

# Stock market reactions to US Consumer Product Safety Commission enforcement actions

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## Abstract

This study examines stock market reaction to violations of product safety regulations and firm product responsibilities in the post-enforcement period. Our event study results show that market reaction was negative to failures by firms to report product defects in a timely way. Our results also show that the stock market reaction varies depending on the type of violations, and whether there are single or multiple violations. Firms spend more on research and development and advertising in the post-enforcement period, in addition to investing in their compliance programmes which have a significant positive impact on product responsibility stewardship. Our empirical results show that the stock market reacts negatively to recall volume and refund remediation strategy. The stock market reaction is negative to social media communication about product recalls initiated by manufacturers. However, this negative effect appears to be counteracted by the positive corporate social responsibility (CSR) reputation effect of the manufacturers. Our findings imply that US manufacturing firms dealing with product recalls must be sensitive to how consumers and investors interpret the communication.

## KEYWORDS

Consumer Product Safety Commission, consumer protection, enforcement, market valuation, product responsibility

## JEL CLASSIFICATION

D18, G14, G28, M48

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## 1 | INTRODUCTION

Consumer product recalls occur frequently in the US. Consumers are inherently vulnerable to various potential hazards such as flammable furniture and dangerous toys (Cowan et al., 2014). In 2018, an estimated 226,100 toy-related injuries were treated in US hospital emergency departments, and 17 toy-related deaths occurred in children younger than 15 years (Tu, 2019). In the US, the Consumer Protection Safety Commission (CPSC) requires companies to immediately report a defect and the possibility of a substantial product hazard under any statute enforced by the CPSC, as stated in section 15 of the Consumer Product Safety Improvements Act 2008 (CPSIA) (Tenenbaum, 2014). Firms can choose to either voluntarily initiate a product recall or wait for CPSC to mandate a recall.

Recalls have short- and long-term effects. Short-term effects include the opportunity cost of sales lost due to defective or hazardous products being pulled off the market (e.g., Barber & Darrough, 1996; Pruitt & Peterson, 1986). Long-term effects include the costs of recalling, replacing or repairing the defective products, and regulatory fines for not reporting to CPSC in a timely manner (Karpoff et al., 2005). Nonetheless, the financial repercussions of product recalls pale in comparison to the life-threatening risk that tainted or defective products pose to consumers (Wowak & Boone, 2015).

Previous studies found that larger negative returns were experienced by firms which had products taken off the market (Davidson & Worrell, 1992). The other financial consequences include direct and indirect costs (Barber & Darrough, 1996; Jarrell & Pletzman, 1985; Kim et al., 2019; Liu et al., 2016; Ni et al., 2016; Stevens, 2013; Stevens & Britto, 2016). The direct costs of product recall are different for retailers and manufacturers. Retailers incur recall administration costs while manufacturers bear the brunt of costs associated with refunds, exchanges, repairs and disposals (Jarrell & Pletzman, 1985; Kost, 2019). The indirect costs include loss of reputation, brand equity and goodwill.

This study investigates the effects of CPSC enforcement actions on stock market valuation. Overall, our findings show that US firms that violated the CPSIA agreed to a settlement and paid an average civil penalty of \$2 million. Further, the results of our event study indicate that the market reacts positively (negatively) to the announcement of a firm's agreement to pay lower (higher) fines. We provide additional evidence that indirect costs also had negative effects on cumulative abnormal returns (CARs). Meanwhile, violating firms spend more on research and development (R&D) and advertising to regain the trust of consumers and investors in the post-enforcement period. Finally, strategic investment in firm compliance programmes have a significantly positive impact on product responsibility stewardship. We also found that not all recalls have the same effect due to the volume of social media communication. We cannot conclude whether manufacturers who recalled their products or retailers had sharper stock price reactions depending on CSR reputation.

This study makes several contributions to the product recall and enforcement literature. First, previous studies have reported that losses to shareholder returns are far greater than the cost attributable to recalled products, varied between violating and non-violating firms and created spillover effects (Cheah et al., 2007; Jarrell & Pletzman, 1985; Pruitt & Peterson, 1986). However, the findings are mixed (Barber & Darrough, 1996; Hoffer et al., 1988; Jarrell & Pletzman, 1985) because previous studies focused on the automobile and pharmaceutical industries. Almost 40 years ago, Jarrell and Pletzman (1985) criticised the failure of the capital market to absorb the total costs borne by the shareholders. Pruitt and Peterson (1986) also suggested indirect costs be considered in the empirical assessment. Therefore, our study undertakes empirical assessment of both the direct and indirect costs of recalls related to CPSC enforcement over the 20-year period from 2000 to 2020.

Second, previous studies examine trends in product liability and monetary penalties (e.g., Barber & Darrough, 1996; Cheah et al., 2007; Davidson & Worrell, 1992; Karpoff et al., 2005;

Mariuzzo et al., 2020), noting adverse investor reactions often occur at the time of initial exposure (Carberry et al., 2018). Apart from Engelen and Kabir (2006) who examined market reaction to regulatory suspension, no studies have yet factored both the CPSC's notices of violations (NOVs), which are issued when a firm violates a mandatory product safety standard in the US, and the subsequent correction actions requested. Cheah et al. (2007) indicated that adverse market reactions might have implications for how firms subsequently strategise their responses, but they did not report the remediation strategies employed by the violating firms. These insights would be useful in assessing the effectiveness of regulatory decisions and actions via the issuance of NOVs to violating firms.

Third, studies have largely focused on market reactions at the time of product recalls (Chen et al., 2009; Ni et al., 2016). However, Pruitt and Peterson (1986) reported that the market reacted for a further two months post-recall announcements. Barber and Darrough (1996) insisted new studies provide evidence of quality improvement by the violating firms. Our study fills the gap in the literature which we believe would encourage violating firms to eventually undertake the required consumer safety improvements.

Research on the impact of US firms' remedial actions on their product stewardship responsibilities post-CPSC enforcement actions is under-researched. Jarrell and Peltzman (1985, p. 536) proposed that, 'something much more is involved in a recall than failure of a specific product', what Carberry et al. (2018) referred to as deeper organisational problems. To rectify the situation, organisations might calculatedly resort to a remediation strategy in their favour. Studies have reported substantial negative abnormal returns when firms replaced the products compared to product repair (Davidson & Worrell, 1992; Ni et al., 2016). Unless the market reaction was significantly different to a remediation strategy, the possibility of its efficiency in deterring similar behaviour needs empirical assessment (see Carberry et al., 2018; Wesley & Ndofor, 2015). Our study fills this gap in the literature.

Finally, we incorporated media coverage of firms and their CSR<sup>1</sup> reputation before and after product recall crises and CPSC enforcement actions. Investors have higher expectations for firms to communicate their decisions and actions in relation to product recalls and enforcement actions through traditional channels and social media. However, previous studies have reported that firms behave irresponsibly in times of crisis (Davidson & Worrell, 1992, p. 472). Social media may influence stock market reactions to recalls (see Hsu & Lawrence, 2016; Lee et al., 2015) and enforcement actions and in April 2013 the US Securities and Exchange Commission (SEC) announced that companies may use social media platforms to announce key information in compliance with Regulation Fair Disclosure. The media complements the stock markets' function as the societal arbiter of ethical behaviour (Barberis & Thaler, 2003). Indeed, Karpoff (2012) suggested that the media has a critical role in influencing investor reactions. In the age when product recall news could reach and be shared by many through social media, CSR has received greater attention in the literature but not many studies have examined Google, Twitter and CSR reputation in one study. Therefore, this study attempts to fill this gap.

The remainder of this study is organised as follows. Section 2 describes the role of CPSC enforcement. In Section 3, we develop the research hypotheses and Section 4 describes the research design. Section 5 presents the results of the study. Finally, Section 6 presents a summary of the research and conclusions.

<sup>1</sup>We thank the anonymous reviewer for these suggestions.

## 2 | THE CONSUMER PRODUCT SAFETY COMMISSION AND THE CONSUMER PRODUCT SAFETY IMPROVEMENTS ACT 2008

Under the Consumer Product Safety Act (CPSA), 1972, the CPSC has the mandate to protect the US public against unreasonable risks of injury associated with consumer products (CPSC, 2020a, 2020b). The Consumer Product Safety Improvements Act (CPSIA) 2008 has expanded the CPSA's authority and resources (Tenenbaum, 2014).

The CPSC Office of General Counsel (OGC) is responsible for investigating potential legal violations and pursuing appropriate remedial and civil penalty actions (OGC, 2014). The CPSC undertakes enforcement actions against firms that sell products even after knowing that their products have defects/hazards, but do not inform CPSC in a timely manner. The Financial Accounting Standards Board's (FASB) Accounting Standards have also highlighted the importance of timely disclosures because information on pending future potential liabilities due to these enforcement actions is useful for decision-makers, such as consumers, suppliers and investors.

## 3 | LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

### 3.1 | Product recalls and short-term impacts on firm valuations

Investors are cautious about future financial losses caused by reputational damage and litigation risks caused by news of product recalls (Barber & Darrough, 1996; Chen et al., 2009; Ni et al., 2016). The devastating impact on a firm's performance and survival is not conclusively supported in the literature (Bromiley & Marcus, 1989; Chen et al., 2009; Eilert et al., 2017; Hoffer et al., 1987, 1988; Jarrell & Pletzman, 1985). Most of the studies reported the negative effects on market valuations of US firms (Ni et al., 2016; Pruitt & Peterson, 1986; Wood et al., 2017) but are yet to examine the implications of a company's failure to report product safety defects in a timely manner, as required by the CSPA,<sup>2</sup> before the product recall event. This communication failure often leads to civil and criminal cases, causing investors to re-evaluate their investments (Garber et al., 1998; Jarrell & Pletzman, 1985). Nonetheless, the adverse impact depends on the market's sensitivity to the type of product recall announcement (Wood et al., 2017), which Jarrell and Peltzman (1985, p. 536) referred to as 'suboptimal deterrence'. Thus, we hypothesise:

- H1** The failure of timely reporting is negatively associated with stock market reaction prior to a firm's product recall announcement, as indicated by the cumulative abnormal returns (CARs).
- H2** The settlement announcement with CPSC is negatively associated with stock market reaction, as indicated by the CARs.

Undesirable media coverage of a firm's past and frequent recalls, severe safety issues, accompanied by exorbitant monetary penalties and fines leads to investors' aversion to financial losses (Eilert et al., 2017; Karpoff et al., 2005; Ni et al., 2016). The level of fines imposed by the CPSC signals the severity of the hazards to the market and the implications for the firm's future revenues (Carberry et al., 2018; Thomsen & McKenzie, 2001). Karpoff and Lott Jr. (1993) stated market reaction may not be significant because the market prices before the settlement date contain unbiased estimates of the civil penalty. Karpoff et al. (2005) also found that the market value losses are smaller on average than the legal penalty imposed. It is unclear whether the stock

<sup>2</sup>Sections 15(b)(2) and (3), and 15 U.S.C. 2064(b)(2) and (3).

market reacts differently according to the fines decided by the CPSC. Thus, we hypothesise the following:

**H3** The level of fines paid by firms is positively associated with stock market reaction, as indicated by the CARs.

A remediation strategy negotiated between the company and CPSC compliance staff may require operational modifications, improvements and strict adherence to quality standards. The company may also be required to agree to and guarantee the maintenance of enhanced compliance programmes which stipulate the required internal controls, including timely reporting. Firms agreeing to implement mandatory compliance programmes with the CPSC demonstrate their commitment to remediation following product recalls. Such announcements can relieve the impact of adverse stock market reactions by restoring investor and customer confidence (Gao et al., 2015). Nevertheless, some investors may still speculate on the extent of product harm and penalties (Davidson & Worrell, 1992; Eilert et al., 2017; Ni et al., 2016), and remain dismissive of such efforts; hence, we hypothesise:

**H4** Firms' agreement to implement CPSC's mandatory compliance programmes is positively associated with stock market reaction, as indicated by the CARs.

Next, we examine the impact of compliance with the CPSC's mandatory compliance programme based on changes in several financial indicators between the pre- and post-enforcement periods. Following the media announcement, Carberry et al. (2018, p. 142) suggested that managers should be prepared to engage in restorative actions and demonstrate restorative capacity.

To convey a positive message and to mitigate investor concerns, firms enhance their product quality and safety processes by investing in modern technologies to upscale their R&D, product quality and inspection services (Carberry et al., 2018; Stevens, 2013). The firms may also redeploy resources and other capital investments (Carberry et al., 2018; Hendricks & Singhal, 2000) in the post-enforcement period. These improvements may be financed by additional long- and short-term debt. Similarly, an increase in advertising expenditure could counter negative publicity (Stevens, 2013) and signal implicit improvement in product safety to consumers regarding the firm's products and services, preserving its target and existing customers (Gao et al., 2015; Rubel et al., 2011). Hence, we formulate these hypotheses:

**H5** A firm's advertising, R&D, capital expenditure, and short- and long-term borrowings significantly increase in post-enforcement years vis-à-vis pre-enforcement years.

**H6** A firm's raw materials and finished goods inventory significantly increase in the post-enforcement years vis-à-vis pre-enforcement years.

### 3.2 | Product recalls and long-term impacts on firm valuation

Previous research has empirically tested the relationship between abnormal returns associated with product recalls and firm remediation strategies (Chen et al., 2009; Unsal et al., 2017). In general, product recalls take more than a month and sometimes a year to complete. The longer it takes to recall, the longer the investors have to wait to find out the total direct cost of the recalls depending upon the firm's remediation strategies.

A refund may lead investors to speculate a high likelihood of product harm, penalties and significant decline to future cash flows. For example, studies found that the market reacted more negatively when products were replaced and purchase price was returned (Davidson & Worrell, 1992; Ni et al., 2016). Therefore, we hypothesise:

**H7** A firm's refund remediation strategy is positively associated with long-term abnormal returns.

Fixing high volumes of product defects takes longer and is more costly, as firms may have to review inspection reports initiated after larger recalls and communicate with several intermediaries in their supply chain, which will further prolong completion of the recall. It is likely that investors would become more concerned about the firm's ability to maintain cash flow and remain profitable. By observing that the firm is moving slowly to complete the recalls and is less proactively managing it, investors may speculate that the financial consequences are going to be severe (Chen et al., 2009). Thus, we hypothesise that:

**H8** An increase in days-to-recall is negatively associated with long-term abnormal returns.

Furthermore, larger recalls facilitate more organisational learning, as the firm needs to adhere to mandatory requirements of the internal control compliance programmes agreed with the CPSC (e.g., Kalaignanam et al., 2013). We posit that such mandatory compliance programmes should stimulate organisational learning post CPSC enforcement actions, detect the root causes of product hazards, and improve product stewardship which will boost long-term returns. Thus, we hypothesise the following:

**H9** Implementation of compliance programmes is positively associated with long-term abnormal returns.

Firms spend more on advertising to rebuild their brand equity, both during and after the recall (see Liu et al., 2016) to mitigate the erosion of brand reputation and regain consumer trust (Chen et al., 2009). As a result, investors will anticipate that brand value will improve by a moderate to a greater amount, increasing future cash flows and profitability (e.g., Liu et al., 2017). We posit that post CPSC enforcement actions, advertising expenditures will have a significant positive impact on product responsibility stewardship.

**H10** An increase in advertising expenses post CPSC settlement is positively associated with long-term abnormal returns.

## 4 | RESEARCH DESIGN

### 4.1 | Sample selection

We used the CPSC database to search for US firms that received an NOV<sup>3</sup> between 2000 and 2020. We obtained a list of 997 firms. Later, we matched the names of these firms in the CPSC's civil and criminal penalty database. This step resulted in 192 civil cases and 17 criminal cases. We selected only civil cases and cross-checked the settlement dates and the agreed fines of these cases with those in the US Federal Register public notices over the sampled period. This step reduced the total number of sampled firms to 155. Out of these 155, we excluded 91 foreign and US private firms due to the non-availability of share prices and financial data. This data constraint imposes a major limitation on our study by reducing the sample size. Out of the 64 sample firms included in the final sample, 14 firms had multiple events in our sample. Except for some cases,<sup>4</sup> multiple events per firm were independent from each other (see Appendix 1).

Anecdotal evidence suggests that innocent firms can suffer when their industry peers experience product recalls. To capture this spillover effect, we selected a matching sample using 2-digit

<sup>3</sup>CPSC informs firms through a Notice of Violation (NOV) regarding the breach and the nature of corrective actions necessary, such as correct future production (CFP), stop sale at distribution level recall (DSSC), stop sales and CFP (SSC), stop sale and consumer level recall (RSSC).

<sup>4</sup>For example, on 19 May 2006 two companies, TJX and True Religion, reported to CPSC about the defects; and there were two settlement cases, Family Dollar and Dollar General on 28 July 2009.

Standard Industrial Classification (SIC) codes to examine whether settlement announcements also affect innocent firms in the same industry.

## 4.2 | Data and measurement of variables

We used the CRSP database to collect stock prices and firm-level financial data for the 64 firms in the event study. We used information from public notices and the CPSC database to identify firms that *knowingly failed to report* and *failed to report immediately* consumer product hazards. A firm *knowingly* violates CPSA when it fails to inform the CPSC immediately of the defect or advises that the defect involves consumer products that subject such firms to civil penalties. Under section 20(d) of the CPSA, 15 USC 2069(d), the term *knowingly* means:

- (1) having actual knowledge or (2) is deemed to be possessed by a reasonable man who acts in the circumstances, including knowledge obtainable upon the exercise of due care to ascertain the truth of representation.

Then, we segregated the sampled firms according to their violations of CPSA: *FFA* (Flammable Fabric Act), *ASTM* (*Smart Parts Regulation*), *Lead in Children's Products* and *Small Parts Regulation*. We also obtained information on consumer reports about product defects, product-related injuries including deaths from the public notices. We used the median dollar amount of civil penalty of \$800,000 to divide firms into two groups. Using the settlement narratives, we also segregated the firms into two groups: those who were asked to set up a *Compliance* programme to demonstrate their commitment to product safety, or those who were not. We used three variables: *Repair* = 1, when a firm offered a repair, and otherwise 0; *Replacement* = 1, when a firm offered a replacement, and otherwise 0; and *Refund* = 1, when a firm offered a refund, and otherwise 0.

To capture firm remediation strategies, following Chen et al. (2009), we created a dummy variable *Proactive*, which is equal to 1 when a firm voluntarily recalled a product, and 0 otherwise. In addition, we also calculated days to capture the chronological details of violating firms' product recalls before CPSC enforcement actions. *Response lag* is the number of days between when a report of the first injury or consumer complaint was received and when a firm informed the CPSC about the defect(s) associated with a product. *Sell-time* is the number of days a product was first sold in the market before its recall. *Days-to-recall* is the number of days between when a firm first notified the CPSC, and the day of product recall initiated by the firm in cooperation with the CPSC. We created a dummy variable, *CProduct*, which equals 1 if a product recalled was an infant (baby) product, children's toy or an item of children's clothing, and 0 otherwise (CPSC News Releases, 2001).

We used the product responsibility score from Thomson Reuters ESG database as a proxy measure of a firm's product stewardship following other studies (e.g., Garel & Petit-Romec, 2021; Ullah et al., 2021). This score measures a firm's capacity to produce quality goods and services while integrating customers' health and safety, integrity and data privacy.

We calculated direct and indirect product recall costs separately<sup>5</sup> using the data from CPSC product recall news over the sampled period. These costs are separate from the expected legal penalties. We used the information from the CPSC press releases on the total number of products sold before the product was recalled by a manufacturer or a retailer. We posit that the larger the recall volume, the more likely affected consumers will spread negative word of mouth online and offline, resulting in losses in sales in the short and long term. Therefore, a recall with a high

<sup>5</sup>To estimate the former, we took two approaches. First, using the information available from the published company reports in 10-K or 10-Q reports (Govindaraj et al., 2004); however, the information was provided by one company only. Second, using recall volume and recalled products' market value as potential direct costs (see Chen et al., 2009; Jarrell & Pletzman, 1985; Liu et al., 2017). The CPSC Press Releases report the number of units of a product(s) and the retail price(s). It implies that, when the announcement of the product recall hits the market, the market response to direct product recall costs will depend on the number of units of the product that have been sold before the recall, as reported by CPSC.

volume is more likely to result in long-term loss of cash flow, which is difficult for investors to forecast at the time of the recall announcement (Liu et al., 2017). Karpoff and Lot. Jr (1993) also posit that investors notice the additional goods and services (e.g., repair, replace) offered by firms to compensate customers. This implies that the market associates recall volume with direct cost of recall.

Some argue that the direct costs of a product recall will be less for a retailer than they would be for a manufacturer (Ni et al., 2014). The retailers would only administer the refunds, exchanges and repairs whereas the manufacturer bears the brunt of the direct costs associated with the administration of refunds, exchanges and repairs. To capture these direct costs to retailers and manufacturers, we used a dummy variable denoted by *Manufacturer*, which is equal to 1 if a firm is a manufacturer of home products, and otherwise, 0. Similarly, we used a dummy variable denoted by *Retailer*, which is equal to 1 if a firm is a retailer. At the time of receiving the news of product recall, we posit that investors are more likely to extrapolate their future losses based on past losses associated with prior recalls and settlements. To capture this, we used a dummy variable *PriorRecall&Settle*, which is equal to 1 if a firm had previously violated section 15 of CPSC, entered into settlement with CPSC and paid a civil penalty.

Reliable prediction of commercial damages due to product liability involves the quantification of various observable and unobservable determinants to fully appreciate the impact of firm product safety crimes (Beatty et al., 2005; Jarrell & Pletzman, 1985; Kranacher et al., 2011; Pruitt & Peterson, 1986). CPSC determines the expected penalty size, taking into consideration several factors such as the occurrence of injury and severity of injuries in addition to the nature, circumstances, extent, nature of the product defect and the number of defective products distributed. CPSC also determines the appropriateness of penalties in relation to the size of the business using number of employees, net worth and annual sales. The maximum legal civil penalty is \$100,000 per violation and \$15 million for a related series of violations (Rubel et al., 2021). The history of noncompliance is also one of the important factors in deciding the size of the penalty.<sup>6</sup>

We include the measures of media coverage and CSR reputation to control the impact on stock prices associated with product recall announcement and civil case settlement events. Starting with the coverage in newspapers that have wider circulation in the US, such as *The New York Times*, *The Washington Post* and *USA Today* (Matsa & Worden, 2022), we used a continuous variable *TMedia* that measures the average daily number of press articles found in these newspapers in the pre-event period (−60, −1). We also used Twitter handles of the sample companies' Twitter accounts, to download the tweets and retweets, to extract any information related to product recalls, investigations, case filing and settlement. We used a dummy variable denoted *SMedia* which is equal to 1 if a tweet and retweet provided information related to any of these events, and 0 otherwise. In addition, we used the Google Trends Analysis to capture the US market news about the sample firms over the sample period. We used a continuous variable *GTrends* to measure the total number of monthly searches on Google. We used *CSR\_Rank* which is the CSR rating from the Thomson Reuter ESG database. *SIZE* is total assets of the firm.

### 4.3 | Event study

In an efficient market, the monetary impact of an unanticipated event (such as a product recall announcement) is immediately reflected in stock prices (Fama, 1970). There are two major news events in our event study: (1) product recall (RSSC) and (2) civil case settlement.<sup>7</sup> For these two events, we searched for initial press announcement dates in CPSC Press Releases on their website. Prior to product recall event, it is not uncommon for CPSC to initiate an investigation against

<sup>6</sup>We do not estimate the expected penalty.

<sup>7</sup>We searched the *Wall Street Journal Index* to check if the event dates coincided with other potential significant news and company announcements.

a company. These investigations often start with a letter from CPSC staff asking the firm for a full report about defects found or reported to the firm and/or consumers. When CPSC closes the case, the letter is sent to the firm and a product recall is initiated.

We expect the market learns about product recalls first from CPSC press releases on its website which is the accurate event day when a recall is announced. This recall news determination has been used in previous studies (e.g., Ni et al., 2014; Unsal et al., 2017; Wood et al., 2017). Some of the studies assumed that the market also learns from other business specific news platforms such as the *Wall Street Journal* (WSJ) (e.g., Barber & Darrough, 1996; Davidson & Worrell, 1992; Hoffer et al., 1988; Jarrell & Pletzman, 1985; Pruitt & Peterson, 1986) or LexisNexis and Factiva databases (e.g., Liu et al., 2017). We compared the CPSC product recall dates with those reported by the WSJ over the sample period 2000–2020.<sup>8</sup>

It is most likely that the market learns about the complaint, the administrative judge's decision and fines agreed between the parties from the CPSC press releases as well as the US Federal Register, which provides online public notices regarding the acceptance of a Settlement Agreement and Order between the CPSC and US firms. When companies enter into a settlement with CPSC, this information signals that CPSC has followed up on its mandate to protect US consumers but also the companies' actions to remedy product harm by addressing safety issues quickly and effectively.

To evaluate the market reaction to these events, we used the CPSC announcement date of a product recall and the Federal Registrar notice date of a civil case settlement as the event date ( $t = 0$ ), and then calculated the *CARs*.<sup>9</sup> In addition to  $[0, +1]$ , we also calculated *CARs* over  $[0, +7]$ ,  $[0, +14]$  and a longer post-event window  $[0, +30]$ . To obtain the *CARs*, we calculated the daily stock normal returns for each firm using the closing stock prices adjusted for dividends and stock splits, and the daily index values of SP500 (a proxy for the market index) to calculate market returns (MacKinlay, 1997). We used the market model to estimate the abnormal returns. This model relates the return of any given security to the return of the market portfolio. We used the CRSP value-weighted index for the market portfolio. The model's linear specification follows from the assumed joint normality of the asset returns. The model is specified as follows:

$$R_{j,t} = \alpha_j + \beta_j R_{mt} + \varepsilon_{jt} \quad (1)$$

$$AR_{j,t} = R_{jt} - (\alpha_j + \beta_j R_{mt}) \quad (2)$$

where  $R_{i,t}$  and  $R_{m,t}$  are the stock returns of firm  $i$  and the market portfolio, respectively. We used a period of 250 trading days (i.e., Day  $-270$  to Day  $-21$ ) as the estimation window. We required a minimum of 70 valid returns for each firm relative to the event date.<sup>10</sup> The abnormal return for firm  $j$  is denoted by  $AR_{j,t}$ .

$$CAR_{i,t} = \sum_{t=1}^{t=n} AR_{i,t} \quad (3)$$

To test hypotheses H7–H10, we estimated the following model:

$$LTR_{i,t} = \alpha_{i,t} + \beta_{i,k} X'_{i,t} + e_{i,t} \quad (4)$$

where  $i$  denotes a firm and  $t$  denotes years. *LTR* is the long-term stock return, calculated using the three-factor model, and  $X'$  is a vector of the explanatory variables defined. In addition to examining the long-term impact of firms' post-product recall and post-CPSC enforcement actions on

<sup>8</sup>The coverage of product recall announcements in the WSJ were mostly for automobiles and the dates for Mattel, Graco and Fisher Price were found to be later than those of the CPSC recall dates.

<sup>9</sup>The alternative models used to measure abnormal returns, e.g., Fama–French Three Factor, Market Adjusted Model and Four-factor model. They are reported in an (online) [appendix](#).

<sup>10</sup>We used different estimation models, window lengths and gaps; still, the results were not quantitatively different.

shareholders' wealth, we also examined their impact on product market stewardship by using product responsibility scores. We used the one-year ahead value of  $PRScore_{t+1}$  to capture the lagged effect of the firm-level variables in period  $t$ , which is in line with previous product recall studies.

According to Chen et al. (2009), if firm characteristics are unobservable but potentially affect both market outcomes and firm strategy, the problem of self-selection bias may arise when estimating the impact of recall strategies. Hence, we used Heckman's two-step estimation approach to estimate the model in Equation (4), as it addresses self-selection bias, produces robust estimates and accounts for potential endogeneity (Chen et al., 2009).

We also used the panel event study estimation approach and introduced a staggered treatment effect using the difference-in-differences (DID) analysis procedure. We are interested in estimating the impact of the passage of an event (i.e., civil case settlement) which occurred in different years for the different firms, and this procedure allowed us to incorporate multiple events that were related to one firm. Specifically, we estimate the regression model in Equation (5):

$$Y_{gt} = \alpha + \sum_{k=T_0}^{-2} \beta_k treat_{gk} + \sum_{k=0}^{T_1} \beta_k treat_{gk} + X_{st}\Gamma + \varphi_s + \gamma_t + \varepsilon_{gt} \quad (5)$$

where *treat* is a dummy variable denoting a case event (more than one settlement) and 0 for all other cases (one settlement).  $T_0$  and  $T_1$  are the lowest and highest number of leads and lags surrounding the treatment period. We used panel event study Stata code and used within-cluster robust variance-covariance matrix<sup>11</sup>  $X$  denotes the control variables,  $\varphi$  and  $\gamma$  are individual and time-fixed effects.

## 5 | RESULTS

### 5.1 | Notice of violations

Table 1 shows the NOVs and actions requested by CPSC by violation type. The CPSC issued 4857 NOVs for *Lead in Children's Products* exceeding *Lead Paint Ban*, 820 NOVs for *Small Parts Regulation*, and 413 NOVs for *FFA*. For example, some of these NOVs led to bigger civil penalties paid by children's toy maker Mattel Inc. which agreed to a civil penalty settlement of \$2.3 million in 2009 for importing and selling toys that contained lead above the permissible limit.

Between February 2012 and April 2016, Polaris Industries Inc. manufactured or imported, distributed and offered for sale in the US approximately 133,000 recreational off-road vehicles (RZR), and 93,500 off-road vehicles (Rangers). The RZR contained one or more defects in violation of sections 15(b)(3) and (4) of the CPSA, 15 USC 2064(B)(3) and section 19(A)(4) 15 USC 2089(A)(2). Despite being aware of these defects, Polaris did not immediately report them to the CPSC until it received reports of 150 fires in RZR that resulted in one death, burn injuries or fire on land. Polaris agreed to pay a civil penalty within 30 days of receiving the CPSC final order.

In summary, these initial findings suggest that the CPSC encourages US firms to take corrective actions rather than immediately stop production, distribution and sale, depending on the circumstances. These patterns in the CPSC's enforcement actions indicate that an intense review of compliance processes within firms and across supply chains may be necessary (Cleeren et al., 2017; Cowan et al., 2014).

<sup>11</sup>The estimation results are not reported to save space. These are available on request from the authors. We set the number of leads and lags to 20. The standard errors are clustered at firm level.

**TABLE 1** Notices of violations and actions requested by CPSC

Action requested by CPSC/violations	Total
CFP – Correct Future Production	281
CPSA Violation	25
Lead in Children's Product	139
Flammable Fabric Act (FFA)	70
Small Parts Regulation	25
Drawstrings 15j Rule (ASTM)	1
DSSC – Distribution-Level Recall	88
Lead in Children's Product	43
Flammable Fabric Act (FFA)	44
Small Parts Regulation	1
RSSC – Consumer-Level Recall	232
Lead in Children's Product	68
Fabric Flammability Act (FFA)	155
Small Parts Regulation	9
SSC – Stop Sale and Correct Future Production	5553
CPSA Violation	2
Drawstrings 15j Rule (ASTM)	15
Lead in Children's Product	4607
Flammable Fabric Act (FFA)	144
Small Parts Regulations	785
Grand total	6154

## 5.2 | Characteristics of the violating firms' product recalls

On average, it took 885 days (approximately two and a half years) for a US firm in our sample to notify the CPSC about product hazards, while the CPSC took an average of 230 days to initiate a product recall (see Table 2). For instance, Black & Decker (US) Inc. took 4350 days (approximately 12 years) to inform the public that its cordless electric lawnmowers contained a defect that could cause unreasonable risk of severe injury or death. Ironically, the civil penalties were paid twice for the same product's safety violations in 2011 and 2015. Overall, the average time between a firm initially learning about a potential hazard and the public receiving the notification through a product recall was at least 1022 days (approximately 2.8 years).

Our findings suggest that firms did not provide information to the CPSC in a timely manner. In many cases, CPSC learned about product hazards through its own independent investigations, in addition to customer reports of injuries and death. Notably, a large proportion of incident reports and injuries involved non-children's consumer products.

## 5.3 | Civil and criminal fines for violations

Table 3 presents the descriptive statistics of civil and criminal fines for violations of the CPSA. The median fine varied from a low of \$47,500 to a high of \$27.25 million. Polaris agreed to pay a \$27.25 million civil penalty for failing to report defective recreational off-road vehicles, which is the highest fine paid during the sample period.

**TABLE 2** Characteristics of the violating firms' product recalls

	Mean	Median	<i>N</i>
<i>Sell-time</i>	1265	1022	155
<i>Response lag</i>	885	665	155
<i>Days-to-recall</i>	230	7	155
Nature of violation	Total incident reports	Total injuries	
ASTM	182	32	16
FFA	1	1	8
Lead-containing paint	2	0	12
Small Parts Regulation	445	19	5
Miscellaneous CPSA violations	16,248	1283	112
Remedy			
Recall, no remedy	13,955	648	105
Recall, refund	14	12	4
Recall, replace	1051	175	11
Recall, repair	514	290	8
Redesign	178	165	2
Type of product			
Children products	5223	513	69
Non-children's products	11,656	822	86
Recall strategy			
Proactive	14,989	1271	124
Reactive	1889	64	31

An independent sample *t*-test<sup>12</sup> showed significantly *higher* fines imposed on firms in civil cases than in criminal ones. We also observed differences in fines according to violation type. On average, firms paid higher fines for *ASTM* and *Lead-Containing Paint* violations. Violations of these products resulted in large-scale product recalls. Among well-known cases of settlements are *Mattel/Fisher-Price*, and *RC2 Corporation*, which resulted in \$2.3 and \$1.25 million in civil penalties, respectively. Notably, a large majority of the firms did not offer any remedy in the product recall announcements.

## 5.4 | Empirical results – hypotheses

Table 4 reports the event study results<sup>13</sup> associated with the sample firms' failure to inform product defects as mandated in CPSA to the CPSC before product recall announcements (see Panel A). Our results show that failures to report the product defects to CPSC in a timely way is associated with negative stock market reaction. The settlement announcement with CPSC was also associated with negative stock market reaction, however *CARs* were not statistically significant at the 0.1 and 5 percent levels (see Panel B). *H1* and *H2* are not supported. Nevertheless, the  $Z_g$  test (non-parametric test) indicates that the stock market was significantly negative one day after the settlement event.

<sup>12</sup>This is a two-sided *t*-test (Boehmer et al., 1991).

<sup>13</sup>All firms with more than two recalls and firms with criminal cases were excluded from the event study.

**TABLE 3** Descriptive statistics of civil and criminal fines

Year	Mean	Median	Min	Max
2000	\$ 245,417	\$ 125,000	\$ 20,000	\$ 750,000
2001	650,000	500,000	125,000	1,750,000
2002	332,917	150,000	75,000	1,000,000
2003	595,000	135,000	150,000	885,000
2004	420,000	287,500	100,000	1,000,000
2005	1,466,667	1,075,000	300,000	4,000,000
2006	377,083	181,250	100,000	700,000
2007	518,750	300,000	50,000	975,000
2008	385,625	50,000	35,000	1,000,000
2009	399,238	47,500	31,500	2,300,000
2010	642,857	400,000	25,000	2,050,000
2011	321,250	100,000	40,000	960,000
2012	709,150	600,000	214,000	1,500,000
2013	1,137,500	725,000	400,000	3,900,000
2014	1,175,000	737,500	600,000	3,100,000
2015	2,855,556	2,800,000	1,575,000	4,300,000
2016	6,250,000	4,500,000	2,000,000	15,450,000
2017	4,950,000	4,925,000	3,800,000	5,800,000
2018	27,250,000	27,250,000	27,250,000	27,250,000
2019	2,425,000	2,425,000	1,000,000	3,850,000
	<b>Civil cases</b>	<b>Criminal cases</b>	<b>t-test</b>	<b>p-value</b>
CSPC Fines	1,224,345	61,083	-5.15***	0.0000
<b>Fines by violations</b>	<b>Mean</b>	<b>Median</b>	<b>Min</b>	<b>Max</b>
<i>FFA</i>	487,500	325,000	75,000	1,500,000
<i>ASTM</i>	580,278	80,500	35,000	4,000,000
<i>Lead in Children Products</i>	419,583	87,500	25,000	2,300,000
<i>Small Parts Regulation</i>	576,286	600,000	31,000	1,100,000
<i>Others</i>	1,520,435	700,000	20,000	27,250,000

Note: \*, \*\* and \*\*\* denote significance at the 10%, 5% and 1% levels, respectively.

Table 5 shows the *CARs* associated with settlements for short- and long-event windows. Panel A of Table 5 shows the market reactions to the value of fines agreed upon in a settlement with the CPSC. Firms that agreed to pay less than \$800,000 in fines showed a positive market reaction, which was significant over the longer window [0, +30]. By contrast, those who paid more than \$800,000 showed a negative market reaction over the longer window, thus hypothesis H3 is weakly supported. For example, Polaris Industries, Office Depot and Home Depot agreed to pay a combined penalty of \$37.43 million for several consumer product safety violations. The market valuations of Polaris Industries and Office Depot dropped by 11 percent and 6 percent, respectively, by Day 30 after settlement.

The results in Panel B show that the market reacted positively to the news that violating firms accepted deficiencies in their product safety compliance processes over the shorter window of [0, +7]. Thus, hypothesis H4 is supported. For example, Home Depot and Best Buy agreed that they would maintain a compliance programme to ensure compliance with the CPSA, including

TABLE 4 Event study results

Panel A: Failure to inform before product recall announcements						
Days, $t$	CARs	$t$ -value	ARs	$z$ -value	Negative ARs	$Z_g$ -value
-10	-0.23%	-0.26	-0.23%	0.41	48%	0.40
-9	-0.25%	-0.05	-0.03%	-0.37	59%	-0.71
-8	-0.82%	-1.23	-0.56%	-0.49	48%	0.40
-7	-0.35%	0.90	0.47%	2.12	28%	2.63***
-6	-0.72%	-0.86	-0.37%	-1.69	55%	-0.34
-5	-1.36%	-1.37	-0.65%	-1.15	48%	0.40
-4	-1.28%	0.22	0.09%	0.28	45%	0.77
-3	-1.41%	-0.42	-0.13%	0.06	59%	-0.71
-2	-0.69%	1.27	0.72%	1.22	31%	2.26**
-1	-0.75%	-0.16	-0.05%	0.02	52%	0.03
0	-1.08%	-0.94	-0.33%	-0.67	62%	-1.09
1	-0.89%	0.43	0.19%	0.26	59%	-0.71
2	-1.43%	-0.62	-0.54%	-0.54	52%	0.03
3	-0.84%	1.27	0.59%	1.52	45%	0.77
4	-1.33%	-1.19	-0.49%	-1.69	76%	-2.57***
5	-1.03%	1.07	0.30%	0.63	34%	1.89
6	-1.47%	-1.42	-0.44%	-0.97	52%	0.03
7	-1.53%	-0.17	-0.06%	-0.51	52%	0.03
8	-1.91%	-0.47	-0.38%	-1.29	62%	-1.09
9	-1.87%	0.10	0.04%	-0.34	55%	-0.34
10	-2.38%	-1.27	-0.51%	-1.15	62%	-1.09
Panel B: Civil penalty settlement announcements						
Days, $t$	CARs	$t$ -value	ARs	$z$ -value	Negative ARs	$Z_g$ -value
-10	0.07%	0.26	0.07%	0.46	54%	-0.23
-9	0.03%	0.67	-0.04%	0.50	62%	-1.19
-8	-0.44%	-0.09	-0.47%	-0.85	56%	-0.55
-7	-0.60%	-0.79	-0.16%	-1.78**	56%	-0.55
-6	-1.14%	-1.07	-0.54%	0.12	59%	-0.87
-5	-0.95%	-1.70	0.19%	-0.77	59%	-0.87
-4	-1.36%	-2.01**	-0.41%	-1.46	62%	-1.19
-3	-0.91%	-2.05**	0.45%	-0.29	41%	1.37*
-2	-1.03%	-1.75	-0.12%	0.51	56%	-0.55
-1	-0.91%	-1.53	0.12%	0.39	41%	1.37*
0	-1.00%	-1.64	-0.10%	-0.66	54%	-0.23
1	-0.68%	-1.52	0.32%	-0.01	41%	1.37*
2	-0.53%	-1.57	0.15%	-1.19	41%	1.37*
3	-0.35%	-1.46	0.19%	0.69	51%	0.09
4	-0.24%	-1.03	0.10%	1.11	49%	0.41
5	0.38%	-0.36	0.63%	1.09	44%	1.05
6	0.19%	-0.68	-0.19%	-0.45	59%	-0.87

TABLE 4 (Continued)

Panel B: Civil penalty settlement announcements						
Days, $t$	CARs	$t$ -value	ARs	$z$ -value	Negative ARs	$Z_g$ -value
7	0.76%	-0.28	0.57%	1.36	36%	2.01
8	0.52%	-0.61	-0.24%	-0.94	64%	-1.51
9	0.42%	-0.65	-0.10%	-0.33	56%	-0.55
10	0.92%	-0.37	0.50%	0.83	41%	1.37*

*Note:* The event date,  $t = 0$ , is the date when a firm agreed to recall the products in Panel A and pay fines to the CPSC in Panel B. Abnormal returns are calculated using the market model. The  $t$ -values are cross-sectional test statistic values for CARs and  $z$ -values are the Patel test statistic values for ARs. The  $Z_g$  values are obtained from the generalised sign test (We used the Cowan (1992) non-parametric test – generalised sign test which controls for the normal asymmetry of positive and negative abnormal returns in the estimation period. We used the Boehmer et al., 1991 cross-sectional two-sided  $t$ -statistic to test that CAR is significantly different from zero.), which compares the proportion of positive to negative ARs on the event date.

\*, \*\* and \*\*\* denote significance at the 10%, 5% and 1% levels, respectively.

a programme for the appropriate disposal of recalled products. Under settlement conditions, we believe such firms must act swiftly to reduce potential loss of sales; however, negative investor sentiment illustrates the adverse reaction to failings in internal control procedures.

In Panel C, we show CARs by violation type. Notably, the market reaction was positive (negative) for firms that settled their violations of ASTM (*Smart Parts Regulation*). We also examined stock market reaction over the longer window  $[0, +30]$  (see Figure 1). The stock market reaction varied in the long run, with violations of lead paint and small parts receiving negative reactions.

To capture the spillover effect on non-violating firms, we plotted CARs on settlement events for settlement firms and peer firms (matched using 2-digit industry SIC codes) over the shorter window of  $[-7, +7]$  (see Figure 2). We observed that peer firms had higher CARs before the settlement dates  $[-7, 0]$  and in the post-settlement period  $[0, +7]$ . These results indicate that peer firms outperformed violating firms. Previous studies report that the announcement did not significantly affect the peer firms (Barber & Darrrough, 1996; Hoffer et al., 1988; Unsal et al., 2017). Nonetheless, Jarrell and Pletzman (1985) suggested that the recall of a rival could have an adverse effect on the industry as a whole.

## 5.5 | Single and multiple CPSA violations

At the product recall announcement event date, we argue that stock market assessment of potential fines will be largely dependent on whether or not a company has been fined in the past for a related series of violations. When companies have a related series of violations that resulted in administrative cases and their agreement to pay civil penalties, investor reaction might be less significant as investors might think that for such firms, it is the cost of doing business. These cases impose externalities on consumers as it is evident that ASTM violations led to the number of injuries. In contrast, accepting settlements and paying the civil penalties could be an influential incentive to alter firm behaviour because any delays would trigger heftier fines or even criminal charges against the company in the future that would influence investors to consider filing class action suit against the directors of companies.

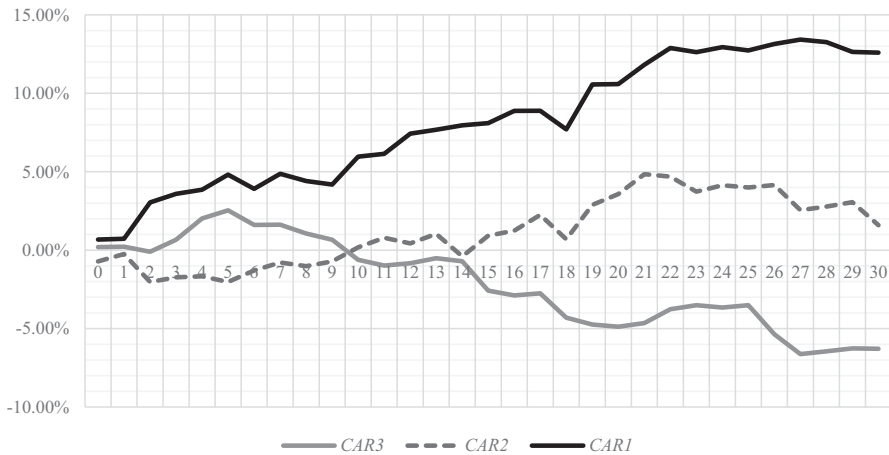
In addition, the negative impact of the number of injuries reported prior to recall but ignored by the companies could imply that investors might react pessimistically at the date of announcement of recall. Figure 3 plots CARs for the firms that had multiple and single product recall announcements. In the case of multiple product recall announcements, negative CARs imply that the market reacts to both product recall costs and expected penalties separately because the market anticipates the expected legal penalty to be higher for these firms compared to firms

TABLE 5 Short- and long-term event study results

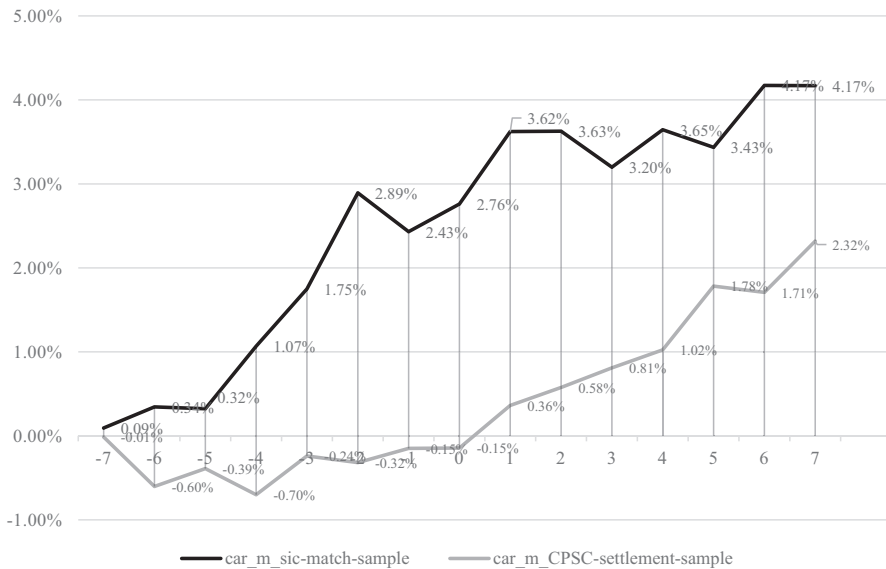
	Days, $t$	CARs	$t_c$ -value	$t_{sc}$ -value	$Z_g$ -value
Panel A: Fines					
CPSC Fines < \$800,000	[0, +1]	0.01%	0.01	-0.17	0.53
	[0, +7]	2.50%	1.59	1.12	0.98
	[0, +14]	3.67%	1.00	0.55	-0.80
	[0, +30]	8.71%	1.46	1.78	-0.35
CPSC Fines > \$800,000	[0, +1]	0.05%	2.30	1.84	1.37
	[0, +7]	1.02%	1.81	2.00	1.56
	[0, +14]	0.04%	0.42	0.89	-0.56
	[0, +30]	-0.06%	-0.34	0.87	-1.53
Panel B: Mandatory compliance programmes					
Required compliance programmes	[0, +1]	0.45%	0.31	0.93	2.02**
	[0, +7]	1.36%	1.87**	2.09**	0.12
	[0, +14]	1.02%	0.95	1.67	-1.77**
	[0, +30]	-0.08%	-0.35	0.37	-0.50
Did not require compliance programmes	[0, +1]	0.19%	0.36	0.03	-0.71
	[0, +7]	1.50%	1.19	0.51	1.15
	[0, +14]	2.82%	1.04	0.11	-0.34
	[0, +30]	5.73%	1.27	0.72	-1.45
Panel C: Violation's type					
FFA	[0, +1]	1.10%	0.34	0.5	-0.94
	[0, +7]	-0.01%	-0.15	0.43	-0.90
	[0, +14]	5.51%	0.62	0.73	-0.93
	[0, +30]	12.64%	0.42	0.45	0.17
ASTM	[0, +1]	1.20%	1.20	0.79	-0.10
	[0, +7]	4.79%	1.74	1.30	2.30**
	[0, +14]	8.57%	1.29	0.84	0.50
	[0, +30]	13.94%	1.22	0.67	-0.10
Lead in Children Products	[0, +1]	-0.16%	-0.25	-0.16	-0.31
	[0, +7]	1.55%	1.60	0.64	-0.31
	[0, +14]	1.32%	0.96	0.16	-1.20
	[0, +30]	5.32%	1.80	1.44	-0.31
Small Parts Regulation	[0, +1]	-0.96%	0.90	1.12	0.61
	[0, +7]	-2.60%	1.66	1.35	-0.54
	[0, +14]	-0.70%	0.25	0.62	-1.59
	[0, +30]	-3.40%	-0.38	-0.02	1.75**

Note: Panel A reports the results using a median fine amount of \$800,000. Panel B reports the results for firms that implemented a compliance programme. Panel C reports the results based on CPSA violation type. We used parametric and non-parametric tests. The parametric tests:  $t_c$ -values are cross-sectional  $t$ -test values and  $t_{sc}$ -value is the BMP test for CARs over the event windows.  $Z_g$  values are obtained from the generalised sign test (non-parametric test) which compares the proportion of positive to negative ARs over the event window.

\*, \*\* and \*\*\* denote significance at the 10%, 5% and 1% levels, respectively.

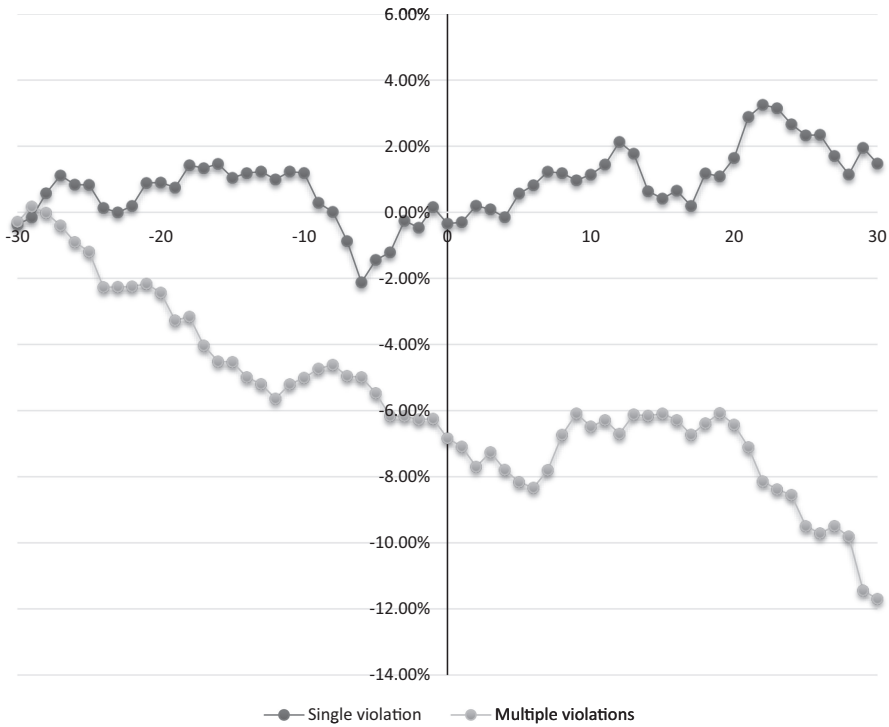


**FIGURE 1** Stock market reaction to violation types. The x-axis shows the days relative to the event day and the y-axis shows the cumulative abnormal returns. This figure shows the cumulative abnormal returns (CARs) over event window [0, +30], where the *CAR1* line shows market reaction to announcements of firms' settlement for violations of Drawstrings Regulation in children outwear product; the *CAR2* line shows market reaction to announcements of firms' settlement for violations of Lead Paint Regulations in Children product; and *CAR3* line shows market reaction to announcements of firms' settlement for violations of Small Parts Regulation.



**FIGURE 2** Spillover effects on non-violating firms. The x-axis shows days relative to the event day and the y-axis shows the cumulative abnormal returns. This figure compares the CARs of the peer firms (matched using 2-digit SICs) with the CPSC settlement firms in the pre- and post-settlement period [-7, +7].

with single product recalls. We did not analyse stock market assessment of potential fines at the time of recall announcements empirically because the actual penalty amounts were not available.



**FIGURE 3** Stock market response to single vs multiple product recall announcements. This figure shows the  $CARs_{(-30,+30)}$  of the firms who had more than one event relating to failure to report CPSC (multiple violations, black dotted line) in a timely manner compared to those firms who failed to report only once (single violation, grey dotted line) over the sample period of 2000–2020.

**TABLE 6** Violating firms' responses post CPSC enforcement actions

Panel A: $Pre_{t-1}$ and $Post_{t+1}$ enforcement year					
Variables	$Pre_{t-1}$	$Post_{t+1}$	Mean	$t$ -value	$p$ -value
Advertising expenses	227.24	263.45	-36.21	-2.00	0.07
Research and development expenses	762.03	824.71	-62.84	-1.14	0.14
Capital expenditure	1840.34	1422.57	417.76	0.95	0.17
Long-term debt	19,397.34	17069.29	2328.04	0.27	0.38
Short-term debt	6,467.94	3,560.99	2906.96	0.90	0.40
Raw materials inventory	139.65	135.21	4.44	-0.47	0.32
Finished goods inventory	1881.62	2151.71	-270.09	-1.65	0.06

(Continues)

TABLE 6 (Continued)

Panel: B $Pre_{t-2}$ and $Post_{t+2}$ enforcement year					
Variables	$Pre_{t-2}$	$Post_{t+2}$	Mean	$t$ -value	$p$ -value
Advertising expenses	223.80	384.63	-160.83	-2.17	0.04**
Research and development expenses	791.43	721.72	-69.72	-1.93	0.06
Capital expenditure	1650.14	1268.35	381.79	1.56	0.12
Long-term debt	17759.67	16296.99	1462.69	0.24	0.81
Short-term debt	5342.85	3068.75	2274.11	1.03	0.31
Raw materials inventory	192.23	199.33	-7.10	-0.20	0.85
Finished goods inventory	1440.47	1817.39	-376.93	-2.62	0.01**

Note: \*, \*\* and \*\*\* denote significance at the 10%, 5% and 1% levels, respectively (one-tailed test).

## 5.6 | Violating firms' responses post-CPSC's enforcement actions

In this section, we report on the responses of violating firms to CPSC enforcement actions. Specifically, we used  $Pre_{t-1}$ ,  $Post_{t+1}$ ,  $Pre_{t-2}$  and  $Post_{t+2}$  enforcement year data to investigate the increase (decrease) in firms' inventories, expenses and borrowings. We used a paired sample test following Byun and Dass (2014),<sup>14</sup> who also use a paired sample  $t$ -test to examine changes in consumers' affective and calculative commitment to brands after product recalls.

We find a significant increase in the advertising expenses and finished goods inventory at the 10 percent level in  $Post_{t+1}$  compared to  $Pre_{t-1}$ , not reaching the 5 percent level (see Table 6, Panel A). In contrast, R&D expenses decreased in  $Post_{t+2}$  compared to  $Pre_{t-2}$ . These findings are partially consistent with hypotheses H5 and H6. This result suggests that the stock of finished goods is replenished to cover recalled products that are sent for repair or are newly manufactured. This strategy ensures sustained delivery to affected customers and maintains sales performance. An alternative explanation for the increase in inventory levels is that customers may have cancelled or deferred future purchases (Ni et al., 2016; Stevens, 2013); this may also explain the high levels of finished goods inventory.

## 5.7 | Empirical results – long-term impacts on firm valuation

Table 7 reports the ordinary least squares (OLS) estimation results of Equation (4). The coefficient on *Refund* is positive, while that on *Days-to-recall* is negative; this is consistent with hypotheses H7 and H8 (see columns 1 and 2). However, the coefficient on *Adverts* is positive, while that on *Compliance* is negative but not significant; therefore, hypotheses H9 and H10 are not supported. Our estimation results using Heckman's two-step estimation shows that parameter estimates of the inverse Mills ratio is not significant; thus, there is no self-selection bias (see columns 3 and 4). There is a positive relationship between implementation of a compliance programme and product responsibility score as the coefficient on *Compliance* is significantly positive after controlling for the firm's post-enforcement spending on advertising and type of consumer products (see column 4).

These results provide a more complete picture than prior studies, i.e., although the stock market reacts negatively to product market violations, investors may earn higher returns in the long term if the violating firms make amends at the right time post-recall and post-CPSC

<sup>14</sup>These authors reported that post-recall, an increase in advertising expenses suggested efforts to deflect the negative perception of their product by spending more on reputation building.

**TABLE 7** Violating firms' recall and remediation measures, and long-term abnormal returns

	OLS		Heckman's two-step	
	<i>LTR</i>	<i>LTR</i>	<i>LTR</i>	<i>PRScore</i>
	(1)	(2)	(3)	(4)
Intercept	0.0075 (0.0081)	0.0337*** (0.0197)	-0.0375 (0.0637)	-0.2601 (0.5018)
Refund	0.0121*** (0.0062)	0.0154** (0.0080)	0.0062 (0.0378)	-0.0686 (0.8339)
Sell-time	0.0053 (0.0013)	0.0002 (0.0012)	0.0008 (0.0028)	0.0001 (0.0010)
Days-to-recall	-0.0026 (0.0014)	-0.0019 (0.0013)	-0.0022 (0.0028)	-0.0022 (0.0028)
Adverts	0.0920 (0.2038)	0.0666 (0.0973)	0.1097 (0.1574)	0.0897 (1.7620)
Compliance	-0.0034 (0.0059)	0.0015 (0.0077)	-0.0008 (0.0146)	0.1820*** (0.0123)
Control variables				
C_products	-	0.0057 (0.0083)	0.0012 (0.0252)	-0.2266*** (0.0148)
Size	-	-0.0034*** (0.0015)	-0.0024 (0.0029)	0.0978*** (0.0265)
Inverse Mills ratio	-	-	0.0583 (0.0845)	-0.5900 (0.3874)
Adj. $R^2$	0.0239	0.2658	0.2898	0.0769

Note: The dependent variable is the long-term return calculated using Equation (4). The independent variables are explained in Section 4.2.

\*, \*\* and \*\*\* denotes significance at the 10%, 5% and 1% levels, respectively. The standard errors are reported in parentheses.

enforcement, admit their internal product compliance failures publicly, and commit to invest in the long-term product stewardship strategies.

## 5.8 | Additional analysis

### 5.8.1 | Empirical results – product recall announcements

In this section, we report additional empirical results<sup>15</sup> to determine how the impact of product recall announcements was related to each firm's specific product recall variables (direct costs: *RSize*, *Refund*) and indirect costs (*Injuries*) as well as their social media and CSR reputation variables. We used the following regression model in Equation (6):

$$CAR_{i,t} = \alpha_{i,t} + \beta_{i,k} X'_{i,t} + e_{i,t} \quad (6)$$

where  $CAR_{i,t}$  is the cumulative abnormal returns for firm  $i$  for product recall event  $t$  calculated over the event window  $[-1, 0]$  and  $X'$  is a vector of the explanatory variables defined in Section 4.2.

<sup>15</sup>We thank the reviewer(s) for the feedback which helped us improve the paper by including these empirical results.

TABLE 8 Additional analysis – recall announcements

	(1)	(2)	(3)	(4)
Intercept	-0.0104 (0.0111)	-0.0052 (0.0035)	0.0035 (0.0281)	0.0135 (0.0507)
RSIZE	-0.0010 (0.0014)	-0.0002 (0.0013)	-0.0021** (0.0017)	-0.0090*** (0.0041)
Refund	-0.0459*** (0.0083)	-0.0383** (0.0148)	0.0136 (0.0163)	0.0193 (0.0334)
PriorRecall&Settle	-0.0454** (0.0212)	-0.0607*** (0.0215)	-0.02191 (0.0171)	0.0344 (0.0371)
Days-to-recall $\times 10^{-5}$	-0.1066** (0.0415)	-0.1037** (0.0516)	0.0156** (0.0332)	0.0138** (0.0672)
Reports	-0.0321** (0.0137)	-0.0389** (0.0164)	0.0647 (0.0945)	-
Manufacturer	-	-0.0154 (0.0182)	-0.0415*** (0.0204)	-
Retailers	-	0.0156 (0.0130)	0.0413** (0.0204)	-
CSR_Rank	-	-	-	0.0005*** (0.0002)
CSR_Rank $\times$ Manufacturer	-	-	-	0.0005 (0.0015)
GTrends ( $\times 10^{-5}$ )	-	-	-0.4230 (0.2581)	-
GTrends $\times$ Manufacturer	-	-	0.0002** (0.0000)	-
SMedia	-	-	0.0356 (0.0479)	-
SMedia $\times$ Manufacturer	-	-	-0.1018*** (0.0208)	-
Adj. R <sup>2</sup>	0.182	0.103	0.0940	0.040

Note: The dependent variable is  $CAR_{(-1,0)}$  associated with the product recall announcements and independent variables are explained in Section 4.2.

\*, \*\* and \*\*\* denote significance at the 10%, 5% and 1% levels, respectively.

The explanatory power of our empirical model in Table 8 seems to suggest that direct cost of recalls and indirect costs of recalls have a negative effect on  $CARs$ . We found a significant negative relationship between  $CAR$  and *Refund*. These findings indicate that the market internalised the refund costs that will be borne by the shareholders now and in the future. We also found a significant negative coefficient for *PriorRecall&Settle*, which indicates that the market reacted adversely to news of a recall by a company that was previously fined by CPSC for similar violations, and which settled a civil case by paying a penalty. As expected, our results show a significant negative coefficient for *Manufacturer*. This implies that stock market reactions to product recalls initiated by manufacturers is different from those initiated by retailers (see Table 8, column 2).

Interestingly, we find that an increase in the Google search trends on recall announcement events of manufacturers has a significant positive effect on  $CARs$ , while an increase in personal

TABLE 9 Additional analysis: empirical results for settlement announcements

	(1)	(2)	(3)
Intercept	-0.0406 (0.0404)	-0.0761*** (0.0345)	-0.1746*** (0.0580)
Refund	0.0690 (0.0443)	0.0744* (0.0383)	0.0975** (0.0343)
Sell-time ( $\times 10^{-5}$ )	-0.1153 (0.0875)	-0.2007*** (0.0709)	-0.1539 (0.0806)
Days-to-recall ( $\times 10^{-5}$ )	-0.0967** (0.0463)	-0.1164** (0.0440)	-1.3931*** (0.3958)
PriorRecall&Settle	-0.0387 (0.0229)	-0.0189* (0.0098)	-0.0516*** (0.01335)
TMedia	0.0014*** (0.0007)	0.0018*** (0.0006)	0.0014*** (0.0005)
GTrends ( $\times 10^{-5}$ )	-0.0412 (0.0209)	-0.1100 (0.1510)	-0.0237 (0.1823)
SMedia	0.0212** (0.0102)	0.0306** (0.0134)	0.03443** (0.0118)
Compliance	-	-0.0250*** (0.0070)	-0.0390*** (0.0115)
C_products	-	0.0131 (0.0103)	0.0190* (0.0097)
Fines	-	-	0.0059 (0.0047)
SIZE	0.0031 (0.0044)	0.0044 (0.0029)	0.0061*** (0.0029)
Adj. $R^2$	0.2051	0.3772	0.4398

Note: The dependent variable is the cumulative abnormal return denoted by  $CAR_{(-1,0)}$  associated with the settlement announcements over the event window  $[-1, 0]$  and independent variables are explained in Section 4.2.

\*, \*\* and \*\*\* denote significance at the 10%, 5% and 1% levels, respectively.

and corporate communication on social media appears to have the opposite effect on  $CARs$  (see Table 8, column 3). In fact, Carberry et al. (2018) reported that the investors reacted more negatively if the corporations were blamed in the media. In terms of the CSR reputation mitigation effect (see e.g., Cho et al., 2022; Noack et al., 2019) our results show that market value reaction was positive for a manufacturer with a higher CSR rating. However, the coefficient is not significant (see Table 8, column 4). Thus, we cannot draw a conclusion as to whether manufacturers or retailers had sharper stock price reactions depending on their CSR reputation.

### 5.8.2 | Empirical results – settlement announcements

In this section, we report additional empirical analysis to determine how the impact of settlement announcements was related to the firm's specific variables. We used the following regression model in Equation (7):

$$CAR_{i,t} = \alpha_{i,t} + \beta_{i,k} X'_{i,t} + e_{i,t} \quad (7)$$

where  $CAR_{i,t}$  is the cumulative abnormal returns for firm  $i$  for a violation case settlement event  $t$  calculated over the event window  $[-1, 0]$  and  $X'$  is a vector of the explanatory variables defined in Section 4.2.

Table 9 demonstrates the explanatory power of our model which seems to suggest that on settlement events, the stock market reacts negatively to firms' specific product recall variables *Days-to-recall* and *Sell-time* (see Table 9, columns 2 and 3), which remains significantly negative even after controlling for fines paid by firms (see column 3). These findings provide stronger support to our earlier assertion that the market reacts more negatively to direct costs than penalties. We find that the stock market reacts positively to news coverage about settlement events in traditional media as well as to consumer and corporate communication on social media (see Table 9, columns 1–3).

According to Unsal et al. (2017), market reaction to the news is dependent on which source the investor used to find or come across the information. While some news breaks overnight via social media and some appears later in print media, usually the information becomes available to the public within a week. After controlling for each firm's specific product recall factors and media coverage, we found significant negative coefficient on *Compliance* (see Table 9, columns 2 and 3). Taken together, these findings imply that the information content in the company entering a settlement agreement and civil penalty announcement provides investors with forward-looking information about the changes expected in the company's internal control procedures. In addition, these findings also indicate that company transparency in sharing the information across different types of media as set out in the settlement agreement with CPSC allows investors to react positively to such changes.

## 6 | CONCLUSION

This study investigates the effects of CPSC enforcement actions on stock market valuation. Unlike other studies, we analysed both direct and indirect costs over two decades of product recalls and found that both negatively influence the stock market reactions to recalls. Similarly, our results provided evidence that the market reacted differently to the violating firms' choice of remediation strategies. Specifically, the market reacted more negatively when refund news was announced at product recall events indicating investor sensitivity over future cash flow implications. As the uncertainty associated with total recall costs reduces for some firms, the investors viewed refunds positively. Our empirical results show that the stock market reacts positively to the announcement of a firm's agreement to pay lower fines but reacts negatively to news of mandatory compliance programmes imposed by CPSC. This is an important contribution to current research as we were able to analytically track a sample of US firms that received NOV for poor product safety. However, not all recalls react in the same way depending on the volume of social media communication.

Our findings indicate that violations and subsequent corrective actions requested by the CPSC vary during the sample period. The fines for civil cases were notably higher, on average, than those for criminal cases. Meanwhile, US firms suffered a deterioration in earnings and market value in the year in which fines were imposed; however, the market reaction was asymmetrical to the type of violation and announcement of high versus low fines. Some companies continued to be 'repeat offenders', including Mattel/Fisher-Price, General Electric, Black & Decker, Family Dollar and Kohls. Mattel Inc., for example, paid \$1,100,000 in 2001, \$975,000 in 2007 and \$2,300,000 in 2009. For large companies with high incomes, these fines may be 'affordable and manageable'. This phenomenon raises the question of whether regulators should investigate firms' past earnings, namely, how much they profited from the violations before the investigation and the imposition of fines, to prevent these companies from re-offending. Regulators should evaluate the frequency of such offences and impose stricter

actions and higher penalties. The findings suggest that irrespective of the value of fines levied, companies may hedge against subsequent losses through insurance policies. Hence, in some cases, the CPSC's fines did not seem to be an effective deterrent. Even more than three decades later, we concur with earlier studies by Jarrell and Pletzman (1985) and Karpoff et al. (2005) that the market is suboptimal at best but largely remains inefficient in deterring production of faulty products.

As expected, our findings suggest that US firms violating CPSC product safety rules experienced a reduction in market valuation. The product recalls initiated by the manufacturers had a significant negative impact on market valuation. However, we cannot conclude whether manufacturers that recalled their products or retailers had sharper stock price reactions depending on CSR reputation; future research might want to consider this due to the increasing demand and importance of CSR to the market participants. Nonetheless, the positive (or negative) financial impacts should be weighed against the costs of investing in corporate compliance programmes and overall internal control systems. Together, these can provide a 'ground zero' for proactive engagement with stakeholders. As emphasised by Lawrenson and Braithwaite (2018), loosely defining safety culture will provide an opportunity for the criminal justice system to criminalise it. Nonetheless, Karpoff (1987) asserted that reputational concerns are not a sizable deterrence to environmental violators as compared to corporate wrongdoing. In our study, the investors reacted positively to companies' media coverage of settlement agreements with CPSC.

Our snapshot analysis of 2 years of pre- and post-violation data shows that US companies tend to invest significantly in R&D, spend more on advertising, and amass more finished goods inventories after product recalls. From a performance management perspective, this study has managerial implications. Management should prepare for an increase in the costs of R&D, advertising, storing and managing finished goods after violations. From a supply chain perspective, violating firms can use this information to improve outsourcing, internal control, product safety policies, due diligence in the selection of suppliers while strengthening the CPSC compliance programmes. Scholars have suggested industry co-operation in product design and inspection (Jarrell & Pletzman, 1985). Li and Lau (2019) urged product designers to use design software that can alert them to potential safety concerns before the production process. These measures can minimise the chances of becoming a repeat offender.

This study has several limitations. First, we did not capture supply chain complexity in our response strategies, as supply chain actors individually and collectively influence a firm's product recall process. Second, organisational culture may also affect how firms respond to product recalls. Other considerations include the moderating effects of situational context (product substitutability), and organisational characteristics. Third, we could not examine criminal cases because the available criminal case data was extremely limited, which prevented further analysis. As Dekker (2011) states, criminalisation is likely to exacerbate the consequences of professional mistakes. Therefore, future research should systematically explore the effects of criminalisation at organisational and individual levels.

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available in CPSC at [<https://www.cpsc.gov/Recalls/violations>]. These data were derived from the following resources available in the public domain: <https://www.federalregister.gov/documents> and WRDS database from Wharton Research Data Services.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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## APPENDIX 1

Events per firms:

1. Acuity Brands had four separate failures to report events – these events were spread over 3 months of February, September and October 2004 and one in April 2001 but only one settlement event in March 2006.
2. Black & Decker had two separate failures to report events, one in October 2006 and one in September 2010. Two separate settlement events in August 2011 and May 2015.
3. Bon-Ton Stores had two failure to report events, one in November 2007 and one in February 2010. Two separate settlement events in April 2009 and December 2012.
4. Family Dollar had two separate failures to report events, one in September 2009 and one in October 2007. Two separate settlement events in July 2006 and July 2009.
5. General Electric had two separate failures to report events in February 2009 and October 2010. Two separate settlement events in August 2002 and February 2015.
6. Kohl's had two separate failures to report events in September 2006 and December 2009. Two separate settlements events in April 2008 and September 2009.
7. Mattel/Fisher-Price had three separate failures to report events, in June 2001, February 2007 and June 2009. Three separate settlement events in June 2001, February 2007 and June 2009.
8. Polaris had two separate failures to report events, in January 2005 and March 2018. Two separate settlements events in January 2005 and March 2018.
9. Ross Stores had two separate settlement events, in August 2009 and June 2013.
10. Williams-Sonoma had two separate failures to report events, on 11 September 2008 and 18 September 2008. Two separate settlement events, in May 2013 and October 2014.