges create trust between the intermediary and the consumer and, as a result, consumers prefer to interact with the intermediaries not only to obtain immediate feedback on the product failure but also as a way to maximize their chances of influencing the

outcome in the event of a complaint (Standop and Grunwald, 2009). Folkes and Keisler (1991) note that consumers “often do not have the motivation or ability to collect information” about causes of product failure and therefore will base their causal attributions on the simple rules of salience or primacy; that is, the consumer will attribute the cause of the failure to the closest entity: the retailer/distributor (Kelley and Michela, 1980).

The reputations of the retailer, distributor, and company may also play an influential role in the customer’s evaluation of product quality. For example, research has shown that a company’s reputation depends far more on the product than it does for the intermediaries whose reputation depends on service provided to consumers (Dawar and Parker, 1994). In the product supply chain, the retailers, who are situated closest to the consumers, sell a variety of products, some as private labels and some directly from the manufacturer (Narasimhan and Wilcox, 1998). While the intermediary’s reputation encompasses the sum total of its product range, which may feature many different manufacturers and retail brands, the company’s reputation can stand or fall by a few products or even by just one.

Studies by Grewal *et al.*, (1998) and Rao and Monroe (1989) show that the intermediary’s reputation exerts a stronger influence over the consumer’s perception and evaluation of quality. These intermediaries, therefore, are expected to protect their reputations by offering better recall remedies compared to companies. Further, from an ability point of view, fear of responsibility for the crisis in the case of intermediaries may remain weak, since these members of the supply chain can always pass the responsibility to the companies who made the product. Product liability studies have also shown that retailers can pass on the entire recall-related cost to the supplier of the product (Noggle and Palmer, 2005). Further, as intermediaries deal with a range of products, they will have an ability to spread across them the recall costs due to a high remedy.

In sum, companies (upstream firms or those firms farther away from the consumers) rely on the reputation of the fewer products they market, which limits their ability to incur high remedy costs and influences firms' willingness to admit responsibility for the recall by offering a high remedy. In contrast, intermediaries rely on the reputation of their service to customers via various products, which increases their ability to offer high remedy because they can pass the recall costs to the original manufacturers as well as spread recall costs across a large number of products. Hence, we hypothesize:

H2: In the event of a product recall, companies (upstream firms) have a higher probability of offering lower order remedies to consumers than intermediaries (retailers and distributors).

3.3 Recall Severity and Remedy

Severity of a recall crisis is the extent of harm or injury caused to the consumer by the defective or hazardous product being recalled (Vassilikopoulou *et al.*, 2009). Severity of recalls can range from low to high, and each industry uses specific criteria to classify recalls according to the degree of severity, such as the number of injuries and deaths due to the product. Notwithstanding the criteria used, less severe recalls may not be seen as failures; rather, they might be interpreted as opportunities to enhance firm reputation or to demonstrate to customers that the firm cares about them and about the quality of its products. Research suggests that minor failures provide opportunities for firms to demonstrate that they are in control of the situation (Salancik and Meindl, 1984). For example, Saturn turned a minor safety problem with a seat recliner into an opportunity by promptly replacing the defective seats and later using the positive experience in an advertisement (Smith *et al.*, 1996).

In contrast, serious safety recalls (i.e., those associated with injuries and deaths) produce no such positive value for firms but produce negative outcomes instead. Research has shown that

severe recalls negatively influence customer perceptions and attitudes (Mowen *et al.*, 1981; Vassilikopoulou *et al.*, 2009) and adversely affect the sales of the recalled automobile models (Crafton *et al.*, 1981; Reilly and Hoffer, 1983; Hartman, 1987). In the case of the toy industry, the customers (typically parents) are adults and toy consumers are children, and while children want toys for fun, parents are more concerned about the safety aspects of toys (Ni *et al.*, 2016). Further, toys are also high in credence qualities (Darby and Karni, 1973) and therefore parents experience uncertainty in the safety features of the products (Ni *et al.*, 2016). In view of the importance of experience and credence qualities of such products, these customers are subject to information asymmetry about their safety attributes (Hartman, 1987). Severity of hazard decreases the confidence in the products and elicits quality concerns in customers. Also, severity would serve as a signal to other key stakeholders such as suppliers and investors, as potential cash flow concerns to the former and potential damage to future earnings to the latter (Cheah *et al.*, 2007; Govindaraj *et al.*, 2004).

In cases of high-severity hazards, customers attribute increased blame to the firms (Laufer *et al.*, 2005). Researchers studying recalls in the food industry found that severe recalls resulted in negative stakeholder reaction, but no such evidence was found when recalls involved less severe hazards (Pruitt *et al.*, 1986; Thomsen and McKenzie, 2001). Firms may, therefore, offer lower remedies in the event of a severe recall, to avoid signalling admission of a serious failure in their company's systems, which could trigger a backlash in consumer reactions. Such information symmetry about the severity of the crisis also induces unfavourable reactions from the firm's business collaborators (Liu *et al.*, 2016). Higher order remedies can be interpreted to mean that the crisis is severe, and the firm is making desperate efforts to appeal to consumers (Chen *et al.*, 2009). Suppliers to the firm, for example, could tighten their payment terms with

the firm (Liu *et al.*, 2016). Therefore, firms are less motivated and hesitant to readily offer higher remedies while issuing a severe recall.

In sum, unlike low-severity recalls, high-severity recalls lead to negative stakeholder reactions. As remedies act as signals to stakeholders about the extent of responsibility for the problem admitted by the firm, and impending financial costs, firms are less motivated to offer higher remedies for high-severity recalls. Hence, we hypothesize:

- H3.* In the event of a product recall, higher the severity of the product hazard lower is the probability of firms offering higher order remedies.

3.4 Moderating effect of Recall Severity.

As discussed in the previous sections, firms highly experienced in recalls tend to offer lower remedies in the event of a recall crisis, because of the lower motivation and ability to do so. Firms are hesitant to offer higher remedies when the recall is severe, to avoid accepting responsibility for the crisis, and to avoid signalling impending financial costs. In this section, we suggest that firms with high experience and upstream firms (companies as opposed to intermediaries) offer lower remedies for high-severity recalls than they would offer for low-severity recalls.

Previous research has shown that stakeholders tend to penalize firms when the recalls are issued voluntarily, the recalls involve severe product hazards, and when firms provide high remedies such as replacement of the products (Zhao *et al.*, 2014). This is because such recalls deliver a signal that the problem is systemic and within the firm, and the firm through higher remedies signals accountability for the crisis. In the case of less severe recalls, firms may be motivated to offer higher remedies for the following reasons. One is to signal to stakeholders that the problem is under control. Second, the chances of the customer going away from the firm

(loss of revenue) may be low since the hazard is not severe. In the case of low-severity recalls therefore, firms may adopt impression-management techniques to present themselves in a good light to stakeholders, by accepting responsibility and offering higher remedies as a way to demonstrate managerial control over the crisis situation (Elsbach and Sutton, 1992; Rhee and Valdez, 2009; Noack *et al.*, 2017).

Further, firms classified as companies or upstream entities (compared to intermediaries) are perceived to be having control over more aspects of the value chain, i.e., product development, design, and manufacturing, and therefore a product failure signals direct responsibility in the case of severe recalls. Such entities could, therefore, be less motivated to offer higher remedies. Intermediaries, on the other hand, can pass on the costs of higher remedies to upstream firms, notwithstanding the fact that they have other brands and products to fall back upon for loss of revenue. Accordingly, we hypothesize:

H4a. Recall severity negatively moderates the relationship between recall experience and recall remedies offered, such that firms with high experience offer lower order remedies for high-severity recalls than for low-severity recalls.

H4b. Recall severity negatively moderates the relationship between type of firm and recall remedy, such that companies (vs. retailers/distributors) offer lower order remedies for high-severity recalls than they do for low-severity recalls.

4. Methodology

4.1 Study Setting, Sample, and Data

The U.S. toy industry provided the research setting for this study. Our sample included all firms that issued at least one product recall between 1988 and 2011. We collected recall data from the website of the U.S. Consumer Product Safety Commission (CPSC). The CPSC recall notices contained the following information: 1) Name of the recalling firm, 2) Name of the recalled product, 3) Quantity and price of the recalled product, 4) Whether the recalling firm is a toy

company, distributor, or a retailer, 5) Description and type of the hazard, 6) Number of incidents reported and injuries if any, and (7) Remedy offered to consumers. We coded the recall notices to operationalise the study variables.

Our data collection initially yielded 1050 recalls for the period 1988 to 2011 that we had studied. Please see figure 1 for a year-wise distribution of the recalls. Of these, we omitted the recalls that did not contain the necessary information to create the study variables, such as type of hazard, incidents reported, and details of the remedy provided. Subsequently, our final sample included 868 product recalls issued by 458 firms. Of these 868 recalls, 351 recalls were issued by firms classified as companies, 302 were issued by firms classified as distributors, and 215 recalls were issued by firms classified as retailers.

-----Please insert figure 1 about here-----

4.2 Operationalisation of Variables

4.2.1 Dependent Variable. The dependent variable, *recall remedy*, is the remedy offered to consumers of recalled products. This remedy is aimed at eliminating the hazard the product caused and this information is clearly provided as part of the recall notice. So, coding them is a relatively straight forward exercise. By reviewing the various recall notices, we categorised the remedies offered by firms into three types: 1= repair-based remedies where the product is repaired by the firm to eliminate the hazard or the customer is requested to discard the product; 2= replacement remedy where the product is exchanged for or replaced by a similar defect-free product at no extra cost; and 3= refund-based remedy where the monetary value of the product is returned to the consumer or monetary value is returned to the consumer plus an additional amount is offered by way of cash, gift card, or something similar. Recall remedy is interpreted as increasing in order, with lower values indicating lower order remedy and higher values reflecting

higher order remedies offered to consumers. The distribution of remedies in our sample was: 107 repair-based, 258 exchange-based, and 503 refund-based.

4.2.2 Independent Variables. The independent variables were operationalised as follows.

Recall Experience. Recall experience was estimated based on the number of prior cumulative recalls issued by a firm (Haunschild and Rhee, 2004). We used a rolling window of prior ten (10) years' recalls. If a firm issued multiple recalls in a year, the value was assigned to reflect the number of recalls. For example, a firm issuing 10 recalls in a given year received a value of 10 for recall experience in that year. However, in estimating cumulative experience, equal weights cannot be assigned to recalls from the distant past and recalls that occurred in recent years, since recent experience offers a more useful learning tool than distant experience. Although the rate at which experience becomes discounted over time has not been theorized, we followed prior research (Baum and Ingram, 1998; Haunschild and Rhee, 2004) and discounted the recall experience value by 10% each year and assigned it as the recall experience for subsequent years. Thus, this method used straight-line depreciation, valuing experience for year t as follows: The count of recalls issued in year $t-1$ was weighted by 10/10, those from year $t-2$ were weighted by 9/10, and so on. After applying weights, the products of the previous years were aggregated to obtain firm recall experience. As followed by previous researchers (Haunschild and Sullivan, 2002; Haunschild and Rhee, 2004), we considered in our computation all recalls dated back to the beginning of our sample. As our sample started in 1988, observations for 1989, 1990 and so on, were based on a one-year, two-year and so on, rolling windows instead of ten years.

Firm Type. We followed Hora *et al.* (2011), and coded firm type as a categorical variable indicating company, distributor, or retailer. For this, we searched various data sources to gather information and collected information about the business operations of the recalling company

from their industry codes in *Compustat*. For privately listed firms, we checked in the *Dun and Bradstreet Directory*, *Hoovers*, and the websites of the companies. Firms that design, develop, and market toys are classified as *companies* (e.g., Mattel and Hasbro). Firms like Jazzware that import toys and related products from overseas and distribute to retailers in the U.S. are classified as *distributors*. Finally, firms such as Wal-Mart that engage in retail operations are classified as *retailers*. Two research assistants blind to the hypotheses coded this data, and the inter-rater agreement obtained was 90 per cent ($Kappa = 0.83$; $p < 0.001$). For our analysis we have used companies as one category and retailers/distributors as another category in our regression analysis.

Recall Severity. We constructed a measure of recall severity using the number of incidents, injuries, and deaths experienced by consumers (Vassilikopoulou *et al.*, 2009). The number of incidents reported in the recall notices fell into four categories: no incident reported, number of incidents, number of injuries, and number of deaths. “No incident has been reported” indicated a situation in which the decision to recall was based on a potential problem with the product, but no incidents of hazard occurred (e.g., a chair can potentially collapse). “An incident” represented a case where a product defect had been detected following the occurrence of a hazardous incident (e.g., a chair collapsed), and “an injury” represented a case where a consumer was injured while using the product. “A death” represented a case that reported a fatality due to the product defect, or fatality while using the product. A recall is considered least severe when no incident has been reported in the notice, and highly severe when a death has been reported in the notice. Recalls with reported “incidents” and those with reported “injuries” fell in between these two extremes.

We created a composite measure of recall severity using the information on incidents, injuries, and deaths provided in the recall notices. In order to assign weights to the information collected from the recall notices, we adapted the Abbreviated Injury Scale (AIS), the most widely used anatomic scale for rating the severity of injuries (MacKenzie *et al.*, 1985). This scale was introduced by the Joint Committee on Injury Scaling, composed of representatives from the American Association for Automotive Medicine, Society of Automotive Engineers, and the American Medical Association. The AIS represents a numerical scale for severity, ranging from 1 (minor injury) to 6 (virtually unsurvivable, or death), with 2, 3, 4, and 5 standing for moderate, serious, severe, and critical, respectively. The composite score of recall severity was calculated as the sum of these scores, as shown in the following equation.

$$\text{Recall Severity} = \text{Number of Incidents} \times 1 + \text{Number of Injuries} \times 3.5 + \text{Number of Deaths} \times 6$$

Here, “number of incidents” from the recall notice was classified as related to minor injuries on the AIS scale, and deaths were related to the “unsurvivable” rating from the AIS scale. Since the detailed breakdown of the types of injuries was not available from the recall notices, the *injuries* scores from the recall notice were multiplied by 3.5—i.e., the average of 2, 3, 4, and 5 scores for injuries from the AIS severity scale. Thus, the final measure of recall severity stood as a composite number made up of the sum of the scores assigned to the number of incidents, the number of injuries, and the number of deaths.

4.2.3 Control Variables. Product characteristics may influence recall remedy. Firms offer low remedy when the value of the product recalled is high, so as to minimize their outlay (Liu *et al.*, 2016). We therefore controlled for both the number of units recalled, and the average selling price of the recalled product. In addition, based on extant research, we also included yearly

dummy variables to control for the yearly variations or time trend effects (Hora *et al.*, 2011; Ni and Huang, 2017).

Table 2 presents the descriptive statistics and correlations for the variables. .

-----Please insert table 2 about here -----

5. Data Analysis

Our dependent variable, recall remedy, is an ordinal variable because the outcomes could be ranked in categories, a condition that violates the assumption needed for use of linear regression models (McKelvey and Zavoina, 1975; Winship and Mare, 1984). Thus, using ordinary least squares regression with ordinal dependent measures may overestimate the regression coefficients (Long, 1997). Ordered logistic models are therefore more appropriate for ordinal dependent measures (Fullerton, 2009).

5.1 Results.

Table 3 presents the results from the ordered logit analysis. Model 1 included the set of control variables. The results showed that the likelihood of a lower level of remedy is associated with higher numbers of units recalled ($\beta = -0.22, p < 0.001$) and higher prices of products recalled ($\beta = -0.66, p < 0.001$).

In model 2, we included the three independent variables i.e. Recall Experience, Firm Type-Company, and Recall Severity. H1 suggesting that firms with higher recall experience have a higher likelihood of offering lower remedies was supported, that is recall experience was negatively associated with remedies ($\beta = -0.17, p < 0.001$). H2 stated as companies tend to offer lower remedies than intermediaries (distributors and retailers) was supported ($\beta = -0.67, p < 0.001$). H3 that posited that firms offer lower remedies for higher severity recalls was also supported ($\beta = -0.26, p < 0.001$).

In model 3, we included the interaction terms to test the moderation effect of recall severity on recall experience (H4a) and firm type (H4b) respectively. The interaction term, Recall Experience x Recall Severity was significant ($\beta = -0.08$ $p < 0.01$) supporting H4a, that is firms with high recall experience offer lower remedies for severe recalls. With ordered logit regressions, examining the coefficient of the interaction term alone is not sufficient. In other words, the marginal effect of an interaction is not simply the coefficient of their interaction (Hoetker 2007, Ai and Norton 2003). Figures 2a, 2b and 2c show these interaction effects with the moderator, recall severity, coded as low (at one standard deviation below the mean) and high (at one standard deviation above the mean). Figure 2a depicts the effect of recall severity on the association between the probability of a *repair-based* remedy and recall experience. At low levels of recall severity, the black line represents there is no significant association between probability of a *repair-based* remedy and recall experience. Conversely, at high levels of recall severity, the dashed line represents the association between probability of a *repair-based* remedy and recall experience is significant. Figure 2b plots the effect of recall severity on the association between the probability of an exchange-based remedy and recall experience and figure 2c plots the effect of recall severity on the association between the probability of a refund-based remedy and recall experience.

The interaction between recall severity and type of firm was not significant. In other words, H4b suggesting that toy companies (vs. retailers/distributors) offer lower order remedies for high-severity recalls was not supported.

-----Please insert figure 2 and table 3 about here-----

5.1.1 Robustness Tests. We conducted a number of tests to confirm the robustness of our findings by running the analyses with different operationalisations of the study variables – experience,

remedy type, and company type. In addition, we also reran the analysis by including additional control variables.

First, we examined whether our results were sensitive to the operationalisation of experience variable, by running the analysis with three alternative operationalisations. Following Liu *et al.* (2016), we operationalised experience as cumulative (i.e., without any discounting) number of recalls. Then, following Baum and Ingram, 1998; Haunschild and Sullivan, 2002) we created measures of experience with two different rates of discounting. One measure discounted the cumulative recalls by the square root of the time passed, to account for the possibility that forgetting might occur at a slower pace; the second measure discounted cumulative recalls by the square of the time passed to account for the possibility that forgetting might occur at a faster pace. Our analyses using these three different measures of experience, presented in table 4, yielded significant results in the expected direction. Using cumulative experience, our main effects are supported as shown in Model-4. Cumulative experience ($\beta = -0.07$ $p < 0.001$), type of firm ($\beta = -0.69$ $p < 0.001$) and recall severity ($\beta = -0.27$ $p < 0.001$) supported hypotheses 1 to 3. The moderation hypotheses of severity and experience was supported ($\beta = -0.03$ $p < 0.01$) and that of severity and type of company was not supported (Model 5). Using square root of experience, our main effects are supported as shown in Model-6. Square root experience ($\beta = -0.07$ $p < 0.001$), type of firm ($\beta = -0.69$ $p < 0.001$) and recall severity ($\beta = -0.27$ $p < 0.001$) supported hypotheses 1 to 3. Again, the moderation hypotheses of severity and experience was supported ($\beta = -0.03$ $p < 0.01$) and that of severity and type of company was not supported (Model 7). Finally, using squared experience, our main effects were supported as shown in Model-8. Squared experience ($\beta = -0.15$ $p < 0.001$), type of firm ($\beta = -0.64$ $p < 0.001$) and recall severity ($\beta = -0.26$ $p < 0.001$) supported hypotheses 1 to 3. Again, the moderation hypotheses of

severity and experience was supported ($\beta = -0.08$ $p < 0.01$) and that of severity and type of company was not supported (Model 9).

-----Please insert table 4 about here-----

Second, we controlled for country of manufacturing as majority of the toys sold in the US are imported from developing economies (Bapuji, 2011). While country of origin has been shown to influence consumer attributions of blame in product recall situations (Carvalho *et al.*, 2015), extant research specifically suggests that import country of origin influences recall timing decisions (Majid and Bapuji, 2018; Muralidharan *et al.*, 2015). Muralidharan *et al.* (2015) characterized institutional unfavorability of the import country and predicted timing decisions. They suggested that the more unfavourable the import country's institutions are, quicker are the defective products recalled from the market. We followed the same methodology followed by Muralidharan *et al.* (2015) to create institutional unfavorability and used it as a control. The sample set reduced to 707 recalls as some of the recall notices did not indicate country of import. Our results hold as indicated in models 10 and 11, Table 4. The main effects (model 10) pertaining to hypotheses 1, 2, and 3 of recall experience ($\beta = -0.19$ $p < 0.001$), type of firm ($\beta = -0.78$ $p < 0.001$) and recall severity ($\beta = -0.33$ $p < 0.001$) were supported. Similarly, while the interaction between recall experience ($\beta = -0.08$ $p < 0.01$) was supported, that between firm type and severity was not supported (model 11).

Third, to examine the possibility that our analysis might be influenced by the operationalisation of the dependent variable, recall remedy, we reran the analyses using a coarse-grained measure (i.e., remedy as a dichotomous variable) and a finer-grained measure (i.e., remedy as four categories). Following Davidson and Worrell (1992) and Liu *et al.* (2016), we coded recall remedy as a dummy variable: The remedies of discard, repair, and replacement of

parts were coded “0” and labelled as repair-based remedy; full replacement, refund, and refund plus bonus were coded as “1” and labelled as full remedy. Since the dependent variable in this case is binary, we ran a binary logistic regression and presented the results in table 5 as odds ratios (OR). OR values greater than 1 signal positive association and OR values less than 1 signal negative association. Results in model 12 show the main effects. Recall experience ($OR = 0.79, p < 0.001$) and severity ($OR = 0.79, p < 0.01$) were negatively associated with remedies offered and thus hypotheses 1 and 3 were supported. The interaction (as shown in model 13) of experience and severity was found negative and significant ($OR = 0.87, p < 0.01$) and supported hypothesis 4a. The main effect of the type of firm and its interaction with severity were not significant.

-----Please insert table 5 about here-----

We further ran our ordered logit regressions by including all four sub-groups of remedies: 1= *discard* (when the customer is requested to discard the product); 2= *repair* (when the product is repaired by the firm to eliminate the hazard); 3= *exchange* (when the product is exchanged by the firm for a new unit or a similar product); 4= *refund* (when the monetary value of the product is returned to the customer with or without an additional amount by way of cash, gift card, or something similar). The distribution of remedy type according to this classification was: Discard – 30; Repair – 77; Exchange – 258; Refund – 503.

Our results are shown in Table 6. Model 14 included only controls, while Model 15 included the main predictor variables. As can be seen in model 15 all the three variables were in the hypothesised direction and significant (experience $\beta = -0.12, p < 0.001$; firm type $\beta = -0.67, p < 0.001$; severity $\beta = -0.23, p < 0.001$), and thus hypotheses 1 to 3 were supported. Model 16 shows the moderation effects of severity on experience and firm type. While interaction between

firm type and severity was not significant, that between experience and severity was significant ($\beta = -0.03, p < 0.10$).

-----Please insert table 6 about here-----

Finally, we conducted additional analysis by operationalising firm type following Hora et al. (2011). We coded firm type as a categorical variable indicating company, distributor, or retailer. In order to maintain granularity for this variable and its influence we coded dummy variables for companies and distributors and ran the regressions. The results are reported in model 17 (of table 6). As expected, toy companies offered a lower remedy than retailers ($\beta = -1.09, p < 0.001$), and distributors also offered lower remedy than retailers ($\beta = -0.84, p < 0.001$).

6. Discussion

Product recalls can pose serious consequences, not only for consumers but also for the companies involved all along the affected supply chain (Bapuji, 2011). As a result of increasing globalization of supply chains and greater consumer demand for safer products, the number of product recalls have increased in recent years (Chen *et al.* 2009). Large-scale recalls such as Mattel toy recalls (2006 to 2009), Toyota recalls (2009-2011), and General Motors recalls (2014) have caught public attention and raised questions about the behavior of firms during recalls, such as time taken to recall and remedies offered. Our findings in this study shed light on recall remedy and have key implications for recall strategy, consumer welfare, and public policy.

Drawing on insights from behavioral theory of the firm, we developed and tested hypotheses that examine the effect of firm recall experience, firm type (i.e., position of the firm in the supply chain), and crisis severity on recall remedies offered by the firm. Our findings suggest that firms vary the level of remedy offered based on organisational and crisis characteristics. Specifically, we find that firms offer a lower remedy if they have high recall

experience, and also when issuing recalls that pose severe hazards. We also find that intermediary organizations such as distributors and retailers, which stand closer to the consumer in the supply chain offer higher remedies compared to companies, which stand farther away from the end consumer. Further, we also find that firms with high recall experience offer lower remedies when issuing high-severity recalls, than they do when they issue less severe recalls. Overall, our findings suggest that remedy decisions by firms are complex and nuanced, and depend on firm experience, firm type, and severity of the product-harm crisis.

Recall situations threaten firm reputation, throw product quality into question, draw management systems under scrutiny, and generate negative sentiments for the involved parties (Rhee and Haunschild, 2006; Cheah *et al.*, 2007; Rhee, 2009). As such, product recalls are situations of organisational crisis (Shrivastava *et al.*, 1988; Pearson and Clair, 1998). Firms are under stress in crisis especially when there is a conflict of interest among its various stakeholders (Snyder *et al.*, 2006) leading to multiple and often conflicting goals of market share, profitability, and brand reputation. Management of these goals during crisis is affected by the pressures that various stakeholders exert on the firm (Jamali, 2008), leading to different levels of firm motivation and ability in managing crisis processes. Appropriate communication through advertising, recalling defective products in a timely manner, offering remedies are key crisis management activities which firms conduct in a product recall management process. While scholars have addressed the first two activities, research examining the antecedents of remedies is limited. Our study addresses this gap.

Specifically, our study contributes to the literature as follows. First, despite the increase in product recalls and the importance of remedies to firm performance and consumer relations, there is limited research in this area (Etayankara and Bapuji, 2009; Liu *et al.*, 2016). In a notable

exception, Liu et al. (2016) argued that recall-remedy decisions are “influenced not only by recall and company characteristics but also by the incentives of top executives” (p. 80).

Specifically, they focused on public companies that traded on the New York Stock Exchange and studied 170 recalls that occurred over a 12-year period (1996 to 2007) and included a wide range of product categories. Our study was focused only on the toy industry, but covered a longer period (24 years), and included 868 recalls issued during that period by both public and private firms. In other words, our study builds on Liu et al., (2016) and adds momentum to this burgeoning area of research.

Second, our study advances the understanding of remedial action through a fine-grained categorisation of remedies. While Liu et al. (2016) have used a dichotomous classification of remedies, we classified remedies into three groups i.e. repair-based remedies, exchange-based remedies, and refund-based remedies. We also tested our hypotheses with recall remedy operationalised into four groups and found the results to be same. In fact, Liu et al. (2016) have suggested that their findings should be interpreted within the scope that they viewed remedies as dichotomous and recommended future researchers to tease out more subtle differences between the subcategories of remedies. By offering a finer-grained classification of remedies, our study responds to the call made by Liu et al. (2016).

Third, although results from our study are consistent with the findings of Liu et al. (2016), we also advance theoretically based explanations for recall remedy decisions and offer more robust operationalisation of variables wherever possible. Specifically, Liu et al. (2016) hypothesized and found that product price has a negative relationship with remedy. We controlled for this effect by including a product term of product price and number of units recalled, to more adequately capture the outlay of a proposed recall. Liu et al. (2016) used firm

reputation and firm experience as covariates and found that they are negatively associated with recall remedy. Drawing on insights from the literature on the behavioral theory of the firm, we hypothesised the effect of recall experience and type of firm (company vs. intermediary) to be negative on recall remedies offered and found support for our arguments. It may be noted that Liu et al. (2016) predicted a positive relationship between product hazard (operationalised as risk of harm to consumers) and recall remedy. We hypothesised and found a negative relationship between recall severity (operationalised as a composite measure of incidents, injuries, and deaths occurring prior to recall) and recall remedy. Although product hazard studied by Liu et al. (2016) and recall severity that we studied might appear to be similar, they are distinct constructs that can have different effects on firm actions. While Liu et al. (2016) categorized severity into three categories based on risk of injury (1= minimum risk of injury; 2= medium level of risk, and 3= highest likelihood of death or grievous injury), we developed a composite variable of crisis severity, which assigned different weights to deaths, injuries, and minor incidents (higher weights to deaths compared to injuries, and a higher weight to injuries compared to minor incidents). Further, a firm perceiving a high risk of harm to consumers may offer a high remedy to retrieve product from the hands of consumers, and thus avoid liability and litigation. In contrast, a firm that has already witnessed a materialised risk might offer a lower remedy to avoid admission of guilt, and thus pre-empt litigation. In short, our study complements Liu et al. (2016) and advances research on recall remedies in important directions.

Fourth, our study adds to growing literature that examines antecedents of firm decisions during the recall process. Extant research has provided valuable insights on the consequences of recalls and the influence of recall strategies on such consequences (e.g. as per table 1). However, very few studies have examined the antecedents of recall process decisions, such as time to recall

(Eilert *et al.*, 2017; Hora *et al.*, 2011; Majid and Bapuji, 2018; Muralidharan *et al.*, 2015; Ni and Huang, 2017) and recall remedy (Liu *et al.*, 2016). Recall process decisions have considerable financial implications for firms; Full refund may prove to be more expensive for firms than replacement or repairs. However, more importantly, recall process decisions affect the recovery of products from consumers and elimination of product hazard. If an appropriate remedy is not offered to consumers, they might not return the product. Consequently, the hazard exists in the marketplace and the product might hurt some consumers at a future date. Therefore, examination of recall process decisions is important to aid in an effective recovery of hazardous products.

Our study on how recall remedies vary based on firm recall experience, firm type, and recall severity also offers important managerial implications. It revealed that having high recall experience and being positioned in the upstream of the supply chain influences firms to offer lower remedies. This appears to arise out of reduced resource availability and also out of acting defensively due to failure experience. Our study also showed that fearing the wrath of consumers and other stakeholders, firms offer a low remedy in case of severe recalls to signal control over the problem. However, providing a high remedy is necessary to regain consumer trust and also to recover the hazardous products from the marketplace. Therefore, managers can focus more on the larger picture and take a longer time horizon in making recall remedy decisions. Such an approach helps them to provide a higher remedy to consumers. Further, managers can devise appropriate communication strategies to explain the rationale for their decisions to shareholders, to minimize their concerns about impending financial costs and potential systemic issues with organisational practices (Chen *et al.*, 2009).

Our findings can also inform consumer product safety policy and regulations. The regulators impose fines for delaying recalls. For example, Toyota was fined 17.35 million dollars

for delaying a floor mat recall (Koyitty, 2012). However, such penalties do not exist for offering a lower remedy. As mentioned earlier legal obligation for a firm during product recalls is to only ensure that these defective products are either withdrawn from the market or either repaired or disposed of appropriately. However, the level of remedy offered is an important predictor of effective recovery of products. Our findings can also inform consumer-safety regulators through appropriate policy and regulations, who can be extra vigilant on severe recalls issued by firms with high recall experience, and those specifically by upstream firms. Specifically, the regulators can encourage these firms to offer higher remedies to facilitate effective recovery of hazardous products. Further, regulators can make provisions to impose penalties for low remedies and low recovery rates so that firms take the due care needed to recover the recalled products from consumers.

6.1 Limitations and future research directions

Our study has the following limitations, which can also serve as avenues for future research inquiry. First, we focused specifically on consumer products in the toy industry, in which the products are generally less complex and inexpensive, compared to products in other industries, such as consumer durables, automobiles, and electronics. Product characteristics, such as the complexity of the product, may play an important role in a firm's decision-making process with regard to the remedy it can provide for the recalled items. Complexity may also determine the extent to which consumers actually care about the remedy they receive. For example, a consumer may be more concerned about receiving an appropriate remedy for a defective automobile than for a defective toy. Although we have controlled for price, which can serve as an indicator of product complexity, the findings of our study are not readily generalizable to other industries involving more complex products. Further, unlike large products like cars, the logistics costs of

providing a repair (low remedy) might involve a higher outlay than simply offering a replacement or a refund (high remedy). Further, toy companies face more pressure from stakeholders because of the involvement of children, thus they offer more remedy than they might for other products. It is not clear how these peculiarities of the toy industry might have affected our findings. Therefore, by studying recall remedy in other industry settings, future researchers can build on our study to address how product characteristics, logistics costs, and stakeholder pressures affect remedy offered by firms.

Second, product recalls as a crisis phenomenon can also be examined from a short-term versus a long-term perspective in crisis decision-making. Our arguments to develop the hypotheses can be inferred to reflect a short-term perspective, wherein profitability concerns could drive the remedy offered. However, managers may also adopt a long-term perspective and consider the concerns of all stakeholders—particularly those of consumers—when making remedy decisions. Future research may consider verifying the differentiated pressures from various stakeholders and their salience on firms' decisions on recall remedies. Crisis-management decisions can enhance relationships with key stakeholders, such as customers, employees, suppliers, and communities, which could ultimately lead to increased profitability (Hillman and Keim, 2001). Therefore, future research could integrate concerns of consumers and other stakeholders into the firm's decision-making process, with respect to recall process decisions, particularly remedies offered. By conducting longitudinal studies and using managerial surveys or case studies of firms that have experienced recalls, future studies can offer insights into the mechanisms that govern managerial decision-making during crisis situations such as product recalls, especially from a long-term perspective.

Third, reputation stands out as “arguably the single most valued organizational asset” (Gibson *et al.*, 2006, p. 15), but we have not considered it in our theorisation and empirical examination given the nature of firms in the toy industry, i.e., very few large and public firms and many small and private firms. Highly reputable firms attract more media attention, and therefore may defend their reputations by providing high compensation for mitigating the damage caused by the recall crisis. Rhee (2009) studied whether good or poor reputation reduces subsequent product recalls of a firm and suggested that a decrease in subsequent recalls is associated with the firm’s motivational-learning process. Reputation, therefore, constitutes an important organisational characteristic that can be examined for its effect on the remedies offered by firms. Similarly, mergers and acquisitions (M&As) within the industry and across industries can bring accumulated experience that can influence crisis management decisions. Future research can develop more granular measures of recall experience that incorporate experience of crisis management gained through M&As in predicting recall management decisions.

Fourth, the role of external agencies deserves consideration, in terms of their effect on the crisis decision-making processes of the recalling firms. Existing research has established that external agencies, such as the media and various regulatory bodies, play important roles in the success of firms’ crisis-management initiatives (Siomkos, 1989). In order to develop a better understanding of the mechanisms that lead to crisis-remedy decisions, future research should take into consideration the influence of such agencies and their effect on remedies offered by firms to affected consumers.

6.2 Conclusion

This article examined how organisational and crisis factors influence firm decisions regarding the remedies offered to customers in the event of a product recall. While firms need to ensure

customer protection and win customer loyalty, they also are subjected to direct and indirect costs associated with providing remedies. Higher order remedies, while would increase the direct costs of the recall, would also signal that the firm accepts responsibility for the recall. This act of acceptance may signal systemic production problems with the firm and may lead to undesirable consequences, such as lawsuits and product-liability cases. These events may prove to be very expensive for the firm, in view of the negative stakeholder reactions. The article shows that remedies offered by a firm in a product recall crisis may vary, depending on recall experience of the firm, its position in the supply chain, and crisis severity, and thereby explains why firms behave differently in recall-crisis situations.

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Table 1: Summary of Research on Product Recalls

Authors	Outcome Studied	Predictor / Context
Consequences of recalls - Consumer related		
Archer & Wesolowsky, 1996	Customer Behavior	Product-harm crisis
Ahluwalia et al., 2000	Consumer Behavior and Sales	Negative Information through product crisis
Dawar & Pillutla, 2000	Brand-Equity	Firm Response in product-harm crisis
Klein & Dawar, 2004	Consumer Attributions	CSR initiatives of firm in harm crisis
Van Heerde et al., 2007	Sales and Marketing effectiveness	Product-harm crisis
Cleeren et al. 2008	Consumer Behavior and Sales	Advertising in harm crisis context
Rubel et al. 2011	Consumer Behavior and Sales	Advertising in harm crisis context
Zhao et al., 2011	Consumer Behavior and Sales	Quality signals from harm crisis context
Cleeren et al., 2013	Consumer Behavior	Post crisis advertising
Germann et al., 2014	Consumer Behavior	Recalls and brand commitment
Liu & Shankar, 2015	Consumer Behavior	Brand preference and advertising effectiveness
Borah & Tellis, 2016	Consumer Spillover Effects	Online chatter about recalls
Consequences of recalls - Shareholder related		
Jarrel & Peltzman, 1985	Stock Market Reactions	Recall announcements
Pruitt & Peterson, 1986	Stock Market Reactions	Recall announcements
Bromiley & Marcus, 1989	Stock Market Reactions	Recall announcements
Davidson & Worrel, 1992	Stock Market Reactions	Recall announcements & remedies offered
Rhee & Hanuschild, 2006	Stock Market Reactions	Recall announcements & reputation
Cheah et al., 2007	Stock Market Reactions	Recall announcements, severity, CSR
Chen et al., 2009	Stock Market Reactions	Recall strategy (reactive vs. proactive strategy)
Thirumalai & Sinha, 2011	Stock Market Reactions	Recall announcements & firm characteristics
Ni et al., 2016	Stock Market Reactions	Recalls, firm type and crisis characteristics
Liu et al., 2017	Stock Market Reactions	Recalls, remedial completion rate , advertising
Wood et al., 2017	Stock Market Reactions	Slack, diversification, & time to recall
Noack et al., 2017	Stock Market Reactions	Recall announcements, CSR
Eilert et al., 2017	Stock Market Reactions	Time to Recall
Antecedents of recalls		
Haunschild & Rhee, 2002	Future Accidents	Learning from accidents, errors.
Haunschild & Rhee, 2004	Future Recalls	Recalls-Voluntary & Involuntary
Thirumalai & Sinha, 2011	Future Recalls	R&D focus and recall experience
Kalaighnam et al., 2013	Reliability and Future recalls	Recall magnitude
Kashmiri & Brower, 2016	Recalls	Governance & top management
Shah et al., 2016	Manufacturing Recalls	Operational parameters
Recall Processes		
Hora et al. 2011	Time to recall	Design, supply chain position, recall strategy
Muralidharan et al., 2015	Time to recall	Country of import
Eilert et al., 2017	Time to recall	Severity and brand characteristics
Ni & Huang, 2017	Time to recall	External, suppliers, design, models, experience
Majid & Bapuji, 2018	Time to recall	Country of import
Liu et al., 2016	Remedial Choices	Product hazard, remedy cost, CEO incentives

Table 2: Descriptive Statistics and Correlations

	Mean	S. D.	1	2	3	4	5	6	7	8
1 Remedy			1							
2 Quantity ^a	9.78	2.21	-.228**	1						
3 Price ^a	2.40	1.18	-.372**	0.004	1					
4 Severity ^a	0.87	1.44	-.411**	.452**	.394**	1				
5 Experience	0.96	2.09	-.270**	.200**	.082*	.195**	1			
6 Firm Type ^{Com}	0.40	0.49	-.344**	.241**	.427**	.393**	.226**	1		
7 Firm Type ^{Dis}	0.35	0.48	.183**	-.107**	-.387**	-.255**	-.220**	-.602**	1	
8 Firm Type ^{Ret}	0.25	0.43	.189**	-.156**	-0.059	-.166**	-0.014	-.473**	-.419**	1

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

^a Variable has been log transformed

Table 3: Results from Ordered Logistic Regression for Recall Remedy

Variables	Model-1	Model-2	Model-3
N	868	868	868
No of Units ^a	-0.22 ^{***} (0.03)	-0.07 [!] (0.04)	-0.09 [*] (0.04)
Average Price ^a	-0.66 ^{***} (0.07)	-0.45 ^{***} (0.08)	-0.46 ^{***} (0.08)
Recall Experience (H1)		-0.17 ^{***} (0.04)	-0.06 (0.05)
Firm Type-Company (H2)		-0.67 ^{***} (0.18)	-0.74 ^{***} (0.21)
Recall Severity ^a (H3)		-0.26 ^{***} (0.06)	-0.23 [*] (0.11)
Recall Experience x Recall Severity (H4a)			-0.08 ^{**} (0.03)
Firm Type x Recall Severity (H4b)			0.10 (0.12)
Log Likelihood	-678.35	-642.70	-637.51
LR Chi ²	266.18	337.48	347.86
Prob > Chi ²	0.00	0.00	0.00
Pseudo R ²	0.1640	0.2080	0.2143

a) Note: Standard Errors in Parentheses

b) Dependent Variable = Recall Remedy as ordinal variable with three groups

c) Firm Type is dummy coded

d) ^aVariable transformed using natural log transformation

e) Yearly dummies are included in all models

[!]p<0.10; *p<0.05; **p<0.01; ***p<0.001

Table 4: Robustness checks with additional operationalisations of experience and inclusion of institutional unfavorability control variable – Ordered Logistic Regression

Variables	^b Model-4	^b Model-5	^c Model-6	^c Model-7	^d Model-8	^d Model-9	^e Model-10	^e Model-11
	^b Experience-Cumulative				^d Experience-Squared		^e With Institutional Unfavorability as control	
	^c Experience-Square root							
N	868	868	868	868	868	868	707	707
No of Units ^a	-0.07 [†] (0.04)	-0.08* (0.04)	-0.07 [†] (0.04)	-0.08* (0.04)	-0.07 [†] (0.04)	-0.08* (0.04)	-0.02 (0.04)	-0.03 (0.04)
Average Price ^a	-0.43*** (0.08)	-0.45*** (0.08)	-0.43*** (0.08)	-0.45*** (0.08)	-0.45*** (0.08)	-0.46*** (0.08)	-0.34*** (0.09)	-0.32*** (0.09)
Institutional Unfavorability							0.01 (0.21)	0.01 (0.21)
Recall Experience (H1)	-0.07*** (0.02)	-0.03 (0.02)	-0.07*** (0.02)	-0.03 (0.02)	-0.15*** (0.03)	-0.06 (0.04)	-0.19*** (0.04)	-0.08 (0.05)
Firm Type-Company (H2)	-0.69*** (0.17)	-0.75*** (0.21)	-0.69*** (0.17)	-0.75*** (0.21)	-0.64*** (0.18)	-0.73*** (0.21)	-0.78** (0.21)	-0.85*** (0.24)
Recall Severity ^a (H3)	-0.27*** (0.06)	-0.24* (0.11)	-0.27*** (0.06)	-0.24* (0.11)	-0.26*** (0.06)	-0.24* (0.11)	-0.33*** (0.07)	-0.27* (0.13)
Recall Experience x Recall Severity (H4a)		-0.03** (0.01)		-0.03** (0.01)		-0.07** (0.02)		-0.08** (0.03)
Firm Type x Recall Severity (H4b)		0.09 (0.12)		0.09 (0.12)		0.11 (0.12)		0.09 (0.14)
Log Likelihood	-642.92	-638.84	-642.77	-638.74	-640.65	-635.61	-485.27	-480.90
LR Chi ²	337.05	345.19	337.33	345.40	341.57	351.65	305.00	313.76
Prob > Chi ²	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pseudo R ²	0.2077	0.2127	0.2079	0.2128	0.2105	0.2167	0.2391	0.2460

Notes:

Standard Errors in Parentheses

Dependent Variable= Recall Remedy as ordinal variable with three groups

Firm Type is dummy coded

^aVariable transformed using natural log transformation

^bExperience is cumulative previous recalls as per Liu et al., 2016

^cExperience is by discounting cumulative previous recalls by square root of the time passed (Haunschild & Sullivan, 2002)

^dExperience is by discounting cumulative previous recalls by square of the time passed (Haunschild and Sullivan, 2002)

^eModel has institutional unfavorability as control. Experience variable here is as per main models (Models 1, 2, and 3).

i) Yearly dummies are included in all models

[†]p<0.10; *p<0.05; **p<0.01; ***p<0.001

Table 5: Robustness checks with recall remedy as a binary variable – Logistic Regression^f

Variables	Model-12^g	Model-13^g
N	808	808
No of Units ^a	0.87* (0.06)	0.85* (0.06)
Average Price ^a	0.64*** (0.08)	0.61*** (0.08)
Recall Experience (H1)	0.79*** (0.04)	0.98 (0.08)
Firm Type-Company (H2)	1.30 (0.38)	1.54 (0.57)
Recall Severity ^a (H3)	0.79** (0.07)	1.00 (0.17)
Recall Experience x Recall Severity (H4a)		0.87** (0.04)
Firm Type x Recall Severity (H4b)		0.94 (0.17)
Log Likelihood	-250.71	-243.06
LR Chi ²	130.39	145.69
Prob > Chi ²	0.00	0.00
Pseudo R ²	0.2064	0.2306

Notes:

Standard Errors in Parentheses

Dependent Variable= Recall Remedy as binary variables (0 or 1)

Firm Type is dummy coded

^aVariable transformed using natural log transformation

^fParameters represent odds ratio (OR). OR values greater than 1 signal positive association. OR values smaller than 1 signal negative association.

^gCategorical variable as per Liu et al., 2016

Yearly dummies are included in all models

!p<0.10; *p<0.05; **p<0.01; ***p<0.001

Table 6: Robustness checks with operationalisation of remedy into four categories and firm type into three categories – Ordered Logistic Regression

Variables	^h Model-14	^h Model-15	^h Model-16	ⁱ Model-17
N	868	868	868	868
No of Units ^a	0.21*** (0.03)	-0.08* (0.04)	-0.09* (0.04)	-0.07! (0.04)
Average Price ^a	-0.63*** (0.07)	-0.42*** (0.08)	-0.42*** (0.08)	-0.49*** (0.08)
Recall Experience (H1)		-0.12*** (0.03)	-0.06 (0.05)	-0.19*** (0.04)
Firm Type-Company ^j (H2)		-0.67*** (0.17)	-0.81*** (0.21)	-1.09*** (0.22)
Firm Type-Distributor ^j (H2)				-0.84*** (0.24)
Recall Severity ^a (H3)		-0.23*** (0.06)	-0.29* (0.11)	-0.26* (0.06)
Recall Experience x Recall Severity (H4a)			-0.03! (0.02)	
Firm Type x Recall Severity (H4b)			0.15 (0.12)	
Log Likelihood	-746.32	-717.27	-715.43	-636.15
LR Chi ²	257.21	315.31	318.99	350.58
Prob > Chi ²	0.00	0.00	0.00	0.00
Pseudo R ²	0.1470	0.1802	0.1823	0.2160

Notes:

Standard Errors in Parameters

Dependent Variable= Recall Remedy as ordinal variable

Firm Type is dummy coded

^aVariable transformed using natural log transformation

^hModels with remedy as ordinal variable with 4 groups

ⁱModels with remedy as ordinal variable with 3 groups (as per Models 1, 2, & 3)

^jBase category – Retailer in model 17

Yearly dummies are included in all models

[!]p<0.10; *p<0.05; **p<0.01; ***p<0.001

Figure 1- Annual number of toy recalls

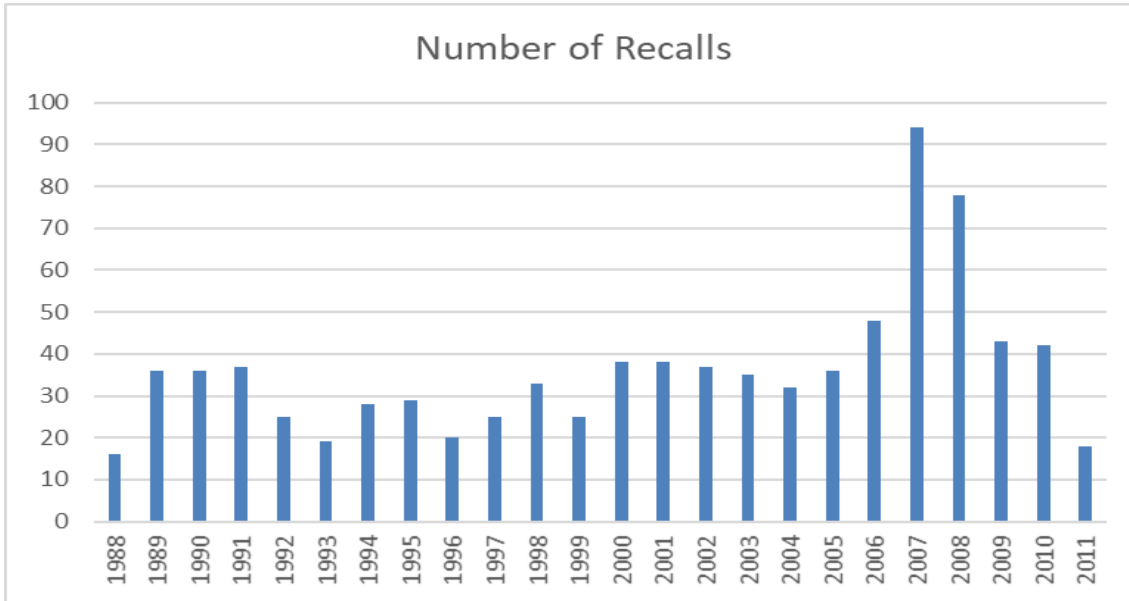


FIGURE 2a: Moderating Effect of Severity on Repair-based Remedy and Recall Experience

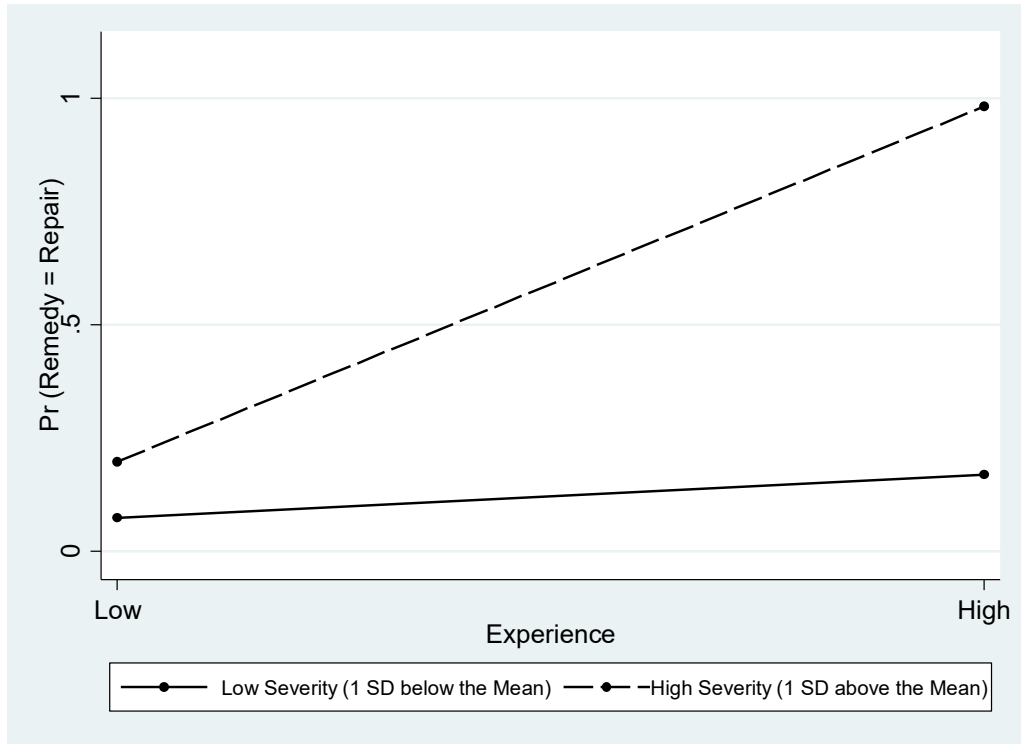


FIGURE 2b: Moderating Effect of Severity on Exchange-based Remedy and Recall Experience

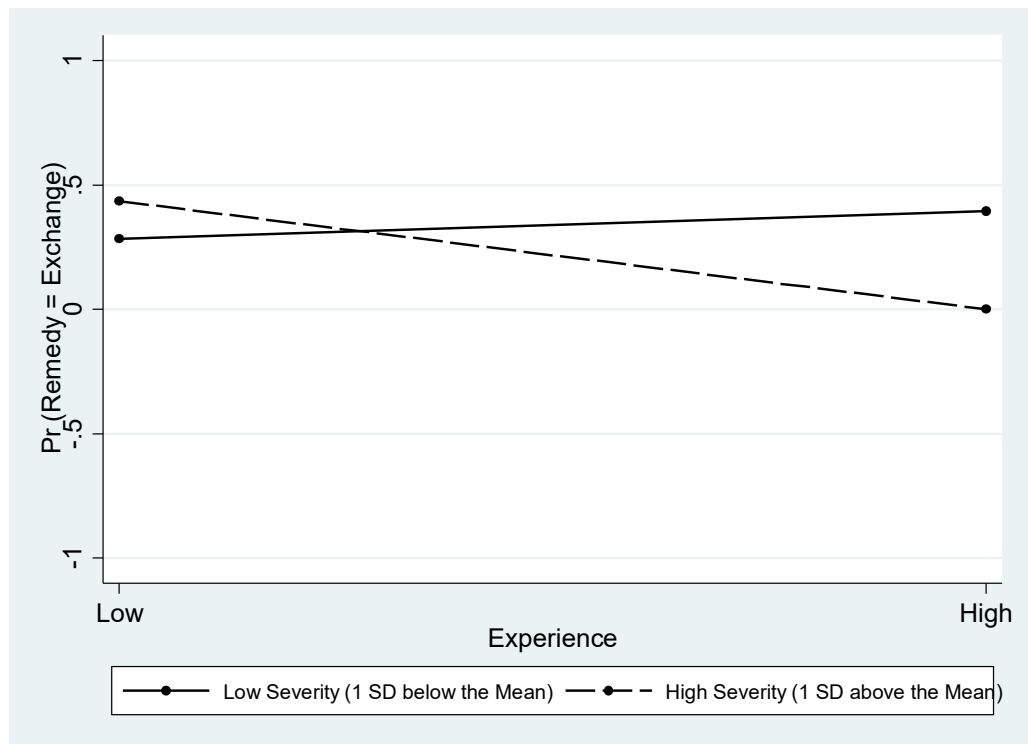


FIGURE 2c: Moderating Effect of Severity on Refund-based Remedy and Recall Experience

