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Does a Firm's Product-Recall Strategy Affect Its Financial Value? An Examination of Strategic Alternatives During Product-Harm Crises

Product-harm crises often result in product recalls, which can have a significant impact on a firm's reputation, sales, and financial value. In managing the recall process, some firms adopt a proactive strategy in responding to consumer complaints, while others are more passive. In this study, the authors examine the impact of these strategic alternatives on firm value using Consumer Product Safety Commission recalls during a 12-year period from 1996 to 2007. Using the event study method, the authors show that regardless of firm and product characteristics, proactive strategies have a more negative effect on firm value than more passive strategies. An explanation for this surprising result is that the stock market interprets proactive strategies as a signal of substantial financial losses to the firm. When a firm proactively manages a product recall, the stock market infers that the consequence of the product-harm crisis is sufficiently severe that the firm had no choice but to act swiftly to reduce potential financial losses. Therefore, firms dealing with product recalls must be sensitive to how investors might interpret a proactive strategy and be aware of its potential drawbacks.

Keywords: product recalls, firm financial value, proactive and passive strategies, firm reputation, crisis management, event study

Incidents of negative publicity are ubiquitous in the marketplace, ranging from lead paint–contaminated toys, to faulty tires, to tainted pet food, to unhygienic food products. These well-publicized incidents are referred to as "product-harm crises" (Dawar and Pillutla 2000). They occur when a firm's product fails to meet a mandatory safety standard, contains a defect that could cause substantial harm to consumers, creates an unreasonable risk of serious injury or death, or fails to comply with a voluntary standard adopted by the specific industry (Mullan 2004).

Often, the consequence of product-harm crises involves product recalls, in which the implicated firm must retrieve recalled products from all distribution channels and from the end consumers. According to the Consumer Product Safety Commission (CPSC), more than 400 consumer prod-

ucts were recalled in 2007 because of safety concerns.[1] Moreover, product recalls are likely to occur more often in the future because of increased globalization of production, greater complexity of products, greater demand by consumers for product quality and safety, and closer monitoring by both firms and government agencies (Berman 1999).

Product-harm crises in general and product recalls in particular have the potential to damage carefully developed brand equity, spoil consumers' quality perceptions, tarnish a company's reputation, and lead to revenue and market share losses (e.g., Laufer and Coombs 2006; Rhee and Haunschild 2006; Siomkos and Kurzbard 1994; Sullivan 1990; Van Heerde, Helsen, and Dekimpe 2007). In the worst case, product recalls could destroy investor confidence in the firm, which in turn leads to either a decline in the financial value of publicly traded firms or the unwillingness of investors to continue funding private firms. Thus, the fundamental sustainability of the firm may be at risk. For example, Merck's stock price plummeted from $45.07 to $33.00 in a single day on September 30, 2004, when Vioxx was recalled. Topps, one of the largest makers of frozen hamburgers in the United States, went bankrupt after it was forced to recall 21.7 million pounds of frozen hamburger on September 29, 2007.

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[1]See http://www.cpsc.gov/cpscpub/ prerel/prerel.html.

Given the increased frequency of product recalls and the potentially devastating consequences for the firms involved, managing such crises effectively has become a top priority for many firms. Previous literature has classified crisis management strategies into four distinct categories: denial, involuntary recall (or forced compliance), voluntary recall, and "super-effort" (Dawar and Pillutla 2000; Laufer and Coombs 2006). These four strategies make up the so-called company response continuum. At one extreme, firms forsake (or try to forsake) any responsibility for the defective product by denying culpability and delaying the recall process. At the other extreme, firms respond to consumer complaints early, issue speedy voluntary recalls, communicate extensively with consumers and other stakeholders, and often provide additional compensation beyond the legal requirement. Thus, a major distinction among various product-recall strategies is whether the firm acts passively and defensively or proactively and responsibly (Siomkos and Kurzbard 1994).[2] A fundamental question is whether a proactive strategy helps attenuate the effects of product recalls on firm value. The theoretical and empirical evidence for this question remains equivocal.

Only a limited number of marketing studies have investigated the impact of product-harm crisis management strategies by focusing on consumer evaluations of products and services (e.g., Ahluwalia, Burnkrant, and Unnava 2000; Dawar and Pillutla 2000). These studies provide valuable insights into how consumers perceive and respond to product-recall strategies. Most of these studies were conducted in a laboratory setting, and the broader issue of how different crisis management strategies might influence firms' financial value has not been studied. This paucity in research is glaring because there has been increased attention on understanding the linkage between firm strategies and stock market performance. Moreover, most consumer-based strategies have the ultimate goal of maximizing shareholder value. Compared with consumer-level and firm-level measures (e.g., Ramani and Kumar 2008), stock returns provide a direct assessment of stockholder value (Prince and Rubin 2002). Therefore, an examination of how product-recall strategies influence stock returns is warranted.

Several studies in economics and finance have examined the impact of product recalls on firm value for several product categories, but the results are mixed (e.g., Davidson and Worrell 1992; Hoffer, Pruitt, and Reilly 1988; Jarrell and Peltzman 1985; Thomsen and McKenzie 2001). For example, Jarrell and Peltzman (1985) find that automobile and drug recalls are associated with negative abnormal stock returns. Hoffer, Pruitt, and Reilly (1988) reexamine the same data and find that recall announcements do not significantly affect firm value after controlling for potential confounding events. Thomsen and McKenzie (2001) find significant shareholder losses when publicly traded food companies are involved in a serious food recall. Most of

these studies focus on the automobile, food, or pharmaceutical industries. One exception is the study by Davidson and Worrell (1992), who examine product recalls in multiple, nonautomobile categories. However, their sample is restricted to only recalls reported in the *Wall Street Journal*. The recall effects across a broad range of consumer products, such as toys, electronics, and household products, which have received a great amount of public attention in recent years, remain largely unexamined. More important, when examining the impact of product recalls, the extant studies have not considered the role of alternative product-recall strategies.

The focus of this article is to investigate how proactive (versus passive) recall strategies during the recall process influence stock returns. We test our theoretical prediction with data from multiple sources on recalls, firm strategies, and firm/product characteristics in different consumer product categories (e.g., toys, child products, household products, sports and recreation products, outdoor products, other specialty products). We study product recalls during a 12-year period from 1996 through 2007. We collected the recall details from the official CPSC recall announcements. The long time span enables us to have a sufficient sample even after excluding recalls for which the effects on stock returns may be contaminated by confounding events (MacKinlay 1997; McWilliams and Siegel 1997). In reality, it is difficult for researchers to directly observe and measure how firms manage product recalls. Fortunately, we were able to identify a viable measure of recall strategies (i.e., proactive versus passive strategies) from the CPSC recall announcements. We match the CPSC recalls with stock return data from the Center for Research in Security Prices at the University of Chicago, as well as the characteristics of these firms from sources such as *Fortune* magazine's annual surveys of "America's Most Admired Companies."

Our key finding is that contrary to the conventional wisdom, proactive recall strategies have a more negative effect on the firms' stock returns than passive strategies, regardless of firm and product characteristics. This finding is different from the existing literature (e.g., Dawar and Pillutla 2000; Siomkos and Kurzbard 1994), which focuses on potentially positive consequences from the consumers' perspective and indicates that when a firm is more responsive to the recall, the negative effect on brand equity, consumer perceptions, and future purchase intentions may be attenuated. In contrast, our findings indicate that investors may view proactive recall strategies differently from consumers, interpreting them as a signal of severe product hazard and financial damage (i.e., the expenses related to the recall process, potential litigation, liability, and penalty payment for damages to consumers or properties are substantial) to the firm. In turn, such perceptions will influence the firm's financial value negatively. Consistent with this explanation, we find that proactive strategies tend to be used more often by less reputable firms (which have little buffer against the negative impact of product-harm crisis) than by more reputable firms. As a result, firms need to be sensitive to how the stock market might interpret proactive strategies because there could be significant, negative repercussions in terms of stock market reactions associated with them. This

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[2]There could be other ways to categorize the product-recall strategies that firms adopt. We focus on the most commonly used typology—namely, proactive and passive strategies.

underscores the importance of linking firm strategies to financial market value when studying product recalls.

We organize the remainder of this article as follows: Next, we provide an overview of the product-recall process and discuss two strategic alternatives (proactive versus passive strategies) available to firms managing product recalls. We then discuss the theoretical background on how these strategies may influence firm financial value. Next, we present the data, the event study methodology, and the main empirical findings. We conduct a cross-sectional analysis to complement the event study and show that recall strategies are a major influencer of abnormal stock returns. This is followed by an analysis of the mediating role of recall strategies and a Heckman estimation to address the potential influence of endogeneity, which confirm the robustness of our findings. We conclude with a summary, a discussion of managerial and policy implications, and suggestions for further research.

Theoretical Background

In the United States, product safety is overseen by several federal government agencies, depending on the product category. The National Highway Traffic Safety Administration is responsible for safety issues related to motor vehicles and related equipment. The Food and Drug Administration has jurisdiction over safety recalls involving foods, drugs, medical devices, and cosmetics. The CPSC is responsible for the product safety of most "consumer products," which include household, outdoor, sports and recreation, and children's products.[3]

Managing Product Recalls: Proactive Versus Passive Strategies

The basic process that leads to a potential product recall is relatively straightforward. The recall process the CPSC uses is as follows: In the beginning, either the firm or the CPSC receives information from consumers or distribution channel members about the potential hazard of a product. Often, such information comes from consumer complaints directly to either the firm or the federal agency. For example, the CPSC receives approximately 400,000 calls annually from consumers through its 24-hour hotline (Schoem 2001). A firm has the obligation to report to CPSC within 24 hours if it receives information or evidence that "reasonably supports the conclusion" that safety issues exist (Mullan 2004). The CPSC and the firm are then involved in "risk analysis" to identify patterns or data that suggest that the product "creates a substantial product hazard." If a product is identified as potentially harmful and it is determined that a recall is in order, the firm and the CPSC can decide to issue a recall at any time. A firm can also issue a "fast-track" recall without waiting for the "risk analysis" to be completed.

In either case, the CPSC initiates an official recall announcement in a standard format jointly with the firm.

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[3]All phrases in quotation marks reflect the terminology specified by the CSPC in its recall procedures.

The firm is not allowed to provide its own news release before the CPSC announcement. Such recalls are "voluntary" recalls. In rare cases, the firm does not agree with the agency's decision that a recall is warranted. The agency then needs to decide whether to impose a mandatory (i.e., involuntary) recall. Because mandatory recalls require elaborate legal proceedings before an administrative judge, which can be lengthy and costly and involve uncertain outcomes, it is usually in the interest of the agency and the firm to cooperate in the recall process. For example, in the case of the CPSC, almost all recalls are voluntary recalls. On average, the mandatory recall process is used less than once a year (Mullan 2004). Regardless of the type of recall, the main purpose is to locate and remove all defective products as quickly as possible from consumers and channel members and to give the public accurate and understandable information about the product defect, the extent of hazard it poses, and the firm's corrective plan in a timely manner (CPSC 1999).

The recall process gives the firm the opportunity to act strategically on whether and when to cooperate with the regulatory agent to issue (or agree to issue) a recall. It can work with the agency to do so earlier in the investigation process, or it can delay to the maximum extent until there is no other choice. As we discussed previously, the literature suggests that firms differ considerably in terms of when they announce a recall and how they handle a recall incident (e.g., Dawar and Pillutla 2000; Laufer and Coombs 2006; Siomkos and Kurzbard 1994).

In line with Siomkos and Kurzbard's (1994) framework, firms' recall strategies can be categorized according to their responsiveness to the recall incident. Some firms adopt a proactive recall strategy. If the firm or the federal agency discovers a product flaw that might necessitate a potential recall, the firm adopting the proactive strategy is more likely to work with the agency and issue a voluntary recall early in the process. Such recalls often occur when the firm becomes aware of a potentially hazardous product through internal inspections and before any consumer safety incidents have been reported to the firm or agency (CPSC 1999). For example, on February 15, 2007, Fisher-Price (a division of Mattel) and the CPSC announced the recall of approximately 500,000 toys that could pose a choking hazard to young children. This proactive recall was mainly based on internal testing and was issued even though there had been no incidents or injuries reported by consumers.

In contrast, firms may adopt a passive strategy in managing product recalls. The passive approach may entail delaying the recall process and/or trying to shift the responsibility to other firms or entities. These recalls tend to be issued much later in the investigation process and usually happen after serious consumer complaints have been made to the firm or the CPSC. Unfortunately, such recalls are often issued after serious injuries and/or death to consumers. As an example, Playskool recalled approximately 255,000 of its Team Talkin' Tool Bench toys only after receiving the death reports of two toddlers (CPSC 2006).

We now turn to the conceptualization of proactive versus passive recall strategies. We also provide theoretical predictions for their impact on firm financial value.

Effects of Product-Recall Strategies on Firm Financial Value

A significant amount of information asymmetry exists between firms and the stock market (Myers and Majluf 1984). This information asymmetry is accentuated during crisis events, such as product recalls. Typically, firms involved in recalls possess more private information about the nature of the product hazard and its potential consequences than the stock market. This is due to the complexity in the production and distribution processes, the firms' proximity to consumers, and their frequent communication with regulatory agencies. In contrast, the stock market relies on a multitude of external information sources (e.g., corporate or government news releases, third-party business publications) to determine the impact of a crisis event on the firm. In addition to publicly available information, the stock market pays close attention to a firm's actions and strategies and tries to interpret these as signals of future earnings and firm value (Ross 1977). An important signal of the potential fallout from a crisis event is the type of product-recall strategy a firm adopts.

Previous research has indicated that a proactive strategy may have positive consequences on consumer perceptions. For example, consumers perceive firms that act in a socially responsible manner as being of a higher quality (Siegel and Vitaliano 2007). A more active firm response helps reduce the negative impact of product-harm crises on consumers' perceptions of the firm and their future purchase intentions (Siomkos and Kurzbard 1994). Furthermore, the negative effect on brand equity and consumer perceptions can be reduced when a firm accepts the responsibility for its product recall (e.g., Dawar and Pillutla 2000; Siomkos and Kurzbard 1994). Finally, a proactive strategy can be interpreted as an indication that the firm is trustworthy and cares about its consumers. For example, *Fortune* magazine recently selected Mattel for its 2008 list of "100 Best Companies to Work For," mainly because of Mattel's quick and responsible actions in recalling defective toys in 2007.[4] Overall, consumers tend to use a firm's recall strategy as a signal of its product and service quality and trustworthiness.

However, it is likely that the stock market and investors view the implications of a proactive product-recall strategy differently from consumers. The stock market is sensitive to news about and signals of a firm's financial prospect (Ross 1977). Although a proactive strategy may have the potential benefits of maintaining consumer confidence and instilling brand loyalty, investors tend to be more concerned about the firm's ability to maintain a healthy cash flow in the short run and how the recall event may negatively affect product sales.[5] By observing that the firm is moving quickly and early to initiate the recall and is proactively managing it, investors may speculate that the financial consequences are going to be severe and that the firm had no other choice but to act proactively to reduce the potential impact. In other words, the investors are likely to interpret proactive actions as a signal of severe financial loss, which typically includes expenses related to the recall process, potential litigation, liability, and penalty payment for damages to consumers or properties. This negative implication of proactive recalls is directly related to some aspects of investor behavior. As Benartzi and Thaler (1995) indicate, investors weigh possible losses 2.5 times more heavily than possible gains because of loss aversion (Tversky and Kahneman 1991). Sharma and Lacey (2004) examine stock market reaction to new product development outcomes and find that stock market losses from product development failures are much larger than stock market gains from product development successes. Moreover, if the implications of a crisis-related news item are ambiguous, investors often process the information as if the worst-case scenario was going to happen (Epstein and Schneider 2008). When the crisis-related news involves both positive and negative aspects, Viale (2007) indicates that the stock market will react categorically to the negative rather than the positive aspects. As a result, the stock market will be more sensitive to the negative implications of proactive recall strategies than to positive implications, such as those from the consumer perspective.

Furthermore, firms are ill-prepared to handle product-harm crises and tend to react to them passively (e.g., Dawar and Pillutla 2000; Pearson and Clair 1998). This is supported in our data, in which passive recalls are more frequently observed.[6] This implies that compared with passive strategies, proactive strategies might receive greater attention and scrutiny from the investors, resulting in more negative interpretations.

Therefore, we propose that a proactive strategy will receive greater investor attention and that the stock market will interpret it as a signal of significant financial losses. In turn, firm financial value will be affected more negatively when the recall strategy is proactive than when it is passive.

> H_1: Proactive product-recall strategies are more negatively related to the firms' financial value than passive product-recall strategies.

Data

We test the hypothesis with CPSC product recalls from January 1996 to December 2007 (see http://www.cpsc.gov/cpscpub/prerel/prerel.html). We chose the recalls issued by the CPSC for several reasons. First, the CPSC (2005) does not allow any news releases or information leaks before the recall announcement. This policy remained unchanged during the 12-year period of our study. After it is determined that a recall is to be issued, all official recall information originates from the CPSC. This feature of the recall process enabled us to accurately measure the date on which a recall announcement was made to the public. The recall and the firm's recall strategy are unanticipated events to the public

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[4]The complete list and the reference to Mattel are available at the following Web site: http://money.cnn.com/magazines/fortune/bestcompanies/2008/snapshots/70.html.

[5]Another reason the investors may take a short-term perspective is that because of investment alternatives, they can move their investment out of a firm if the cash and profitability prospects appear to be at risk. We thank the guest editor and two anonymous reviewers for helpful suggestions regarding the theoretical discussions.

[6]Among the 153 recall events studies in this article, 115 (or 75%) are passive recalls, and 38 (or 25%) are proactive recalls.

when the CPSC announces the recall. This offers an ideal setting for the event study method (MacKinlay 1997).

Second, each CPSC recall announcement specifically indicates the number of safety incidents related to the recalled products that had been reported to the firm and the CPSC by the time the recall was issued. If any, these incidents tend to be injuries, deaths, and severe property damage to the users of the products. These reports provide useful information that enables us to distinguish between proactive and passive recall strategies. If the firm and the CPSC have not received any incident report but a recall is issued, it suggests that the firm moved quickly in managing the crisis and adopted a proactive strategy. If this is not the case, it suggests that firms are relatively passive in managing the recall. Note that these incidents were reported either to the firm or to the CPSC; the general media may not be aware.

Third, among all federal agencies that regulate product recalls, the CPSC is responsible for the most diversified range of consumer products. Many of the recent large-scale product recalls have occurred for nondurable goods, such as toys and toothpaste, which fall under the regulatory authority of the CPSC. Thus, using the recall data from the CPSC helps enhance the generalizability of our findings.

Finally, the CPSC does not handle automotive-related recalls. Product recalls in the automobile industry are consistently more frequent than in other industries. For example, Davidson and Worrell (1992) report that the number of recalls from the "big three" automakers in their 20-year sample is larger than all other recalls combined. Pruitt and Peterson (1986) find that the number of automobile recalls from the three automakers is about twice as large as all other recalls combined. The inclusion of a large number of automobile product recalls may lead to significant sample bias unless the focus is on the automobile industry itself.

We collected information for product recalls that were issued for firms publicly traded on the New York Stock Exchange. We obtained the daily stock return data from the Center for Research in Security Prices at the University of Chicago. Because CPSC regulations on reporting product safety problems are different between manufacturers and retailers (Mullan 2004), we exclude all retailer recalls (e.g., Target, PetSmart) and focus only on manufacturer recalls. We obtain key firm characteristics, such as firm reputation and revenue, from the annual survey of "America's Most Admired Companies" by *Fortune* magazine (e.g., Fombrun and Shanley 1990) and from the firms' annual financial reports.

Event Study Analysis

Methodology

Event studies have traditionally been employed in the finance and accounting disciplines. MacKinlay (1997) provides a comprehensive review of the key considerations and methodological issues in event studies. In marketing, event studies have been used to examine the impact of various marketing strategies on stock returns, such as the addition of Internet distribution channels (Geyskens, Gielens, and Dekimpe 2002), celebrity endorsement (Agrawal and Kamakura 1995), brand extension announcements (Lane and Jacobson 1995), and the change of company names (Horsky and Swyngedouw 1987). The recent studies by Joshi and Hanssens (2009) and Tellis and Johnson (2007) provide useful descriptions of the key features of this methodology.

An important issue in event studies is identifying an investigation period during which there are no confounding events that could obscure the effects associated with the event under consideration (MacKinlay 1997; McWilliams and Siegel 1997). If there is uncertainty about when the event actually occurred, the researcher must use fairly long event windows. Unfortunately, a long event window increases the possibility of confounds because of a greater number of intervening events. Therefore, the literature has suggested that the event window should be set as short as possible (e.g., McWilliams and Siegel 1997). Consistent with this requirement, the CPSC data provide a unique and accurate event day, namely, the day when a recall was announced. We further exclude any recall observations for which the firm involved in a recall experienced other economically relevant events on the recall date. As per the event study literature, we located the confounding events by searching the archives and indexes of the *Wall Street Journal*, which is considered the most comprehensive news source for financially relevant events (e.g., McWilliams and Siegel 1997).

To prevent the impact of potential leakage of recall information before the event day, we follow Davidson and Worrell's (1992) suggestion and exclude recalls for which there were news reports in the *Wall Street Journal* before the recall announcement on safety issues related to the recalled product (e.g., safety incidents, product inspection). By doing so, we can uniquely examine the financial impact of unanticipated recall announcements and ensure that any differential effects between proactive and passive strategies on stock returns is not due to investors' prior knowledge about safety incidents from media reports. More important, this helps rule out the alternative explanation that the differential effect of a passive recall strategy occurs because investors might have more prior information about passive recalls (relative to proactive recalls) and are less likely to be surprised about them.

Finally, we identify and exclude recall cases in which the potential hazard is chronic and manifests over time, such as those based on concerns about lead paint. Such hazards may not induce immediately visible incidents but are harmful in the long run if left unchecked. These cases could cause ambiguity for the classification of proactive and passive recalls because the chance of incident reporting is inherently minimal.[7] For similar reasons, we also exclude the recall cases in which a firm initiated multiple recalls that included both proactive and passive recalls on the same day.

After these screening steps to ensure data quality for the even study, we obtained a final sample of 153 recalls. Among them, 38 were issued before the firm or the CPSC had received any report of safety incidents. We categorized

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[7]We thank an anonymous reviewer for pointing out this issue.

these as proactive recalls. We classified the remaining 115 recalls as passive recalls. Our sample size compares favorably with previous event studies. For example, there were 58 observations in Horsky and Swyngedouw's (1987) study, 89 in Lane and Jacobson's (1995) study, 110 in Agrawal and Kamakura's (1995) study, and 93 in Geyskens, Gielens, and Dekimpe's (2002) study. Davidson and Worrell's (1992) cross–product category study of product recalls had 133 recalls.

The "event" in our study is a product-recall announcement from the CPSC. Thus, the official announcement date by the CPSC is the event day (Day 0). The theory of stock market efficiency from the finance literature indicates that the impact of recall strategies, if any, should be detectable on the event day. As is common in event studies (MacKinlay 1997), we used a period of 250 prior trading days (i.e., Day –270 to Day –21), which is approximately one year in calendar days, as the period to estimate normal returns.[8] We estimated normal returns through the market model (MacKinlay 1997):

(1) $$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it},$$

where R_{it} and R_{mt} are the day t (t = –270, …, –21) returns of stock i (the company for which the recall was issued) and a standard market portfolio m. We used the typical market portfolio, Standard & Poor's S&P 500 index, in the estimation. We applied estimations of α and β to the event day to calculate the expected return, which we then subtracted from the actual return to obtain the abnormal return (AR):

(2) $$AR_{i0} = R_{i0} - \hat{\alpha}_i - \hat{\beta}_i R_{m0}.$$

Following the event study process (e.g., Agrawal and Kamakura 1995; Davidson and Worrell 1992; Geyskens, Gielens, and Dekimpe 2002; Lane and Jacobson 1995; MacKinlay 1997), we tested our hypothesis by examining whether the abnormal returns for proactive and passive recall strategies were significantly different from zero and whether the abnormal returns of the two strategy groups were significantly different from each other.

Results and Discussion

Table 1 presents the event study results related to the effects of proactive versus passive product-recall strategies on abnormal returns. We use multiple test statistics to examine abnormal returns for each type of recall. In addition to the common t-test, we examined Patell's (1976) test statistic (t-Patell), which is robust to potential bias caused by stocks with large standard deviations in returns, and Boehmer, Musumeci, and Poulsen's (1991) standardized cross-sectional test (t-BMP), which is robust to potential event-induced changes in variance.

As Table 1, Panel A, shows, the average abnormal return for the proactive recalls is –.59%, which is consistently significant in the common t-test, the t-Patell test, and

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[8]To reduce concerns related to potential information leakage, it is important that we specify an estimation period that ends several days before the event period. We follow this accepted practice but note that our results remain unchanged for alternative specifications of the estimation period.

TABLE 1
Impact of Product-Recall Strategies on Firm Financial Value

A: Abnormal Stock Returns (AR) for Proactive and Passive Recalls

Recall Strategy	N	AR	t-Statistic	t-Patell	t-BMP
Proactive	38	–.59%	–2.31*	–2.27*	–2.35*
Passive	115	.097%	.63	.45	.46

B: Comparison of AR Between Proactive and Passive Recalls

Two-Sample t-Test		Wilcoxon Rank-Sum Test	
AR Difference	t-Statistic	W-Score	Z-Statistic
–.69%	–2.24*	2406.00	–2.19*

*$p < .05$.

the t-BMP test. In contrast, none of the three tests are significant for the passive recalls. Therefore, significantly negative abnormal stock return is associated with proactive recalls but not with passive recalls.[9]

We further compare the abnormal returns of different recall strategies by conducting a two-sample t-test and a nonparametric Wilcoxon rank-sum test. As Table 1, Panel B, shows, proactive recalls have significantly more negative abnormal returns than passive recalls. The difference is –.69% ($p < .05$). The rank sum of the abnormal returns (the Wilcoxon score) for proactive recalls is 2406, and the distribution of abnormal returns for proactive recalls is significantly shifted to the left of the distribution for passive recalls (Z = –2.19, $p < .05$).

Overall, these results provide consistent evidence that the proactive recalls are associated with significantly more negative abnormal returns than the passive recalls. On average, the abnormal return for proactive strategies is approximately .7% lower than that for passive strategies ($p < .05$). Thus, our hypothesis is supported, suggesting that the stock market interprets a proactive product-recall strategy as a signal of severe financial losses.

In contrast to previous studies that have focused on the positive aspects of proactive recall strategies from a consumer's perspective (e.g., Dawar and Pillutla 2000; Laufer and Coombs 2006; Siomkos and Kurzbard 1994), our findings point to the potential drawback of proactive strategies by examining stock returns for a recall sample that spans a broad array of product categories. Our results indicate that in product-recall crises, though overtly socially responsible behavior by a firm may generate positive responses from

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[9]As we discussed previously, several studies examine whether product recalls have any impact on firm value for several product categories, but they report mixed findings (e.g., Davidson and Worrell 1992; Hoffer, Pruitt, and Reilly 1988; Jarrell and Peltzman 1985; Thomsen and McKenzie 2001). Our results offer a strong contribution to this literature by showing that the impact of recalls may depend on key factors, such as recall strategies, and that it is useful to differentiate product recalls accordingly.

consumers, it may be interpreted by the stock market negatively. Therefore, firms need to be sensitive to how the stock market might interpret their proactive actions.

Product-Recall Strategies as a Key Influencer of Abnormal Stock Returns

Cross-Sectional Analysis

In this section, we examine the source of abnormal returns to complement the event study and show that product-recall strategies are a significant influencer of abnormal returns. The typical approach in event studies to examine the influence of a factor is to conduct cross-sectional regression of abnormal returns against a set of explanatory variables (MacKinlay 1997). Thus, we estimate an empirical model that includes both recall strategies and important firm and product characteristics:

$$(3) \qquad AR_{i0} = \alpha_0 + \alpha_1 PROACT_i + \alpha_{2 \sim 15} X_i + \varepsilon_i,$$

where $PROACT_i$ is a binary variable that denotes whether the firm adopts a proactive recall strategy ($PROACT_i = 1$) or a passive strategy ($PROACT_i = 0$), X_i includes firm and product variables that may influence stock market reactions to the recall event, and $\alpha_{2 \sim 15}$ is the vector of coefficients to be estimated for these variables. To support the results of the event study, the parameter estimate of proactive strategies (α_1) must remain significantly negative when the set of variables (X) is included in the empirical model.

We were able to gather the following firm characteristics for the recall sample: the level of firm reputation, firm size in terms of sales revenue, the level of financial liability, and whether the recalled product used the company name in its brand or carried an individual brand name. These variables may influence abnormal returns in different ways. For example, strong firm reputation and a larger firm size may help buffer the firm from negative events, such as product recalls (Ahluwalia, Burnkrant, and Unnava 2000; Dawar and Pillutla 2000; Siomkos and Kurzbard 1994). A high level of financial liability may make the firm more susceptible to the consequences of product-harm crises. The branding strategy a firm adopts is relevant because it captures the potential spillover effect, especially if the recalled product uses the company name in its brand (Sullivan 1990).

Similar to previous measures of firm reputation (e.g., Fombrun and Shanley 1990), we assess REPUTATION with the reputation ratings data from *Fortune*'s annual survey of "America's Most Admired Companies." This survey asks executives, directors, and security analysts to rate the largest companies in their own industry. An overall reputation score is assigned to each company on the basis of how it is rated on eight attributes relative to its major competitors. Note that the reputation scores are based on firms' relative performances within their industries. Thus, REPUTATION of a firm takes the value of the standardized reputation score with respect to the means and standard deviations of the corresponding industry (Fombrun and Shanley 1990). Because the *Fortune* survey provides reputation scores for up to ten companies in each industry, we assign the industry average to companies that were not

included in the survey. We collected sales revenue (FIRMSIZE) and financial liability (LIABILITY) from the firms' annual 10-K reports for the year before the recall event, so they reflect the information that the stock market had about the firm at the time of the recall. For the same reason, we measured firm reputation for the year before the recall as well. The branding variable (BRAND) is coded as 1 if the recalled product used the company name in its brand and 0 if it used an individual brand name that is different from the company name.[10]

We obtained product characteristics from the original CPSC recall announcements. These include VOLUME (volume of the product to be recalled), SELLTIME (how long the recalled product had been sold in the market before the recall), PRICE (retail price of the recalled product), HAZARD (the level of potential product hazard [most severe injury, more severe injury, and minor injury]), and a set of product category dummies following the CPSC categorization (TOY for toy products; CHILD for nontoy children products; OUTDOOR for outdoor product, such as lawn mowers; SPORTS for sporting goods; and SPECIALTY for specialty products).[11] The omitted reference category includes household products. Finally, we include a time variable (YEARTREND) to capture possible trends of the impact of recalls on abnormal returns. YEARTREND is the number of years between 1996 (the first year of our recall sample) and the year when the recall occurred. Table 2 lists the variables and their description, and Table 3 provides descriptive statistics and the correlation matrix.

Table 4 presents the estimation results, which support our finding of the event study that proactive recall strategies are associated with more negative abnormal returns than passive strategies.[12] First, the estimation shows that a product-recall strategy is an important influencer of abnormal stock returns. Its impact is greater than any other firm or product characteristics in terms of t-statistics. Second, α_1 is significantly negative, indicating that proactive strategies have a more negative effect on firm financial value than passive strategies. Third, among independent variables, HAZARD, YEARTREND, and OUTDOOR also significantly influence abnormal returns. However, firm characteristics, such as REPUTATION, FIRMSIZE, and BRAND, do not have a significant impact.

Mediation Test of Recall Strategies

The cross-sectional analysis shows that firm characteristics, such as REPUTATION and FIRMSIZE, do not influence abnormal returns directly when we include the product-

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[10]For example, we do not categorize the Jordan Trunner cross-training shoe recalled by Nike as the family brand because its brand name does not carry the firm name Nike. However, we categorize the Nike Air Face Up basketball shoe as the family brand because it contains the firm name Nike.

[11]In coding the hazard level of each recall, we followed the CPSC guideline of categorizing hazard: Class A hazard, Class B hazard, and Class C hazard. The risk of death or grievous injury or illness ranges from likely or very likely for Class A hazard to not likely but possible for Class C hazard.

[12]We inspected the variance inflation factor for every regression reported in this article to ensure that there is no multicollinearity.

TABLE 2
List of Variables in the Analysis

Variable	Meaning
PROACT	Whether the recall strategy is proactive (1) or not (0)
REPUTATION	The level of firm reputation
FIRMSIZE	Firm size as measured by the sales revenue (in billions of U.S. dollars)
LIABILITY	The level of current liability of the recalling firm (in billions of U.S. dollars)
BRAND	Whether a recalled product used its company name in its brand name (1) or not (0)
VOLUME	The number of recalled product units sold (in millions)
SELLTIME	How long the recalled products have been sold in the market before the recall (in thousands of days)
PRICE	The (maximum) retail price of the recalled product (in thousands of U.S. dollars)
HAZARD	The level of product hazard risk (1 = high, 2 = moderate, and 3 = low)
CHILD	Whether a recalled product is in the nontoy children's product category (1) or not (0)
TOY	Whether a recalled product is in the toy product category (1) or not (0)
OUTDOOR	Whether a recalled product is in the outdoor product category (1) or not (0)
SPORTS	Whether a recalled product is in the sports/recreation product category (1) or not (0)
SPECIALTY	Whether a recalled product is in the specialty product category (1) or not (0)
YEARTREND	Number of years between 1996 and the year of the recall

recall strategy dummy. A question, then, is whether these firm characteristics influence firms' choice of product-recall strategies. If we obtain significant effects of firm characteristics on strategy choice, it would indicate that recall strategies, as a signal to the stock market, mediate the effects of firm characteristics on abnormal returns (e.g., Kenny, Kashy, and Bolger 1998; Song, Xie, and Dyer 2000).

In addition to the empirical model (Equation 3), the mediation test requires an estimation of how the firm and product characteristics influence the probability that a proactive recall strategy is adopted. In previous sections, we suggested that one reason investors react negatively to proactive recall strategies is that they infer from a proactive recall that the likely consequence of the product-harm crisis is sufficiently severe and that the firm is reacting quickly to reduce potential financial losses. Any delay in the recall would create greater financial risk in terms of recall costs, litigation costs, and payments for penalties and damages. Firm reputation is strongly correlated with product quality (Waddock and Graves 1997), and firms with a strong reputation are typically those that compare favorably with competitors on products and services (Fombrun and Shanley 1990). Because of the perception of high quality, when high-reputation firms (e.g., Toyota) are involved in product recalls, their recalls may be perceived as an occasional error or a temporary aberration. Thus, reputation can be a useful

asset for firms in buffering the negative impact of recalls—that is, the impact of recalls is lower for a firm with a strong reputation (Ahluwalia, Burnkrant, and Unnava 2000; Dawar and Pillutla 2000; Siomkos and Kurzbard 1994). As a result, proactive strategies are less useful for high-reputation firms than for low-reputation firms, and high-reputation firms are less likely to engage in proactive recalls.

Similarly, we expect that FIRMSIZE is negatively correlated with the use of proactive strategies and that BRAND and LIABILITY are positively correlated with it. First, compared with small-size firms, large firms are less sensitive to potential losses because they have more resources and a greater financial cushion. They are less likely to take preventive measures by initiating proactive recalls to reduce recall costs and lessen the risk of potential litigation and liability payments. Second, products that use a family brand name are more subjected to negative brand-image spillover than products that use different brand names (e.g., Aaker and Keller 1990; Sullivan 1990). If a firm using the company name on a product that is a potential hazard does not act quickly to initiate recalls, incidents due to the product hazard are more likely to occur, which can trigger greater public attention to and scrutiny of the firm's other products that share the same family brand name. This may lead to recalls of other products and higher litigation and liability costs. As a result, a firm with family branding is more likely to adopt a proactive recall strategy. Finally, firms with a higher level of debt are more sensitive to potential financial losses; thus, they are more likely to initiate proactive recalls to reduce recall costs and the risk of litigation.

At the product level, the volume of the recalled product (VOLUME) may affect recall strategies. From the perspective of reducing financial losses, firms are less likely to initiate a proactive recall when VOLUME is large because many product hazard investigations do not eventually result in a recall. Compared with a proactive strategy, which makes it unavoidable for the firm to pay the costs of recalling a large volume of products, delaying the potential recall might be financially worthwhile if a recall eventually does not need to be issued. In contrast, if the volume of the recalled product is small, the direct recall cost is lower than the high costs that could result from litigation and damage payments.

We estimate the following probit model as part of the mediation test:

$$(4) \qquad \Pr(PROACT_i) = \gamma' Z_i + \varepsilon_i.$$

Here, the vector Z_i includes the intercept and variables X_i, which are defined similarly to Equation 3, in which γ are the parameters to be estimated. Equations 3 and 4 constitute two essential steps in mediation tests suggested by Kenny, Kashy, and Bolger (1998).[13] By inspecting the significance

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[13]Some studies suggest a third step in the mediation test and run a regression of the abnormal returns on all control variables (e.g., Baron and Kenny 1986). However, the mediation literature has shown that this step is not required because it excludes many inconsistent mediation cases in which opposing indirect effects may cancel out the direct effects (e.g., Kenny, Kashy, and Bolger 1998; MacKinnon, Krull, and Lockwood 2000). An alternative

TABLE 3
Descriptive Statistics and Correlations (N = 153)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. PROACT	1.000														
	.														
2. REPUTATION	−.133	1.000													
	(.100)	.													
3. FIRMSIZE	−.104	.479	1.000												
	(.201)	(.000)	.												
4. LIABILITY	−.043	.461	.885	1.000											
	(.596)	(.000)	(.000)	.											
5. BRAND	−.053	.138	.101	.109	1.000										
	(.514)	(.088)	(.215)	(.179)	.										
6. VOLUME	−.171	−.096	.077	−.033	−.035	1.000									
	(.034)	(.238)	(.341)	(.686)	(.668)	.									
7. SELLTIME	−.264	−.062	.054	.057	−.043	.269	1.000								
	(.001)	(.443)	(.506)	(.487)	(.596)	(.001)	.								
8. PRICE	.015	.155	−.037	−.008	.272	−.175	−.093	1.000							
	(.853)	(.056)	(.654)	(.919)	(.001)	(.031)	(.255)	.							
9. HAZARD	.227	−.065	−.103	−.082	.021	−.049	−.166	.280	1.000						
	(.005)	(.425)	(.205)	(.313)	(.792)	(.543)	(.041)	(.000)	.						
10. CHILD	.154	.041	−.102	−.064	.044	.120	−.056	−.141	.204	1.000					
	(.057)	(.616)	(.211)	(.430)	(.588)	(.140)	(.490)	(.082)	(.011)	.					
11. TOYS	.132	−.161	−.091	−.072	−.313	.163	−.102	−.170	.102	−.084	1.000				
	(.103)	(.047)	(.261)	(.376)	(.000)	(.044)	(.209)	(.035)	(.210)	(.302)	.				
12. OUTDOOR	−.120	.111	.009	.026	.049	−.124	.112	.326	−.174	−.152	−.182	1.000			
	(.138)	(.171)	(.912)	(.747)	(.551)	(.127)	(.167)	(.000)	(.031)	(.061)	(.024)	.			
13. SPORTS	.002	.067	−.145	−.099	.253	−.115	−.115	.308	.236	−.125	−.150	−.272	1.000		
	(.982)	(.409)	(.074)	(.223)	(.002)	(.156)	(.158)	(.000)	(.003)	(.123)	(.064)	(.001)	.		
14. SPECIALTY	.095	.108	−.049	−.036	−.083	−.056	.020	−.013	.004	−.043	−.052	−.094	−.078	1.000	
	(.241)	(.185)	(.546)	(.660)	(.309)	(.488)	(.803)	(.871)	(.961)	(.595)	(.523)	(.247)	(.341)	.	
15. YEARTREND	.125	−.083	.082	.095	−.003	−.043	−.020	.129	−.048	.042	.058	−.030	−.061	−.061	1.000
	(.123)	(.306)	(.314)	(.244)	(.966)	(.595)	(.806)	(.111)	(.559)	(.610)	(.473)	(.709)	(.457)	(.453)	.
M	.250	.137	13.703	8.970	.730	.200	.821	2.837	2.240	.065	.092	.250	.180	.026	7.200
SD	.430	.666	27.225	34.342	.450	.545	1.050	5.234	.600	.250	.290	.430	.390	.160	3.210

Notes: *p*-values are in parentheses.

TABLE 4
Cross-Sectional Regression of the Abnormal Returns

Independent Variable (Parameter)	Parameter Estimates	SE
Intercept	−1.534**	.756
PROACT (α_1)	−.859**	.337
REPUTATION (α_2)	.239	.250
FIRMSIZE (α_3)	.005	.011
LIABILITY (α_4)	−.007	.009
BRAND (α_5)	−.004	.327
VOLUME (α_6)	−.237	.275
SELLTIME (α_7)	.091	.138
PRICE (α_8)	−.011	.033
HAZARD (α_9)	.522**	.257
CHILD (α_{10})	.466	.616
TOY (α_{11})	−.031	.526
OUTDOOR (α_{12})	.777**	.389
SPORTS (α_{13})	−.298	.436
SPECIALTY (α_{14})	.904	.869
YEARTREND (α_{15})	.079*	.043
R^2	.16	
Sample size	153	

*$p < .10$.
**$p < .05$.
Notes: To enhance the readability of the results, we note the dependent variable, abnormal returns, as a percentage in this analysis.

of the coefficients for the strategy dummy and the other explanatory variables in both equations, we can assess the mediation effects of recall strategies.

The probit results appear in Model 1 of Table 5. Consistent with our prior discussion, the effect of firm reputation (REPUTATION) is significantly negative, suggesting that high-reputation firms are less likely to adopt a proactive recall strategy than low-reputation firms. Furthermore, the estimation shows negative parameter estimates for FIRM-SIZE and VOLUME and positive estimates for LIABILITY and BRAND. However, while the estimate for VOLUME is highly significant, the others did not achieve the traditional level of significance.

More important, Table 4 and Table 5 (probit estimation) jointly show the mediation effects: (1) The direct impact of proactive recall strategy on abnormal return is significant in Equation 3, and (2) firm characteristics that influence recall strategy choices in Equation 4, especially REPUTATION, do not affect abnormal returns in Equation 3. Based on the steps that Kenny, Kashy, and Bolger (1998) outline, these effects indicate that product-recall strategies completely mediate the influences of firm characteristics on abnormal returns. Therefore, the stock market consolidates the impact of various firm and product characteristics and reacts mainly to a firm's recall strategy. In other words, during a product recall, the financial market uses a firm's strategic

way to test mediation effects is to use structural equation models. However, because of the categorical nature of proactive recall variable (which violates the normality assumption of structural equation models), it is difficult to pursue this approach.

choice of a recall strategy as a signal to evaluate the potential consequence of the crisis.

Heckman Two-Step Estimation

In anticipation of the potential outcomes of different strategies, forward-looking firms may choose a particular strategy on the basis of its characteristics (e.g., Shaver 1998). If firm characteristics are unobservable to the researcher but affect both market outcomes and firm strategy, the problem of self-selection bias may arise in the estimation of, in our context, the impact of recall strategies on stock returns (Greene 2000; Hamilton and Nickerson 2003; Shaver 1998).

The Heckman two-step estimation is an effective approach to check and correct for potential self-selection bias and endogeneity (Heckman 1979). This procedure has been extensively used in the management and economics literature (e.g., Hamilton and Nickerson 2003; Shaver 1998). In this section, we carry out the Heckman estimation to show that the cross-sectional analysis we reported is not subject to self-selection bias and that the finding about the negative impact of proactive strategies on abnormal returns is robust after accounting for potential endogeneity.

The first stage of the Heckman process involves a probit model on the choice of product-recall strategies, as in the empirical model (Equation 4). The inverse Mills ratio λ, which serves as the self-selection correction parameter in the Heckman model, is constructed using the probit estimates. The second stage includes ordinary least squares (OLS) regressions of abnormal returns on the explanatory variables plus λ for the proactive recall subsample and the passive recall subsample, separately:

$$(5) \qquad AR_{i0}(PROACT = 1) = \beta_1'W_i + \beta_{\lambda 1}\lambda_1 + \varepsilon_{i1}, \text{ and}$$

$$(6) \qquad AR_{i0}(PROACT = 0) = \beta_0'W_i + \beta_{\lambda 0}\lambda_0 + \varepsilon_{i0},$$

where W_i includes the intercept and the exogenous variables that may influence abnormal returns and λ_1 and λ_0 are inverse Mills ratios for each observation in the proactive subsample and the passive subsample. We calculate them as follows:

$$\lambda_1 = \phi(\gamma'Z)/\Phi(\gamma'Z), \text{ and}$$

$$\lambda_0 = -\phi(\gamma'Z)/[1 - \Phi(\gamma'Z)],$$

where ϕ and Φ are the probability density function and cumulative distribution function of the standard normal distribution. For model identification purpose, at least one variable that affects strategic choice but does not directly affect abnormal returns must be included in the probit stage but not the OLS stage (Hamilton and Nickerson 2003). Thus, we exclude SELLTIME and PRICE from the OLS estimation because there is no a priori reason to believe that they will significantly influence abnormal returns, which is also confirmed by the results in Table 4. Because the error terms in Equations 5 and 6 are subject to heteroskedasticity, we use consistent asymptotic standard errors to test the significance of the parameters.

The key to the Heckman estimation is that the significance of the inverse Mills ratio terms reflects the degree of

TABLE 5
Firm Choice of Recall Strategy and the Heckman Two-Step Estimation

Independent Variable	1 (Probit on Recall Strategy)[a]	2 (OLS Regression of Abnormal Returns)[b]	
		Proactive Recalls	Passive Recalls
Intercept	−.682	−5.222	−1.095
	(.809)	(3.131)	(.758)
REPUTATION	−.436	−.633	.468
	(.262)*	(.602)	(.295)
FIRMSIZE	−.012	.005	.002
	(.013)	(.028)	(.013)
LIABILITY	.011	.010	−.008
	(.009)	(.018)	(.010)
BRAND	.176	−.046	−.410
	(.351)	(.677)	(.361)
VOLUME	−5.067	−.488	−.131
	(1.868)**	(5.949)	(.295)
SELLTIME	−1.257		
	(.458)**		
PRICE	−.013		
	(.034)		
HAZARD	.192	.967	.465
	(.253)	(.679)	(.277)
CHILD	.461	2.096	−.765
	(.559)	(1.003)**	(.837)
TOY	1.060	−.370	.114
	(.557)**	(1.029)	(.676)
OUTDOOR	−.028	.315	.767
	(.429)	(.832)	(.371)**
SPORTS	−.165	−.433	−.427
	(.446)	(1.014)	(.461)
SPECIALTY	1.400	2.636	−.081
	(.970)	(1.467)*	(1.185)
YEARTREND	.055	.097	.061
	(.046)	(.097)	(.049)
Correction for self-selection parameter (λ)		1.194	.196
		(1.540)	(.645)
Log-likelihood	−60.39		
R^2		.38	.14
Sample size	153	38	115

*$p < .10$.
**$p < .05$.
[a]First-stage probit model parameter estimates with standard errors of estimates are in parentheses.
[b]Second-stage OLS parameter estimates with consistent asymptotic standard errors of estimates are in parentheses.
Notes: To enhance the readability of the results, we note the dependent variable, abnormal returns, as a percentage in this analysis.

self-selection bias. If $\beta_{\lambda 1} = 0$ and $\beta_{\lambda 0} = 0$, self-selection bias is not a concern for the cross-sectional regression of abnormal returns reported in Table 4. As Model 2 in Table 5 shows, this is indeed the case. The coefficients of the self-selection bias parameters $\beta_{\lambda 1}$ and $\beta_{\lambda 0}$ are not significantly different from zero for the proactive subsample and the passive subsample. Therefore, the cross-sectional model (Equation 3) yields an unbiased estimate of the effect of product-recall strategies (i.e., proactive recalls have a significantly negative impact on firm value). In addition, the firm and product characteristic variables REPUTATION and VOLUME, respectively, lose significance in the second-stage OLS regressions of abnormal returns. Together with the significance of product-recall strategies in the cross-sectional model (Equation 3), the Heckman results further demonstrate that product-recall strategies are key influencers of abnormal stock returns, regardless of firm and product characteristics.

General Discussion

A key finding in this research is that the use of a proactive product-recall strategy, which firms can use to elicit positive responses from consumers, actually hurts a firm's financial value more than a passive recall strategy. We also find that less reputable firms are more likely to use proactive recall strategies. These results suggest that in choosing proactive versus passive strategies, firms are primarily concerned with minimizing potential financial losses associated with the recall. In essence, the stock market and investors use recall strategies as a proxy or signal to estimate the financial impact of recalls. They interpret proactive strategies as a signal of severe product hazard and substantial financial losses to the firm. This explains our result that proactive recalls are more negatively related to a firm's value than passive recalls.

Implications

Our findings have direct managerial and public policy implications. A growing body of literature has argued that there is a positive link between firms' socially responsible strategies and their financial market performance (Margolis, Elfenbein, and Walsh 2007). Our results suggest that at least in the context of product-harm crises, when firms implement proactive strategies to reduce the impact of a crisis and maintain long-term viability, they need to be aware of alternative interpretations of their behavior by consumers and investors. Their views might differ, but both are important facets of crisis management. In terms of financial value, the stock market's pessimistic views of a proactive strategy could actually hurt firm value. As a result, when a firm proactively recalls a product, it needs to communicate effectively to the stakeholders about the rationale for its actions so that the stock market will not simply interpret the situation as just another case of severe product hazard and significant financial losses.

Although the study shows a surprising negative effect of proactive recall strategies, it suggests the effect of firm reputation in reducing the need for a proactive approach (i.e., firms with a high reputation are less likely to adopt proactive strategies), thus buffering the negative impact on firm value. In this sense, our study provides support for the extant studies that, mostly from consumer perspectives, have found a positive role of firm reputation in product-harm crises (e.g., Ahluwalia, Burnkrant, and Unnava 2000; Dawar and Pillutla 2000; Siomkos and Kurzbard 1994).

From a public policy perspective, it has long been argued that the stock market has the governance role of monitoring and disciplining corporate behavior (Samuel 1996). The socially responsible investing trend has added more weight to the significance of this role. However, our findings indicate that during a product-harm crisis, the stock market does not seem to reward seemingly socially responsible behavior. As we discuss, information asymmetry between the firm and investors can be an important reason behind such failure. When the market itself cannot resolve the issue of information asymmetry, appropriate regulatory measures should be taken to aid communication and information exchange, thus increasing market efficiency and social welfare.

Although the marketing discipline has begun to examine the linkage between corporate social responsibility and firms' financial performance (Luo and Bhattacharya 2006), the findings from the literature have been relatively inconsistent, particularly among studies that use market-based measures, such as stock returns (Orlitzky, Schmidt, and Rynes 2003). Our results suggest that such inconsistency could have occurred because a "responsible" corporate policy can be interpreted in different ways by different stakeholders. Further research on corporate social responsibility may need to consider why firms adopt such policies and how the market might interpret them.

Directions for Further Research

This study could be a harbinger of several new issues that link marketing strategies to firm performance. For example, drawing on the previous literature, we classified product-harm crisis management strategies along the proactive-versus-passive dimension. Because of the greater frequency of product recalls in recent years, firms need clear guidance on the available strategies and the effectiveness of these strategies under different market and product conditions. Thus, a comprehensive study of recall strategies could offer a useful typology and assessment of their effectiveness.

In this article, we mainly focused on the impact of product-recall strategies on firm value when the recall is announced. Because event studies are often limited in detecting long-term stock market effects, alternative methods that complement event studies will be useful in examining possible long-term effects (e.g., Mitchell and Stafford 2000). It would also be worthwhile to examine whether the benefits of proactive strategies from the consumer perspective (through increased consumer confidence and brand loyalty) could benefit firm value in the long run.

Finally, it would be useful to examine the role of news media in a recall event. Certain types of product recalls, such as those for toys, might garner greater attention or bias from the media. For similar reasons, it would be worthwhile to examine potential differences in recalls and stock market reactions across industries and government agencies (e.g., the CPSC, the Food and Drug Administration).

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