

Does Capital Market Pressure to Deliver Financial Performance Affect Product Safety?

Empirical Evidence from Product Recalls

Gilles Hilary
Georgetown University
gilles.hilary@georgetown.edu

Mark (Shuai) Ma
The University of Pittsburgh
mark.ma@pitt.edu

Wenjia Yan
Nanjing University
wenjiayan@nju.edu.cn

Abstract

We investigate the impact of capital market pressure to deliver short-term financial performance on product safety. We find that firms that face heightened pressure exhibit a higher probability of product recalls. Further, the association between capital market pressure and the probability of recall is stronger when the CEO has a financial background or is especially powerful within the firm but is mitigated when the COO is relatively more powerful. These results were robust in alternative samples and multiple robustness tests. Overall, our findings underscore how pursuing short-term financial goals may lead to myopic behavior and divert attention from crucial operational aspects, leading to compromised product quality and subsequent safety issues necessitating recalls. Expanding prior findings from the operation and finance literature, we also offer actionable recommendations for firms that wish to mitigate the deleterious effects of capital market pressure.

Keywords: Financial performance, product safety and recall, capital market pressure, managerial myopia.

Acknowledgements: We thank Dr. Tyson Browning (Editor), Dr. Rogelio Oliva (Editor in Chief), 3 anonymous reviewers, the anonymous Associate Editor, the anonymous department Editor and our colleagues at the University of Pittsburgh and Nanjing University for their insightful comments and suggestions.

Does Capital Market Pressure to Deliver Financial Performance Affect Product Safety?

Empirical Evidence from Product Recalls

1. Introduction

Managers face strong pressure from the capital market to deliver short-term financial performance (Bolton et al., 2006). The impact of such pressure on firms' operational decisions and on outcomes of the production process is an important concern at the intersection of operations management, management, and finance. We investigate how this pressure affects product safety, which is an integral part of product quality and is critical in determining firms' long-term success (Health and Safety Executive, 2005; Shaheen & Smith, 2019). Prior studies suggest that product safety issues result in both direct and indirect costs to the firm, including negative stock market reactions, damaged brand reputation, loss of customers, and product liability lawsuits (Eilert et al., 2018; Hora et al., 2011; Javadinia et al., 2024; Liu & Shankar, 2015; Mafael et al., 2022). It is estimated that defective products cost consumers more than \$1 trillion annually in severe cases of property damage, injury, sickness, or even loss of life (Carpenter, 2018). Therefore, understanding the determinants of product safety and its failures has important implications for operation managers and other stakeholders.

The concern about the effect of capital market pressure on corporate products is long-standing. For example, surveys in the 1980s contrasted the effect of financial markets on American and Japanese executives and their products (Abegglen & Stalk, 1985). Yet, to our knowledge, empirical research has not reached a conclusion on the effect of this pressure on product safety. However, several theoretical models have investigated how such pressure can lead to myopic managerial behavior. For example, the literature suggests that stock price pressure in general (Shleifer & Vishny, 1990; Stein, 1988) and the need to cater to the short-term performance

demands of transient investors in particular (Bolton et al., 2006) act as major sources of myopia. Despite their heterogeneous analytical approaches,¹ these different models show how managers may be pressured to focus on short-term financial performance at the expense of the firm's long-term welfare. Given the overarching prediction of this line of research, we expect that managers, confronted with the need to deliver good financial results on a regular basis, may be tempted to cut discretionary spending on quality control and maintenance to achieve these short-term objectives at the expense of long-term objectives. In turn, product quality and safety could be negatively impacted. Therefore, we predict that capital market pressure leads managers to make myopic corporate decisions that engender serious product quality issues and threats to consumer safety that ultimately trigger product recalls.

We evaluate this prediction and factors that may moderate it. An empirical challenge for testing our prediction is measuring product safety, a multidimensional construct with potential polysemy depending on the specific context. We follow the literature to address this concern and use product recalls as our empirical proxy for underlying product safety issues.² We obtain a sample of product recalls identified based on news and corporate filing searches, which allows us to consider safety issues in a broad cross-section of firms from different industries.

Our overall theoretical and practical interests are based on the desire to gain insights into why some firms experience more product safety issues than others. Thus, the first objective of this study is to empirically validate a salient factor that can be associated with these occurrences. Naturally, a follow-up question is which managers are prone to such pressure. Therefore, we

¹ Models of corporate myopia include the signal-jamming (Stein, 1989), multiperiod agency (Bolton et al., 2006), and failure-to-arbitrage (Shleifer & Vishny, 1990) models. Specifying the precise theoretical mechanism that leads to corporate myopia in our setting is beyond the scope of this study.

² Product recalls are costly to firms (Wowak and Boone, 2015). Therefore, firms would not recall their products unless the products indeed have safety issues.

further examine the moderating effects of the characteristics of two executives who are heavily embedded in the production process, the chief executive officer (CEO) and the chief operating officer (COO). Top echelon executives have been heavily criticized for prioritizing financial performance over product safety in high-profile product safety incidents, such as the cases of the 2010 Toyota cars and the Boeing 737 airplanes. Following the step-down of its former CEO, Boeing's board faced a fierce debate over how to find a new CEO who would not sacrifice product safety for short-term performance. Understanding the moderating effects of executives' characteristics on the association between capital market pressure and product recalls has important practical implications for identifying solutions that firms and boards can deploy to mitigate the negative effects of capital market pressure. These analyses help us better understand the roles of these executives in operational processes and decisions (Bendoly & Oliva, 2024). This is the second objective of our study.

2. Literature Review and Hypothesis Development

2.1. Prior Literature on Product Safety and Recalls

The provision of safe products is a basic societal and legal expectation. A vast literature suggests that safety issues have significant negative consequences for firms and multiple stakeholders (Cleeren et al., 2017; Li et al., 2022; Shah et al., 2017; Wowak & Boone, 2015). For example, studies have documented that recalls negatively affect brand reputation (Barber & Darrough, 1996; Jarrell & Peltzman, 1985), product market demand (Liu & Shankar, 2015; Rhee & Haunschild, 2006), and selling prices (Hammond, 2013; Hartman, 1987). Unsafe recalled products may also cause severe injuries or even death to customers (Liu et al., 2016). Yet, despite such high costs, product safety incidents and recalls of unsafe merchandise remain common (Shah

et al., 2017). Therefore, understanding the root causes of product safety issues has important implications for both operational practitioners and regulators.

More recently, researchers have started investigating determinants of product safety. Several studies have examined the role of firms' internal production factors. For example, pressure on production capacity (Lu & Lu 2017), production complexity (Shah et al., 2017), component sharing (Ramdas & Randall 2008), distance between upstream and downstream factories (Bray et al., 2019), and issues with after-sales maintenance contracts (Guajardo et al., 2012) significantly impact safety. A few studies have further investigated the role of external actors. They find that product safety can be negatively affected by foreign suppliers (Steven et al., 2014; Steven & Britto, 2016) and industry competitors (Ball et al., 2018; Lam et al., 2022). However, none of these prior studies have considered the effect of capital markets on managers' operational decisions related to product safety, though managers have been heavily criticized for prioritizing capital market performance over product safety in recent product safety scandals (e.g., the Boeing 737 airplane case). Yet Wang et al. (2021) suggest it is important for operation management (OM) research to investigate managerial short-termism in the presence of information asymmetry.

2.2. Market Pressure and Corporate Myopia

Theoretically, analytical models have suggested, at least since Holmström (1982), that focusing on a firm's short-term profitability distracts investment away from the first-best level if investors have incomplete information about how much the firm ought to invest to maximize its long-term value. In particular, Narayanan (1985), Stein (1989), and von Thadden (1995) show analytically how managers can boost short-term earnings through hidden actions at the expense of long-term corporate value. Survey evidence (Graham et al., 2005) confirms this intuition and indicates that executives express their willingness to engage in myopic actions to boost earnings

temporarily. Empirically, Asker et al. (2015) provide archival evidence suggesting that myopia may be an inevitable consequence of being listed. Unsurprisingly, there is extensive evidence that managers manipulate accounting numbers to meet or beat earnings expectations and increase stock prices (Burgstahler & Dichev, 1997). Research further finds that this pressure to report higher accounting numbers has real consequences for firm operations. For example, managers cut spending on research and development (Baber et al., 1991), equipment maintenance (Graham et al., 2005), and advertising (Bendig et al., 2018; Cohen et al., 2010) to meet earnings forecasts. They also sell long-term assets and marketable securities (Herrmann et al., 2003) and engage in overproduction (Roychowdhury, 2006). Overall, the literature confirms that many firms' managers are subject to significant capital market pressure, and this pressure may lead them to act myopically.

The example of Boeing shows how this can happen. In 1997, Boeing relocated from Seattle to Chicago, which was expected to focus the company on the financial markets (Muellerleile, 2009).³ Consistent with this view, Mukunda (2014) indicated that the company started developing products with unprecedented level of outsourcing to maximize Boeing's return on net assets (RONA). Outsourcing removed assets from Boeing's balance sheet, but this raised concerns from engineers because it made supply chains so complex that it affected product quality.⁴ Yet, financial analysts and investors developed concerns about Boeing's civilian airplane profitability in 2015.⁵ In response, the company doubled down on cost-cutting measures.⁶ Later, several Boeing airplanes

³ Goldstein (2019) notes, "This was a priority of the finance veterans now at the top of Boeing's organizational chart. The company's decision to leave Seattle ... symbolized this transition away from engineering and toward becoming a shareholder-driven firm." <https://prospect.org/infrastructure/transportation/2024-01-09-boeing-737-max-financial-mindset/>

⁴ The article further states, "Boeing's decision to minimize its assets was made with Wall Street in mind. RONA is used by financial analysts to judge managers and companies, and the fixation on this kind of metric has influenced the choices of many firms."

⁵ For example, the *Seattle Times* ran an article titled "Will 787 Program Ever Show an Overall Profit? Analysts Grow More Skeptical," while *Forbes* subsequently indicated in 2016 that "The negative surprise last month of lower-than-expected [by financial analysts] 2016 earnings and aircraft delivery guidance sent stock plunging as low as 10% off the previous day's close."

⁶ "Ray Conner, the CEO of Boeing Commercial Airplanes, told the Leadership team and employees via a webcast that a new, major effort of cost cutting and job reductions is needed." The article also indicated the presence of potential accounting irregularities. <https://www.forbes.com/sites/scotthamilton5/2016/02/11/cost-cutting-pricing-pressure-and-sec-probe-hit-boeing-stock-again/?sh=60baa0764f54>

crashed and depressurized. A Boeing engineer alleged that significant safety improvements were blocked during the jet's development because corporate management cared more "about speed, cost-cutting, and bean count" but was "not concerned about safety, just meeting schedule" (BBC, 2019). These planes were grounded and subject to additional testing.

Because there is no universally agreed-upon measure of financial market pressure in the literature, different studies have used different metrics. We consider three groups of market participants that are well documented in the literature as vectors of capital market pressure. We start with financial analysts because of their importance in the financial markets (Bradshaw, 2011) and because of the extensive literature showing that analysts can impose undue pressure on the firms that they cover. For example, Huang et al. (2016) concluded that "our evidence suggests that greater analyst coverage raises the pressure on managers to meet analyst earnings forecasts." This pressure is due to the fact that missing forecasts can have dire consequences for firms and their executives.⁷ Further, firms also face incentives to increase analyst coverage by reporting better financial performance (Bhushan, 1989; McNichols & O'Brien, 1997) because a decrease negatively affects them. For example, losing coverage increases the cost of equity (Bowen et al., 2008), reduces financial flexibility (Chang et al., 2006), and exacerbate the risk of delisting (Mola et al., 2013). This phenomenon creates a positive feedback loop between good financial performance and additional pressure. In turn, this coverage increases the pressure to meet analyst forecasts through myopic behavior. For example, He and Tian (2013) found that the habit of

⁷ For example, He and Tian (2013) note that "Whenever [financial analysts] expect the firms to experience a drop in near-term earnings, they would revise their forecasts downward and make unfavorable recommendations, leading to negative market reactions and potential disciplinary actions against the managers (see, e.g., Brennan et al., Swaminathan, 1993; Hong, Lim, and Stein, 2000)." They also cite several adverse personal consequences for managers who miss the consensus earnings forecasts, including "significant declines in the firms' stock prices (Bartov, Givoly, and Hayn, 2002), reduced CEO bonuses (Matsunaga and Park, 2001), and an increased probability of management turnover (Mergenthaler, Rajgopal, and Srinivasan, 2011)."

closely following analysts hinders corporate innovation by imposing pressure on managers to focus on meeting short-term earnings forecasts.

In addition, we consider two other important market participants: short-term institutional investors and short sellers. The literature on these market participants also suggests they may induce intense pressure to deliver good financial results in the short run. For example, Bushee (2001) found that short-term institutional investors give firms with strong short-term performance a much higher stock market valuation and penalize those with good long-term performance but weak short-term performance. Brochet et al. (2015) found a correlation between the presence of short-term investors and corporate myopia (proxied by manipulation of accounting earnings), and Cremers et al. (2020) also provided consistent empirical results. Similarly, Ringgenberg (2014) indicated that “The results suggest short sales exert considerable price pressure,” and Kunzmann and Meier (2016) suggested that managers who fail to deliver results could be forced to leave their positions when short sellers heavily short their firms. Accordingly, after reviewing the literature, we identified three types of market participants who generate pressure that may induce myopia, but we acknowledge that the effect of these participants is multi-dimensional. For example, analysts may also improve transparency (Chang et al., 2006). Because our goal is to obtain an empirical proxy for market pressure, we do not simply consider them separately but we also extract their commonality using a principal-component analysis.

2.3. Hypotheses

Studies find that analysts may lead managers to engage in myopic decisions such as forgoing innovative projects (He & Tian, 2013), cutting discretionary expenditures (Irani & Oesch, 2016), or reducing marketing expenses (Currim et al., 2018). Moreover, Cremers et al. (2020) stated, “An inflow of short-term institutional investors predicts an increase in the likelihood that

firms cut R&D investment to report higher earnings....When short-term investors subsequently leave, the reductions in R&D, higher earnings, and the increase in firm valuations are reversed.”

Such financial performance pressure may also lead managers to make decisions that create more product quality and safety issues. The literature suggests that primary causes for product safety issues include insufficient maintenance of machinery, antiquated manufacturing technology, employee errors, overutilization of plants, and lack of quality control systems and continuous monitoring (Connally, 2009; Taylor, 2011; Shah et al., 2017). In this context, financial market pressure may negatively affect product safety. For example, managers may attempt to boost their firms’ sales revenues to improve reported earnings by rushing to release new products to market without undergoing time-consuming safety inspections. They could also improve short-term financial performance by myopically cutting spending on product safety protocols, employee training, or machine maintenance, because the payoffs to these investments accrue slowly over time. As a result, product defects may arise because of the lack of safety checks. Thus, we expect capital market pressure to be associated with more safety incidents proxied by product recalls.

Hypothesis H1: Capital market pressure to deliver short-term financial performance increases the probability of product recalls.

We next examine whether some firms are more likely to succumb to capital market pressure than others. Specifically, we consider the effect of two CEO characteristics and one COO characteristic. The first one that we consider is whether a CEO has a financial background. Prior studies suggest that CEOs’ behavior is affected by their formative years (Custódio & Metzger, 2014; Wang & Yin, 2018). Thus, CEOs who have a financial background may pay more attention to firms’ financial and short-term capital market performance, which would amplify the consequences of market pressure. Indeed, in the high-profile Boeing case, the financial background of its former CEO, David Calhoun, was often identified as the reason why the manager prioritized

short-term performance over product safety (CNN 2024; NPR 2024). Following his resignation, the company evaluated several potential candidates. Both the board of directors and many external experts suggested that the company needed to choose someone with an engineering profile rather than another financial expert. As a result, several internal candidates were rejected because they came “from a finance background, not an engineering background” (CNN, 2024). Ultimately, the company chose Robert Ortberg, who had “a background in engineering, not finance,” as its new CEO (NPR, 2024). Although this clinical analysis suggests that a financial background makes CEOs more prone to capital market pressure, to the best of our knowledge, this issue has not been rigorously evaluated in the literature.

Hypothesis H2: The association between capital market pressure to deliver short-term financial performance and the probability of product recalls is stronger when the CEO has a financial background.

We also consider two potential countervailing forces. We start with another important CEO characteristic, their power within the firm. Prior studies suggest that more powerful CEOs are more likely to engage in myopic behavior, such as financial misconduct and socially irresponsible behavior (Friedman, 2014, Kwon et al., 2023), because “a powerful CEO is less likely to receive independent advice or to have her decisions scrutinized” (Han et al., 2016). In the context of product safety issues, powerful CEOs may ignore warnings from other management team members and employees about the potential negative effects of cutting investment into safety. Without checks and balances, CEOs are more likely to prioritize short-term financial performance that would benefit themselves in the short-term at the risk of long-term costs to shareholders. With stronger controls, this is less likely to be the case.

Hypothesis H3: The association between capital market pressure to deliver short-term financial performance and the probability of product recalls is stronger when the CEO is more powerful.

Further, we consider a second countervailing force, a powerful COO. While the CEO focuses on vision, strategy, and external relations, especially with financial markets, the COO is responsible for day-to-day operations and operational efficiency (Puutio, 2024). Thus, a COO is directly responsible for the production process and product quality. This difference in focus often leads to a divergence of priorities. If the CEO's strategies appear disconnected from the organization's realities, the COO can advocate for more feasible, operationally grounded, options. Their deep understanding of the company's resources allows them to provide independent feedback on CEOs' operation-related decisions and to propose alternative solutions that ensure sustainable growth (Marcel, 2009). If the COO is relatively more powerful within the firm, they are also more likely to oppose decisions when the CEO wants to cut safety investment to improve short-term financial performance. Practitioners seem to share this view. For example, McKinsey (2023) notes that "As CEOs are increasingly public facing, dealing with external constituencies and stakeholders, the COO is becoming a counterweight."⁸ This reasoning motivates our last hypothesis:

Hypothesis H4: The association between capital market pressure to deliver short-term financial performance and the probability of product recalls is weaker when the COO is more powerful.

3. Sample and Variables

3.1. Sample Selection

We obtain a dataset of product recalls from the Refinitiv ESG database. The database collects information about product recalls through news and corporate filings searches and covers product recalls from a variety of industries. We obtain financial data from Compustat and analyst coverage data from IBES. We retain only manufacturing firms. After linking the recall sample with other

databases and removing observations with missing data,⁹ our final sample contains 5,099 firm-year observations, including 570 firm-year observations of recall firms. Table 1 below details the sample selection process.

Table 1
Sample Selection

	# of Observations
Firm-year observations of companies covered by the Refinitiv ESG database from 2015 to 2023	28,285
Less:	
Observations in nonmanufacturing industries	13,912
Observations with missing short interest or institutional ownership information	3,355
Observations with missing CEO characteristics information	1,067
Observations with missing financial information	4,852
Final sample	<u>5,099</u>
Including observations with recalls	570

3.2. Dependent Variable

To test H1, the dependent variable (*Recall*) is an indicator of firm-year observations with at least one product recall in the following year $t + 1$. The Refinitiv database includes information about the incident of product recalls by a firm in a certain year but does not provide other details, such as injuries or product damages caused by the safety issue. As discussed below, we use a second, smaller, but more detailed sample to provide additional analysis.

3.3. Independent Variables

Our key independent variable is *Pressure*, a composite measure of capital market pressure to deliver financial performance during the current year t based on short-term investors, short-sellers, and analyst coverage. We measure *Pressure* as the first principal component of analyst coverage, short interest, and the percentage of short-term investor ownership for the firm. In addition to this composite measure, we also used the three individual variables as robustness checks: *Analyst Coverage* is the natural logarithm of one plus the number of analysts covering the firm; *Short*

⁹ We collected the announcement date of a recall and identified the fiscal year in which the recall fell based on the beginning and ending dates of the firm's fiscal year.

Interest is the firm's short interest; *Short-Term Investor Ownership* is the percentage of short-term institutional investor ownership for the firm.

We identify seven determinants of recalls from the literature as control variables. In particular, we used the natural logarithm of total assets (*Size*) to proxy for firm size (Giannetti & Srinivasan, 2022; Kini et al., 2017; Singh & Grewal, 2023; Steven et al., 2014; Steven & Britto, 2016), return on asset (*ROA*) as a proxy for firm profitability, and financial leverage (*Leverage*) as a proxy for financial constraints (Ball et al., 2018; Giannetti & Srinivasan, 2022; Kini et al., 2017). We also controlled for R&D intensity (*R&D*; Ball et al., 2018; Kini et al., 2017; Singh and Grewal, 2023; Steven et al., 2014; Steven & Britto, 2016; Thirumalai & Sinha, 2011; Wowak et al., 2021), *Firm Age* (Ball et al., 2018; Singh & Grewal, 2023), *CEO Tenure* (Giannetti & Srinivasan, 2022), capital expenditures (*CAPX*; Singh & Grewal, 2023; Steven et al., 2014; Steven & Britto, 2016), and past recall behavior (*Past Recall*). Further, we also included several additional variables that correlate with *Pressure*, including firm sales (*Log[Sale]*), dividend payments (*Dividend*), and the frequency of management earnings guidance (*Management Guidance*; Bushee & Noe, 2000; McKenzie & Henry, 2012; Shores, 1990). In addition, we control for both three-digit SIC industry fixed effects and year-fixed effects.

Table 2
Variable Definition

Variable Name	Definition
<i>Recall</i>	An indicator for observations with product recalls in the following year. Source: Refinitiv.
# <i>Recall</i>	The frequency of product recalls by the firm in the following year. Source: CPSC.
<i>Ln#Recall</i>	The natural logarithm of one plus the number of product recalls in the following year. Source: CPSC.
# <i>Injury</i>	The number of injuries due to defective products reported by customers in the following year. Source: CPSC.
# <i>Damage</i>	The natural logarithm of one plus the number of product safety reports that involve property damage due to defective products in the following year. Source: CPSC.
# <i>Death</i>	The natural logarithm of one plus the number of deaths due to defective products in the following year. Source: CPSC.

<i>#Report</i>	The number of reports of product safety issues by the firm in the following year. Source: CPSC.
<i>Severity Index</i>	The severity level of a hazard due to product safety issues by the firm in the following year. It is set to one if there are customer reports of safety incidents, two if there is at least one report of customer injury or property damage, and three if there is at least one report of death. Source: CPSC.
<i>Pressure</i>	The first principal component of <i>Coverage</i> , <i>Short Interest</i> , and <i>Short-Term Investor Ownership</i> . Source: IBES, Short Interest File, Brian Bushee's website, and Thomson Reuters.
<i>Analyst Coverage</i>	The natural logarithm of one plus the number of analysts that covered the firm during the current year. Source: IBES.
<i>Short Interest</i>	Short interest ratio, expressed as the number of shares sold short (SHINT) divided by the total number of outstanding shares (CSHO). Source: Short Interest File.
<i>Short Term Investor Ownership</i>	Percentage of short-term investor ownership of total institutional ownership. Source: Brian Bushee's website and Thomson Reuters.
<i>Treat</i>	An indicator equal to one for a treated firm that experiences an exogenous drop in analyst coverage due to brokerage closures or mergers and zero otherwise. Source: IBES and SDC.
<i>Post</i>	An indicator equal to one for observations in the posttreatment period and zero otherwise. Source: IBES and SDC.
<i>Size</i>	Firm size, calculated as the natural logarithm of total assets (AT) at the end of the current year. Source: Compustat.
<i>ROA</i>	Return on assets, calculated as pretax income (PI) scaled by total assets (AT). Source: Compustat
<i>Leverage</i>	Financial leverage, calculated as total debt (LT) scaled by total assets (AT) at the end of the current year. Source: Compustat.
<i>R&D</i>	Research and development expense, calculated as research and development expense (XRD) scaled by total assets (AT). Source: Compustat
<i>Advertising Expense</i>	Advertising expense, calculated as advertising expense (XAD) scaled by total assets (AT). Source: Compustat.
<i>Firm Age</i>	The natural logarithm of the difference between the current year and the first year when the firm appears in CRSP. Source: CRSP
<i>CEO Tenure</i>	The number of years that the CEO is in the current position. Source: BoardEx.
<i>Past Recall</i>	An indicator for firms with recalls in the past year. Source: Refinitiv.
<i>CEO Financial Background</i>	An indicator for CEOs who have both an MBA degree and financial expertise. Source: BoardEx.
<i>CEO Power</i>	CEO's power within the firm, which is measured as the CEO's compensation relative to that of the other four top executives. Source: Execucomp.
<i>COO Power</i>	COO's power relative to the CEO's, which is measured as the COO's compensation relative to the CEO's compensation. Source: Execucomp.
<i>CAPX</i>	Capital expenditure, calculated as capital expenditure (CAPX) scaled by total assets (AT). Source: Compustat.
<i>Log (Sale)</i>	The natural logarithm of a firm's sales (SALE). Source: Compustat.
<i>Dividend</i>	The firm's total cash dividends (DV) paid to common shares divided by total assets (AT) at the end of the current year. Source: Compustat.
<i>Management Guidance</i>	The natural logarithm of one plus the number of management earnings guidance in the following year. Source: IBES.

4. Methods

Panel A of Table 3 reports the descriptive statistics. On average, 11.2% of firms incur product recalls. The average firm has an *ROA* of 6.3% and a leverage ratio of 0.539. Therefore, the sample firms are generally financially healthy. Panel B shows that the frequency of recalls is relatively stable over the sample period. Table A1 of the Online Appendix reports the correlation matrix.

Table 3

Sample Description

Panel A Descriptive Statistics

Variable	N	Mean	Std. Dev.	Median
<i>Recall</i>	5,099	0.112	0.315	0.000
<i>Pressure</i>	5,099	-0.029	0.516	-0.026
<i>Analyst Coverage (without log)</i>	5,099	11.665	8.651	10.000
<i>Short Interest</i>	5,099	0.053	0.104	0.031
<i>Short-Term Investor Ownership</i>	5,099	0.134	0.094	0.113
<i>Size</i>	5,099	8.074	1.621	7.924
<i>ROA</i>	5,099	0.063	0.137	0.071
<i>Leverage</i>	5,099	0.539	0.243	0.537
<i>R&D</i>	5,099	0.046	0.084	0.019
<i>Advertising Expense</i>	5,099	0.011	0.030	0.000
<i>Firm Age</i>	5,099	3.145	0.813	3.296
<i>CAPX</i>	5,099	0.033	0.026	0.026
<i>Log (Sale)</i>	5,099	7.771	1.662	7.752
<i>Dividend</i>	5,099	0.019	0.038	0.009
<i>Management Guidance</i>	5,099	0.060	0.312	0.000
<i>CEO Tenure</i>	5,099	1.766	0.874	1.792
<i>Past Recall</i>	5,099	0.090	0.286	0.000

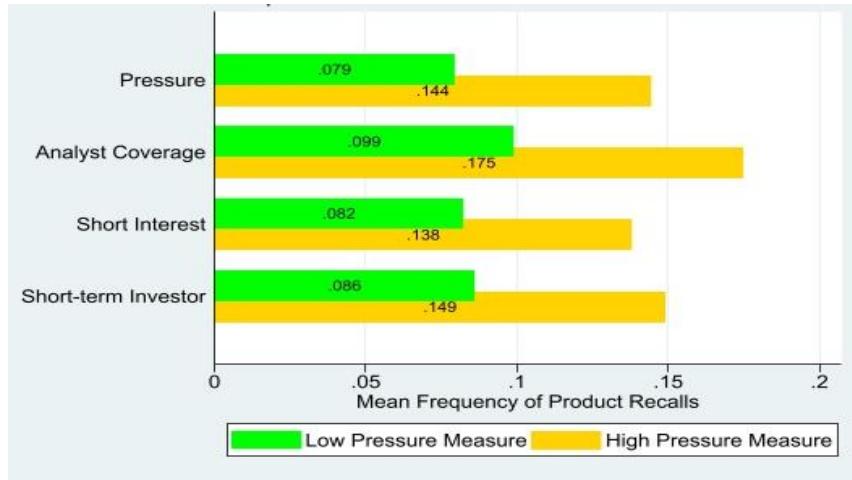
Panel B Sample Distribution by Year

Year	No. of observations	No. of observations with at least one recall
2015	422	24
2016	535	53
2017	583	50
2018	587	64
2019	604	62
2020	613	67
2021	615	47
2022	604	99
2023	536	104

Note: This table shows the sample characteristics. Panel A reports the descriptive statistics for our primary sample, including the number of observations, means, standard deviations, bottom quartile, median, and top quartile. Panel B reports the characteristics of the recalls for the subsample with product recalls (*#Recall>0*), including the number of observations, mean, standard deviations, 10th percentile, bottom quartile, median, top quartile, and 90th percentile. Panel B shows the sample distribution and observations with recalls by year.

In Figure 1, we compare the mean frequency of recalls for subsamples split based on the median for the composite measure and each individual measure of capital market pressure. The figure consistently shows more recalls when the pressure to deliver financial performance is heavier.

Figure 1
Capital Market Pressure and Product Recalls



4.1. Recall Probability

To evaluate Hypothesis 1, we estimated the following regression Model (1):

$$\begin{aligned} Recall_{i,t+1} = & \alpha_0 + \alpha_1 Pressure_{i,t} + \alpha_2 Size_{i,t} + \alpha_3 ROA_{i,t} + \alpha_4 Leverage_{i,t} + \alpha_5 R&D_{i,t} + \alpha_6 \\ & Advertising\ Expense_{i,t} + \alpha_7 Firm\ Age_{i,t} + \alpha_8 CEO\ Tenure + \alpha_9 CAPX_{i,t} + \alpha_{10} Log(Sale)_{i,t} \\ & + \alpha_{11} Dividend_{i,t} + \alpha_{12} Management\ Guidance_{i,t} + \alpha_{13} Recall\ Past_{i,t} + \text{Industry Fixed} \\ & \text{Effects} + \text{Year Fixed Effects} + \varepsilon. \quad (1) \end{aligned}$$

We estimated this equation by using either a probit model or a linear model. The dependent variable *Recall* is an indicator that equals one if firm *i* has at least one recall in year *t+1* and zero otherwise. Because *Pressure* may be affected by recalls, we lag the independent variables by one period to mitigate concerns about reverse causality. Table 4, Panel A, reports the main regression results.¹⁰ The first and third columns use probit regressions, and the other two columns use linear regressions. The coefficients on *Pressure* are positive and significant in all four columns (*t*-

¹⁰ All regressions use firm-clustered standard errors.

statistics = 3.02, 2.74, 4.32, and 2.09, respectively). These findings are consistent with the hypothesis (H1), which states that capital market pressure negatively affects product safety and leads to more recalls. The effect of capital market pressure on product safety was economically significant. Based on the marginal effects of the probit regression in column 2, when *Pressure* increases by one standard deviation, the probability of *Recall* increases by approximately 1.1%. Consistent with the view that innovative firms incur more recalls (Thirumalai & Sinha, 2011), firms with higher research and development expenditures incur more product recalls.¹¹

We report linear regressions using individual measures of capital market pressure in Panel B. As in Panel A, the coefficients on these three independent variables are all positive and significant.¹² Based on the marginal effects of the probit regression in column 2, when *Analyst Coverage*, *Short Interest*, or *Short-Term Investor Ownership* increases by one standard deviation, *Recall* increases by approximately 10%, 2.4%, or 2% of its standard deviation, respectively. Results were similar when we used probit regressions. Therefore, all these results support H1. They complement each other and help mitigate the risk of alternative explanations. For example, analysts may encourage managers to be more transparent about product safety information that is damaging (Chang et al., 2006). However, this explanation does not apply to tests with short-term investor ownership or short sellers; as Jia and Menon (2023) stated, “when shareholder short-termism is high, the manager only discloses good news and withholds bad news.”

Table 4
Capital Market Pressure and Product Recalls
 Panel A Composite Measure of Pressure

	(1)	(2)	(3)	(4)
Dependent Variable =			<i>Recall</i>	
Model =	<i>Probit</i>	<i>Probit</i>	<i>Linear</i>	<i>Linear</i>

¹¹ Instead of controlling for research and development expenditures, we alternatively control for intangible assets in Table A2 of the Online Appendix and find similar results.

¹² In Table A3 of the Online Appendix, we test whether analyst coverage has a nonlinear effect but do not find a nonlinear effect.

	(1)	(2)	(3)
Dependent Variable =	Recall		
Pressure Measure =	Analyst Coverage	Short Interest	Short-Term Investor Ownership
Pressure Measure	0.016** (2.002)	0.078* (1.874)	0.068** (2.035)
Control Variables	YES	YES	YES
Intercept	YES	YES	YES
Year FE	YES	YES	YES
Industry FE	YES	YES	YES
Observations	5,099	5,099	5,099
Unique Firms	651	651	651
Pseudo R ² /R ²	0.104	0.367	0.079

Note: This table tests the association between capital market pressure and the occurrence of product recalls. We include (but do not tabulate) an intercept, industry-, and year-fixed effects. We report firm-clustered t-statistics in parentheses; ***, **, and * indicate significance at the 1%, 5%, and 10% levels (two-tailed).

Panel B Individual Measure of Pressure

	(1)	(2)	(3)
Dependent Variable =	Recall		
Pressure Measure =	Analyst Coverage	Short Interest	Short-Term Investor Ownership
Pressure Measure	0.016** (2.002)	0.078* (1.874)	0.068** (2.035)
Control Variables	YES	YES	YES
Intercept	YES	YES	YES
Year FE	YES	YES	YES
Industry FE	YES	YES	YES
Observations	5,099	5,099	5,099
Unique Firms	651	651	651

Pseudo R ² /R ²	0.171	0.202	0.235
Note: This table tests the association between capital market pressure and the occurrence of product recalls. We include (but do not tabulate) an intercept, industry-, and year-fixed effects. We report firm-clustered t-statistics in parentheses; ***, **, and * indicate significance at the 1%, 5%, and 10% levels (two-tailed).			

4.2. Moderating Effects

Next, we consider the moderating effects of CEO and COO characteristics with two goals: a) providing insights into what measures practitioners can take to counteract the negative effects of capital market pressure, and b) providing additional evidence on the underlying mechanism for the effect of capital market pressure on product safety. First, we identify CEOs with a financial background (*CEO Financial Background*) as those who have an MBA degree (i.e., the most prominent business administration degree with significant emphasis on financial education) and who were identified as financial experts by their firms. Hypothesis 2 is predicated on the notion that CEOs with a financial background are more likely to prioritize financial performance over product safety. Our next moderator variable is the power of the CEO within the firm (*CEO Power*). We measure CEO power based on the CEO's compensation relative to that of the other four top executives (Cheng et al., 2016).¹³ When a CEO is paid much more than other executives, this centrality is an indicator of their power (Bebchuk et al., 2007). H3 predicts that powerful CEOs are more likely to ignore warnings from others about the potential product safety effects of the decisions they have made to enhance short-term financial performance. The third moderator is the relative power of the COO (*COO Power*). We measure *COO Power* as the COO's compensation relative to the CEO's compensation. H4 indicates that a relatively powerful COO is in a position to mitigate the nefarious effects of market pressure.

Table 5 reports the results of the linear regression models.¹⁴ In both columns, we find negative and significant coefficients on the interaction terms between *Pressure* and *CEO Financial*

¹³ Firms are required to disclose the compensations of their top five executives.

¹⁴ We used a linear model rather than a probit one because of Ai and Norton (2003).

Background. The coefficients on *Pressure* remain positive and significant. Therefore, these findings suggest that the negative effect of the pressure to deliver financial performance on product safety is indeed more pronounced when the CEO has a financial background. In terms of economic magnitude, the effect of *Pressure* on *Recall* was 114% higher ($= 0.072/0.063$) when the CEO had a financial background. These tests are consistent with H2. Consistent with H3, we also find positive and significant coefficients on the interaction terms between *Pressure* and *CEO Power*. In terms of economic magnitude, the effect of *Pressure* on *Recall* was 146% higher ($= 0.046^*2/0.063$) when *CEO Power* equals 2 (i.e., CEO compensation is twice as high as other executives' average compensation). Consistent with H4, we find negative and significant coefficients on the interaction terms between *Pressure* and *COO Power*.

Table 5
Moderating Effects

Dependent Variable =	(1)	(2)
	<i>Recall</i>	
<i>Pressure</i> * <i>CEO Financial Background</i>	0.058*	0.072**
	(1.736)	(1.998)
<i>Pressure</i> * <i>CEO Power</i>	0.070**	0.046*
	(2.170)	(1.680)
<i>Pressure</i> * <i>COO Power</i>	-0.079*	-0.100**
	(-1.835)	(-2.123)
<i>Pressure</i>	0.063***	0.063***
	(3.177)	(4.239)
<i>CEO Financial Background</i>	0.015	0.005
	(0.620)	(0.208)
<i>CEO Power</i>	-0.003	0.001
	(-0.540)	(0.253)
<i>COO Power</i>	-0.000***	-0.000*
	(2.219)	(2.239)
Control variables	NO	YES
Intercept	YES	YES
Year FE	YES	YES
Industry FE	YES	YES
Observations	4,111	4,111
Unique Firms	605	605
Pseudo R ² /R ²	0.081	0.107

Note: This table reports linear regression results of moderating effects associated with CEO and COO characteristics. We include (but do not tabulate) an intercept, industry-, and year-fixed effects in each regression. We report firm-clustered t-statistics in parentheses. We provide the variable definitions in Appendix A; ***, **, and * indicate significance at the 1%, 5%, and 10% levels (two-tailed).

5. Additional Analyses

Next, we conduct additional tests to support the validity of our findings and their interpretation. We tabulate most of the results in the Online Appendix because of space constraints.

5.1. CPSC Recalls

Our main sample covers recalls of firms in multiple industries to ensure the generalizability of our findings. However, standards for recalls may vary across industries, which may introduce some undesirable heterogeneity. To address this potential issue, we provided additional tests using a manually collected sample of only consumer product recalls, which are subject to the same recall requirement by the Consumer Product Safety Commission (CPSC). Congress enacted the Consumer Product Safety Act (CPSA) in 1972 “to protect the public against unreasonable risks of injury associated with consumer products.”¹⁵ The legislation covers both domestically manufactured products and imported goods. The CPSA established the CPSC as the government agency to develop safety standards, promote product safety-related research, monitor consumer markets, investigate product safety incidents, and enforce compliance with the CPSA.¹⁶ Manufacturers and sellers must report to the CPSC immediately after receiving notification that a product does not meet safety standards or “creates a substantial risk of injury to the public.”¹⁷ A product may be defective because of its design, packaging, instructions, construction, unsafe raw materials, or contents. Based on the report and its own monitoring, the commission determines the risk that the defective product poses a “substantial product hazard.” If so, it determines which corrective actions are warranted. The CPSC has the authority to order firms to halt the sale of a

¹⁵ <https://www.cpsc.gov/Regulations-Laws--Standards#:~:text=The%20mission%20of%20the%20Consumer,the%20Consumer%20Product%20Safety%20Act>.

¹⁶ Although the CPSC has the authority to set safety standards for consumer products under some circumstances, it usually defers to voluntary safety standards developed by private industry “standards development organizations” with recommendations from the CPSC.

¹⁷ The CPSC determines whether the product imposes such a risk based on multiple factors, including the potential severity of harm to consumers and whether children or seniors are more likely to be harmed by the product.

hazardous consumer product, recall it, require refunds, and mandate repair or replacement. However, the CPSC can impose such an order only after conducting an administrative hearing, and the firm may challenge the decision. Consequently, the CPSC often encourages the company to correct product hazards voluntarily.

We obtain a dataset of product recalls from the CPSC website.¹⁸ Using manually collected ticker symbols for recalling firms, we identify 396 firm-year observations of U.S. public firms with 548 recalls during the sample period from 2010 to 2019. After merging with other databases and excluding observations of nonmanufacturing firms, we obtain 82 firm-year observations of recall firms before matching.¹⁹ Given the class imbalance in the sample, we use a matched sample to account for observational heterogeneity. We first identify a list of seven independent variables used in recent studies on determinants of products.²⁰ After this procedure, we use propensity-score to match each observation with at least one product recall with up to nine observations without product recalls from the same industry.²¹ Thus, the final sample for our primary empirical analyses in the CPSC sample consists of 559 firm-year observations.²² Table A5 in the Online Appendix explains the sample selection process in greater details. Table A6 provides the descriptive statistics.

¹⁸ See <https://www.cpsc.gov/Recalls>.

¹⁹ The vast majority (73%) can be tied to reports of safety incidents by customers before the products were recalled. For the remaining cases when firms recalled without prior reports of safety incidents, we read their recall announcements. We found that all these firms indicated their products had safety issues that could cause injury, property damages, and even death. For example, Polaris recalled Pro-RMK Snowmobiles in 2012 and stated, “The bolt attaching the front, lower left shock can fail and cause the operator to lose control of the vehicle. This poses a serious hazard of injury or death.” <https://www.cpsc.gov/Recalls/2012/polaris-recalls-pro-rmk-snowmobiles-due-to-injury-death-hazard>

²⁰ We report all the independent variables used in recent studies on determinants of product recalls in Table A4 of the Online Appendix. We include a determinant in our matching process if it is used in at least two recent studies, unless data of the determinant are unavailable or missing for many of our sample firms. These determinants are also the control variables in Model (1).

²¹ Only some recall firms could be matched by exactly nine control firms. So, the sample size is not a multiple of 10.

²² Our sample size (548 recalls from 2015 to 2023) is comparable to prior studies that examine CPSC recalls by US public firms (Lee et al., 2015).

Table 6 reports the regression results using the CPSC recalls. The dependent variable takes two alternative forms: *#Recall* is the number of product recalls that the firm has in the following year $t+1$, and *Ln#Recall* is the natural logarithm of one plus the number of product recalls that the firm has in the following year $t+1$.²³ We include all independent variables from Model (1). In addition, we control for the number of product safety incident reports (*#Report*), the number of injuries reported by customers (*#Injury*), the number of customer reports of property damage (*#Damage*), and the number of deaths caused by the product safety issues (*#Death*).²⁴

Table 6

Capital Market Pressure and Consumer Product Recalls

Panel A Composite Measure of Pressure

Dependent Variable =	(1) <i>#Recall</i>	(2) <i>#Recall</i>	(3) <i>Ln#Recall</i>	(4) <i>Ln#Recall</i>
<i>Pressure</i>	0.302* (1.874)	0.329** (2.004)	0.029* (1.892)	0.024** (2.207)
<i>Size</i>		-1.036** (-2.238)		-0.017 (-0.765)
<i>ROA</i>			-1.443 (-0.886)	0.008 (0.065)
<i>Leverage</i>			-0.530 (-0.943)	-0.039 (-0.985)
<i>R&D</i>			3.594 (0.878)	0.157 (0.443)
<i>Advertising Expense</i>			-0.827 (-0.231)	-0.349 (-1.568)
<i>Firm Age</i>			0.123 (0.597)	0.003 (0.252)
<i>CAPX</i>			1.796 (0.443)	0.173 (0.489)
<i>Log (Sale)</i>			1.367*** (2.734)	0.029 (1.086)
<i>Dividend</i>			9.320* (1.916)	0.790* (1.856)
<i>Management Guidance</i>			0.603	0.020

²³ To mitigate concerns about variations in the dependent variables, we also estimate probit regressions with an indicator for firms with recalls in the following years as the dependent variable in additional tests. We observed a reasonable variation, because 12% of our observations had at least one recall. Results (reported in Table A7 of the Online Appendix) are robust to this approach.

²⁴ As an example, a recall announcement by Hewlett-Packard suggests “HP has received eight new reports of battery packs in the U.S. overheating, melting, or charring, including one report of minor injury and two reports of property damage totaling \$1,100.” In this example, *#Report* is set to 8, *#Damage* is set to 2, and *#Injury* is set to 1. <https://www.cpsc.gov/Recalls/2019/HP-Expands-Recall-of-Batteries-for-Notebook-Computers-and-Mobile-Workstations-Due-to-Fire-and-Burn-Hazards>

<i>Past Recall</i>		(1.556)	(0.458)
	0.145***		0.028
	(2.794)		(0.209)
<i>#Injury</i>	0.022		-0.078
	(1.272)		(-0.771)
<i>#Damage</i>	-0.001		0.192***
	(-1.006)		(6.872)
<i>#Report</i>	-1.056		-0.029
	(-1.185)		(-0.142)
<i>#Death</i>	0.705**		0.011
	(2.045)		(0.164)
Intercept	YES	YES	YES
Year FE	YES	YES	YES
Industry FE	YES	YES	YES
Observations	559	559	559
Unique Firms	153	153	153
Pseudo R ² /R ²	0.083	0.158	0.136
			0.498

Note: This table tests the association between capital market pressure and the occurrence of product recalls. We use a Poisson regression in the first two columns and linear regressions in the next two columns. We include (but do not tabulate) an intercept, industry-, and year-fixed effects. We report firm-clustered t-statistics in parentheses; ***, **, and * indicate significance at the 1%, 5%, and 10% levels (two-tailed).

Panel B Individual Measure of Pressure

Dependent Variable =	#Recall		
	(1)	(2)	(3)
<i>Pressure Measure</i> =			
	<i>Analyst Coverage</i>	<i>Short Interest</i>	<i>Short-Term Investor Ownership</i>
<i>Pressure Measure</i>	0.293** (2.004)	2.590** (2.108)	1.798* (1.948)
Control Variables	YES	YES	YES
Intercept	YES	YES	YES
Year FE	YES	YES	YES
Industry FE	YES	YES	YES
Observations	559	559	559
Unique Firms	153	153	153
Pseudo R ² /R ²	0.119	0.113	0.116

Note: This table reports the Poisson regression test of the association between capital market pressure and product recalls. We include (but do not tabulate) an intercept, industry-, and year-fixed effects in each regression. We report firm-clustered t-statistics in parentheses; ***, **, and * indicate significance at the 1%, 5%, and 10% levels (two-tailed).

The coefficients on *Pressure* are positive and significant in all columns of Panel A

(t-statistics = 2.97, 3.14, 3.35, and 3.06, respectively).²⁵ These findings are consistent with H1.²⁶

²⁵ To mitigate concerns that our results were driven by observations with multiple recalls, we split the sample of recall firms based on the median of recalls per firm-year and reran our tests using these two subsamples with their corresponding matched control samples. We found our results were robust in both subsamples with recalls above and below the median. Results are reported in Table A8 in the Online Appendix.

²⁶ The effect of capital market pressure on product safety was economically significant. Based on the estimate in column 3, when *Pressure* increases by one standard deviation, *#Recall* by approximately 5.3%.

We report results using three individual measures of capital market pressure in Panel B. As in Panel A, the coefficients on these three independent variables are positive and significant. All these different results support H1, which suggests that capital market pressure negatively affects product safety.

Table 7 analyzes the effect of capital market pressure on other characteristics of recalls.²⁷ Specifically, we use three dependent variables that reflect damages caused by the product (before its recall) in Panel A: *#Injury*, the number of injuries reported by customers due to product safety issues related to recalls in the year t+1; *#Damage*, the number of customer reports that involve property damages in the year t+1; and *#Report*, the number of product safety incident reports related to recalls in the year t+1. In Panel B, we use *Severity Index* or the natural logarithm of *Severity Index* plus one as the dependent variable to measure the severity of product safety issues (Liu et al., 2016). We calculated a severity index for each recall based on related incidents, injuries, damages, and deaths.²⁸ A higher *Severity Index* indicates more severe harm to customers.

In both panels, we include all control variables from Model (1). We find positive and significant coefficients on *Pressure* in all three columns in Panel A (t-statistics = 2.02, 2.16, and 2.72, respectively). Therefore, firms facing intense capital market pressure experience more severe product safety issues before the recalls, leading to more reports of safety incidents and more significant damage to consumers' health and property.²⁹ In addition to the regression results, we provide path analyses in Table A9 of the Online Appendix to show how pressure to deliver financial performance affects the number of injuries, damages, and reports through recalls. We

²⁷ In the Online Appendix, we also test the effect of capital market pressure on the issuance of refunds in product recalls.

²⁸ We define the variable more precisely in Table 2.

²⁹ The marginal effects suggest that the frequency of injuries, property damage, and reports increase by 0.353, 0.786, and 0.937, respectively, when *Pressure* increases by one standard deviation. Thus, these effects are economically significant.

find that pressure to deliver financial performance leads to more recalls, injuries, and damages.³⁰

In Panel B, we continue to see positive and significant coefficients on *Pressure* in all columns, indicating that firms facing intense capital market pressure experience more severe product safety issues before the recalls. An alternative explanation for our main findings is that higher market pressure imposes discipline on management to monitor safety issues proactively, and such a disciplinary effect induces managers to initiate more voluntary product recalls even though their product safety issues are less severe. These additional findings help mitigate concerns based on this alternative explanation.

Table 7
Capital Market Pressure and Product Safety Incidents

Panel A. Injury, Damages, and Report

Dependent Variable =	(1) #Injury	(2) # Damage	(3) #Report
<i>Pressure</i>	0.497** (2.018)	0.482** (2.156)	0.853*** (2.719)
Control Variables	YES	YES	YES
Intercept	YES	YES	YES
Year FE	YES	YES	YES
Industry FE	YES	YES	YES
Observations	559	559	559
Unique Firms	153	153	153
R ²	0.164	0.103	0.066

Note: This table tests the association between capital market pressure and product safety incidents. We include (but do not tabulate) an intercept, industry- and year-fixed effects in each regression. We report firm-clustered t-statistics in parentheses; ***, **, and * indicate significance at the 1%, 5%, and 10% levels (two-tailed).

Panel B Hazard Severity

Dependent Variable =	(1) Severity Index	(2)	(3)	(4)
		Log(1+ Severity Index)		
<i>Pressure</i>	0.086** (2.070)	0.073* (1.901)	0.051** (2.164)	0.042** (1.992)
Control Variables	No	YES	No	YES
Intercept	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES

³⁰ In Table A10, we show that firms subject to market pressure are more likely to offer a refund to consumers for defective products recalled in the year following a product recall. A recalling company may provide remedies to customers by repairing the defective product or offering a refund. Relative to a repair, a refund is more expensive and creates more negative consequences for the manufacturer (Liu et al., 2016). Although the marketing literature treats this action as a decision, firms are likely to restrict refunds to cases with more severe product safety issues. Thus, the decision to refund should be correlated with the severity of product safety issues.

Observations	559	559	559	559
Unique Firms	153	153	153	153
Pseudo R ² /R ²	0.140	0.152	0.141	0.150

Note: This table tests the association between capital market pressure and hazard severity levels. We include (but do not tabulate) an intercept, industry-, and year-fixed effects in each regression. We report firm-clustered t-statistics in parentheses; ***, **, and * indicate significance at the 1%, 5%, and 10% levels (two-tailed).

5.2. Instrumental Variable Regression

To address the concern that analyst coverage may be endogenous, we first followed Yu (2008) and provided an instrumental variable (IV) test based on the expected level of analyst coverage as determined by brokerage house size (e.g., the total number of analysts employed).³¹ Yu (2008) indicated that this level varies with the “revenue or profit” of brokerage houses and “capture[s] the variations in analyst coverage that are exogenous to firms’ earnings management behavior.” Safety decisions are even more remote from brokerage decisions than from earnings management. Furthermore, given that each brokerage house follows an extensive portfolio of different firms, the brokerage house’s revenue is unlikely to be significantly related to the product safety of a single client. Therefore, we believe the conditional level of coverage offers an instrument that reasonably fulfills the (untestable) exogeneity assumption. We followed Yu (2008) and computed the expected level of analyst coverage based on the following equations:

$$ExpACover_{(i, t, j)} = (BHSIZE_{(t, j)} \div BHSIZE_{(0, j)}) \times ACover_{(i, 0, j)}. \quad (4)$$

$$ExpACover_{(i, t)} = \sum_{j=1}^n ExpACover_{(i, t, j)}. \quad (5)$$

We use Equation (4) to calculate $ExpACover_{(i, t, j)}$, which is the expected level of analyst coverage of firm i in year t from a specific brokerage house j . To do so, we calculate the growth rate of the brokerage house size from the benchmark year 0 to the current year t by scaling $BHSIZE_{(t, j)}$ with $BHSIZE_{(0, j)}$. $BHSIZE_{(t, j)}$ and $BHSIZE_{(0, j)}$ are the size of brokerage house j in year t and the benchmark year, respectively; 2009 serves as the benchmark year for our study. Then, we

³¹ We note that the literature (Bhushan, 1989; McNichols & O’Brien, 1997) has suggested that analysts cover firms that are easier to follow and more profitable. Thus, the possible endogeneity in our sample may bias against finding our results.

multiplied this growth rate by $ACover_{(i, 0, j)}$, the number of analysts that cover firm i and are employed by brokerage house j in the benchmark year. Further, as shown in Equation (5), we calculated a firm's total expected analyst coverage, $ExpAnalystCover_{(i, t)}$, as the sum of $ExpAnalystCover_{(i, t, j)}$ across all the n brokerage houses in the year t . $ExpAnalystCover_{(i, t)}$ shows the variation in the level of analyst coverage due to the differences in brokerage house size and is unlikely to be associated with a firm's product safety. We run a two-stage least squares (2SLS) estimation. The first-stage regression results are presented in column 1 of Table A11 of the Online Appendix, where the dependent variable is *Coverage*. The coefficient on *ExpAnalystCover* is positive and significant at the 1% level. The F-statistic of *ExpAnalystCover* is 151, suggesting that the IV satisfies the relevance criteria. We used the fitted value from the first-stage regression as the independent variable (*IVAnalystCoverage*) in the second stage. In column 2, we report the second-stage regression results. Consistent with our expectation, the coefficient on *IVAnalystCoverage* is positive and highly significant at the 5% level.³²

5.3. Brokerage Merger and Closure

Next, we provide a difference-in-difference (DiD) test by using brokerage mergers and closures as quasi-natural experiments. When two analysts from different brokerage houses involved in a merger cover the same firm before the merger, one of them will likely discontinue coverage after the merger because of redundancy (Derrien & Keskes, 2013). Therefore, brokerage mergers and closures create shocks to analyst coverage that are plausibly exogenous to product safety issues. We compare the treated sample, whose analyst coverage was negatively affected by the shocks, with the matched control sample. Specifically, a firm is identified as a treated firm if it was followed by a broker that experienced closure or merger, and its analyst coverage decreased

³² We did not apply this 2SLS approach to our main tests because the IV is only applicable to analyst coverage but not the other two components of the composite measure of capital market pressure.

after the brokerage house's closure or merger.³³ We require at least two brokerage houses to follow the firm after the merger. We further exclude industries without product recalls during our sample period. We keep observations for each treated firm from 3 years before and 3 years after the shock (6 years total).³⁴ For each observation of a treated firm, we match up to two observations of control firms whose coverage was not negatively affected by the shocks based on industry, year, and firm size.³⁵ The dependent variables are the same as in Model (1), and we regress them onto *Treat* (an indicator for treated firms), *Post* (an indicator for the post period), their interaction (*Treat*Post*), and other independent variables from Model (1). For each treated firm, we identify the event year when its analyst coverage dropped after a brokerage house that previously followed the firm experienced mergers and closures. Results (reported in Table A12 of the Online Appendix) indicate that the coefficient estimates of *Treat*Post* are negative and significant for both *#Recalls* and *Ln#Recalls*.

5.4. Lead-Lag Analyses

Next, we provide lead-lag analyses between capital market pressure and product recalls. In Model (1), the dependent variable (*#Recall*) leads the independent variables (*Pressure*) by 1 year. We augment Model (1) with *Lead Pressure*, the value of *Pressure* 2 years ahead. Thus, *Lead Pressure* was measured 1 year after *#Recall*. Results (reported in Table A13 of the Online Appendix) show significantly positive coefficients on *Pressure* in all specifications, but the

³³ Following Wu and Zang (2009), we collected data on brokerage mergers from Thomson's SDC Mergers and Acquisition database. Specifically, to identify firms that likely employ sell-side financial analysts, we required both the acquirer and target to be in two industries whose primary four-digit SIC codes are 6211 (investment banks and brokerage firms) and 6,282 (independent research firms). We included only completed deals in which 100% of the target's ownership is acquired. To further identify broker closures, we constructed a list of brokers that disappeared from the IBES database during our sample period.

³⁴ If a firm is affected by two shocks to brokerage houses within three years, we only consider the first event.

³⁵ Results are similar if we use 1-to-3 or 1-to-5 matchings.

coefficients on *Lead Pressure* are insignificant. Therefore, the frequency of product recalls is associated with capital market pressure in the prior year but not in the following year.

5.5. Correlated Omitted Variables

Next, we provide additional tests to mitigate concerns about the effects of omitted variables. First, we control for firm fixed effects, or four-digit industry fixed effects, instead of three-digit industry fixed effects in our baseline specifications. Results (reported in Table A14 of the Online Appendix) are robust. Second, we provide a set of tests using change regressions instead of the level regression in Model (1). Results (reported in Table A15 of the Online Appendix) continue to show that increases in capital market pressure lead to an increase in the frequency of recalls. Third, we implement an Impact Threshold for a Confounding Variable (ITCV) test (Frank, 2000).³⁶ Results (reported in Table A16 of the Online Appendix) indicate that the ITcv for our pressure measure (*Pressure*) is 0.085. Among the other independent variables, the variable with the highest impact (*Size*) has an impact value of 0.067, and the variable with the second highest impact (*Log[Sale]*) has an impact value of 0.065. Thus, an omitted variable can change the inference only if it has an impact that is 1.4 times as high as the impact of *Size* and that of (*Log[Sale]*). Fourth, we rerun our tests using a larger sample that contains all the observations in four-digit SIC industries with at least one product recall during the sample period instead of the smaller matched sample. Our results (reported in Table A17 of the Online Appendix) are robust in this larger sample. We conclude that our results are unlikely to be due to omitted variables.

5.6. Alternative Window

³⁶ Frank (2000) derived the minimum correlations necessary to turn a statistically significant result into a borderline insignificant result. The ITcv test is defined as the lowest product of the partial correlation between the dependent variable and the confounding variable and the partial correlation between the independent variable of interest and the confounding variable that makes the coefficient statistically insignificant. If the ITcv is high (or low), the OLS results are robust (or not robust) to omitted variable concerns.

Firms facing intense capital market pressure may delay recalls to avoid the negative effect on financial performance. Such discretion in the timing of recall decisions biases against finding our results (i.e., a positive association between pressure and recalls in the subsequent year) because intense pressure to deliver financial performance disincentivizes firms from engaging in recalls. we use the frequency of product recalls over the following 3 years as the dependent variable and rerun our tests in Table A18 of the Online Appendix. Results remain similar to those in Table 2.

5.7. Intermediate Steps

Lastly, we conduct several other tests, which we provide in the Online Appendix, to reinforce our interpretation of our results based on market pressure. First, we test how capital market pressure affects firms' discretionary accruals, a standard measure of earnings management behavior (i.e., manipulation of accounting numbers) in the accounting literature (Jones, 1991), and report our findings in Table A19, Panel A. We show that more intense capital market pressure leads to more earnings management. This behavior can help firms meet and beat analyst forecasts myopically but, like safety incidents, may entail costly consequences (Karpoff et al., 2008). Second, we test how capital market pressure affects firms' abnormal operating expenditures (estimated following Roychowdhury, 2006) and report our findings in Table A19, Panel B. We also find that higher pressure from the capital market leads to abnormally low operating expenditures. These findings further support the idea that the pressure from the capital market leads managers to focus on delivering short-term performance by engaging in myopic behaviors.³⁷

6. Discussion

³⁷ We used analyst coverage as one measure of capital market pressure. However, analyst coverage may also enhance monitoring of management misconduct (Bradley et al., 2021). To further validate our proxy, we replaced analyst coverage with the frequency of meeting or beating analyst forecasts over the previous 5 years. Prior research suggests that firms that frequently meet or beat analyst forecasts face stronger pressure to meet or beat analyst forecasts again (Chu et al., 2018). Results presented in Table A20 of the Online Appendix are consistent with our interpretation.

A rich literature in OM has examined the consequences of product safety issues and recalls. Understanding why product safety issues emerge with regularity is also important, given that recalls can have a material effect on firms' wealth and performance (Chen et al., 2009; Davidson & Worrell, 1992). More specifically, we examine whether capital market pressure to deliver short-term financial results leads to product safety issues and how firms can mitigate such negative consequences. We then consider factors that may mitigate this relationship and explore practical recommendations for firms that want to mitigate these negative safety outcomes.

Using a large sample of product recalls, we find that the probability of product recalls is significantly higher for firms subject to more intense capital market pressure. Further, the association between capital market pressure and product recalls is more pronounced for firms with CEOs who have a financial background or are particularly powerful within their firm but is mitigated when the COO is relatively more powerful vis-a-vis the CEO. These results are robust in additional tests, including IV regressions, difference-in-differences tests based on brokerage merger or closure, and lead-lag analyses.

We find similar results using a dataset of consumer product recalls from the CPSC; this dataset contains additional details about the recalls. Specifically, we find that consumer product manufacturers facing stronger capital market pressure experience more product recalls. Products recalled by these firms are preceded by more reports of safety incidents, injuries, and property damage by consumers, and these incidents are more serious than those reported by firms that do not face heavy market pressure. These findings complement each other and support the view that myopia caused by capital market pressure has a deleterious effect on internal processes and ultimately, product safety. For example, it is unlikely that the higher probability of recalls by firms facing intense capital market pressure is caused by the decision to voluntarily recall products with

less severe safety issues to avoid actual damage. This phenomenon exists because these firms also experience more reports of product safety incidents filed by customers before the recalls. Further, the higher frequency of refunds indicates more severe safety issues that are likely beyond repair.

6.1. Theoretical Contributions

Our study makes several significant contributions to the OM literature and its interface with the accounting and finance literature. First, understanding the determinants of product safety is an important research area in operations management (e.g., Speier et al. 2011). Prior OM literature has investigated how product safety is affected by internal factors, supply chains, and specific operational issues (e.g., factory utilization, outsourcing in distant areas) that are the proximate cause of product failure (e.g., Ball et al., 2018; Wowak et al., 2021; Wowak et al., 2015; Kini et al., 2017; Steven et al. 2014; Steven and Britto 2016). We extend the line of research by examining an external economic determinant of product quality and safety, the capital market pressure to deliver financial performance, as a potential root cause for product safety failures. Birge (2015) suggests that although “operational models often avoid financial considerations such as the role of investors and other market participants, both firm and market financial activity can have a significant effect on the impact of operational decisions.” In response to Birge (2015), our study finds that capital market pressure affects operational decisions and product safety. In particular, we find that when managers face heavy capital market pressure to deliver short-term performance, their firms have abnormally low operating expenditures and more product recalls. These findings suggest that when managers face intense capital market pressure, they cut firms’ spending on product safety to increase reported financial performance. Such myopic managerial decisions lead to product safety issues.

Second, we contribute to the literature on how corporate leadership affects operational

performance (Marucheck et al., 2011). CEOs and COOs are directly involved in the production and manufacturing process. We found that the characteristics of CEOs and COOs significantly influence the effect of capital market pressure to deliver short-term financial performance on a firm's operational performance in terms of product quality and safety. We believe our focus on the senior executive level is warranted given that interviews with mid-level safety managers reveal that they often see their roles as tactical (Mittal et al., 2024). Thus, our study helps us better understand how these process-embedded executives affect operational decisions related to product safety (Bendoly & Oliva, 2024). In particular, prior research (Wowak et al., 2015) suggests that the CEO compensation structure set up by boards affects product safety. Our findings further suggest that a CEO's financial background makes them more susceptible to capital market pressure and, thus, more likely to sacrifice product safety for short-term financial performance. Therefore, in addition to economic incentives, top executives' knowledge and mindset are important boundary conditions that affect their operational decisions and product safety.

Third, we contribute to the literature on how the power of top executives affects operations and risk management. Prior research (Li et al., 2021) suggests that the power of top executives shapes their roles in operations and risk management. However, no prior study has examined how the power structure within the top management team affects the management of product risk and product safety. We find that a powerful CEO is more likely to prioritize short-term performance over product safety, but this effect is mitigated when a powerful COO acts as a countervailing force. This last finding directly answers the call of Browning (2020, p. 495) who suggests that the OM literature should answer the question of "What does a COO do?". Overall, the balance of power within the top management team plays an important role in product risk management.

6.2. Implications for Shareholders and Regulators

Our findings establish a clear link between increased capital market pressure and heightened product safety concerns, underscoring the detrimental impact of financial market pressures on firms' behavior. Executives may not always grasp immediately the implications of their actions on product safety and may overlook risks due to operational constraints. For example, some commentators (Cole, 2011) have blamed "overconfident executives" for being ignorant of the risk of their actions in many product safety scandals. Toyota eliminated a key quality control committee shortly before its safety scandal. The company suggested, "We had come to believe that quality control had become part of the company's DNA and did not need a special committee to enforce it." Although executives may not intentionally decide to manufacture or distribute products that threaten consumer safety with possibly lethal consequences, they may be led onto this slippery road by pressure from financial markets (Welsh et al., 2015). Thus, our first recommendation for managers is to become aware of this important product safety issue when they face intense capital market pressure.

However, it is important to note that not all firms under intense pressure incur product safety issues, because several other factors may influence this association. We identified certain CEO characteristics that can help mitigate the negative effect of capital market pressure. Our findings suggest that the negative effect of capital market pressure on product safety is mitigated when the firm's CEO does not have a financial focus or the CEO overbearing power within the firm. Importantly, we find that a relatively more powerful COO can also mitigate these issues. These findings have implications for both shareholders and regulators (Chakravarty et al., 2022). Boards can counter the negative impact of capital market pressure by ensuring that CEOs are properly monitored and do not enjoy unfettered power, for example, by raising the profile of COO.

Finally, regulators might pay special attention to companies subject to heavy financial pressure and have no countermeasures in place because these organizations are more likely to experience severe, potentially lethal, product safety issues. Regulators could encourage these companies to deploy ad hoc process and strategies to prevent the occurrence of these problems.

6.3. Limitations and Future Research

The limitations of our study are worth noting. First, we do not evaluate product safety directly. Instead, we observe recall decisions and the incident reports filed by consumers. It is possible that some unsafe products have not been identified. If firms not subject to short-term market pressure sell more unsafe but undetected products, our results may be biased. The same concern applies to our conditional analysis. For example, if firms implementing tighter controls are more likely to sell these unsafe but undetected products, our recommendation may be misplaced. We do not see solid ex-ante reasons to expect this, but ideally, future research would be able to evaluate quality in all observations in a broad sample of firms to address this issue.

Second, we do not examine how capital market pressure affects the decision to recall, conditional on observing a safety issue. If capital market pressure leads firms to issue more recalls conditional on observing a safety issue, our interpretation of the findings may need to be corrected. It is not immediately clear why this would be the case. For example, we expect firms to be less forthcoming, if anything, when they face short sellers. Although observing product quality ex-ante may be difficult, it would be interesting for future research to analyze the effect of capital market pressure on the decision to recall conditional on the detection of safety issues.

Finally, our analysis focuses on how moderator variables related to top management characteristics change the effect of capital market pressure on product safety. It would be a fruitful avenue for research to consider the influence of other employees and regulators or the corporate

culture on the negative effect of capital market pressure. It would also be interesting to examine whether training or prior experience can help managers mitigate this product safety issue.

References

- Abegglen, J., Stalk, G., 1985. *Kaisha, the Japanese Corporation*. New York: Basic Books.
- Ai, C., Norton, E. C. (2003). Interaction Terms in Logit and Probit Models. *Economics Letters*, 80, 123-129. [https://doi.org/10.1016/S0165-1765\(03\)00032-6](https://doi.org/10.1016/S0165-1765(03)00032-6)
- Asker, J., Farre-Mensa, J., Ljungqvist, A., 2015. Corporate investment and stock market listing: A puzzle? *The Review of Financial Studies*. 28(2), 342-390.
- Baber, W., Fairfield, P., Haggard, J., 1991. The effect of concern about reported income on discretionary spending decisions: the case of research and development. *The Accounting Review*. 66, 818–829.
- Ball, G.P., Shah, R., Wowak, K.D., 2018. Product competition, managerial discretion, and manufacturing recalls in the US pharmaceutical industry. *Journal of Operations Management*. 58–59, 59–72.
- Barber, B.M., Darrough, M.N., 1996. Product reliability and firm value: the experience of American and Japanese automakers. *Journal of Political Economy*. 104, 1084–1099.
- Bartov, E., Givoly, D., Hayn, C., 2002. The rewards to meeting or beating earnings expectations. *Journal of Accounting and Economics*. 33(2), 173-204.
- BBC, 2019. Boeing whistleblower raises doubts over 787 oxygen system. BBC News, available at <https://www.bbc.com/news/business-50293927>.
- Bebchuk, L. A., Cremers, M., Peyer, U., 2007. CEO centrality. National Bureau of Economic Research.
- Bendig, D., Willmann, D., Strese, S., Brettel, M., 2018. Share repurchases and myopia: Implications on the stock and consumer markets. *Journal of Marketing*. 82(2), 19-41.
- Bendoly, E., Oliva, R. 2024, Holding North: Recognizing identity and advancing contribution in operations management. *Journal of Operations Management*. 70: 518-522.
- Bhushan, R., 1989. Firm characteristics and analyst following. *Journal of Accounting and Economics*. 11 (2–3), 255–274.
- Birge, J. R. 2015, OM Forum: Operations and Finance Interactions, Manufacturing & Service Operations Management. 17 (1), 4–15
- Bolton, P., Scheinkman, J., Xiong, W., 2006. Executive compensation and short-termist behavior in speculative markets. *The Review of Economic Studies*. 73, 577–610.
- Bowen, R.M., Chen, X., Cheng, Q., 2008. Analyst coverage and the cost of raising equity capital: evidence from underpricing of seasoned equity offerings. *Contemporary Accounting Research*. 25 (3), 657–699.
- Bradley, D., Mao, C.X., Zhang, C., 2021. Does analyst coverage affect workplace safety? *Manage. Sci.*, 68(5):3464-3487.
- Bradshaw, M.T., 2011. Analysts' Forecasts: What do we know after decades of work? SSRN working paper, Available at SSRN: <https://ssrn.com/abstract=1880339>
- Bray, R.L., Serpa, J.C., Colak, A., 2019. Supply chain proximity and product quality. *Management Science*. 65 (9), 4079–4099.
- Brennan, M.J., Jegadeesh, N., Swaminathan, B., 1993. Investment analysis and the adjustment of stock prices to common information. *The Review of Financial Studies*. 6(4), 799-824.
- Brochet, F., Loumioti, M., Serafeim, G., 2015. Speaking of the short-term: Disclosure horizon and managerial myopia. *Review of Accounting Studies*. 20, 1122-1163.
- Browning, T.R., 2020. Operations management writ large. *Journal of Operations Management*. 66(5), pp. 494-500.
- Burgstahler, D., Dichev, I., 1997. Earnings management to avoid earnings decreases and losses. *Journal of Accounting and Economics*. 24, 99–126.

- Bushee, B.J., 2001. Do institutional investors prefer near - term earnings over long - run value? *Contemporary Accounting Research*. 18(2), 207-246.
- Bushee, B.J., Noe, C.F., 2000. Corporate disclosure practices, institutional investors, and stock return volatility. *Journal of Accounting Research*. 171-202.
- Carpenter, D., 2018. The Consumer Product Safety Act: A Legal Analysis. Congressional Research Service Report 7-5700.
- Chakravarty, A., Saboo, A.R., Xiong, G., 2022. Marketing's and Operations' roles in product recall prevention: Antecedents and consequences. *Production and Operations Management*. 31(3), 1174-1190.
- Chang, X., Dasgupta, S., Hilary, G., 2006. Analyst coverage and financing decisions. *J. Financ.* 61, 3009–3048.
- Chen, Y., Ganesan, S., Liu, Y., 2009. Does a firm's product-recall strategy affect its financial value? An examination of strategic alternatives during product-harm crises. *Journal of Marketing*. 73, 214–226.
- Cheng, Q., J. Lee, T. Shevlin. 2016. Internal governance and real earnings management. *The Accounting Review*. 91 (4), 1051-1085.
- Chu, J., Dechow, P.M., Hui, K.W. and Wang, A.Y. 2019. Maintaining a Reputation for Consistently Beating Earnings Expectations and the Slippery Slope to Earnings Manipulation. *Contemporary Accounting Research*. 36: 1966-1998.
- Cleeren, K., Dekimpe, M.G. and Van Heerde, H.J., 2017. Marketing research on product-harm crises: a review, managerial implications, and an agenda for future research. *Journal of the Academy of Marketing Science*. 45, 593-615.
- CNN, 2024, Who can fix Boeing? Here are some potential CEO candidates, <https://www.cnn.com/2024/03/27/business/boeing-ceo-successor-choices/index.html#:~:text=What%20Boeing%20wants%20in%20its,to%20the%20company's%20current%20problems>.
- Cohen, D., Mashruwala, R., Zach, T., 2010. The use of advertising activities to meet earnings benchmarks: evidence from monthly data. *Review of Accounting Studies*. 15, 808–832.
- Cole, R., 2011. What really happened to Toyota? *MIT Sloan Manage. Rev.* (Summer 2011), <https://sloanreview.mit.edu/article/what-really-happened-to-toyota/>.
- Connally, E., 2009. Good food safety practices: managing risks to reduce or avoid legal liability. *Food Saf. Technol.*, FST-32.
- Cremers, M., Pareek, A., Sautner, Z., 2020. Short-term investors, long-term investments, and firm value: Evidence from Russell 2000 index inclusions. *Management Science*. 66(10), 4535-4551.
- Currim, I.S., Lim, J., Zhang, Y., 2018. Effect of analysts' earnings pressure on marketing spending and stock market performance. *Journal of the Academy of Marketing Science*. 46 (3), 431–452.
- Custódio, C., Metzger, D., 2014, Financial expert CEOs: CEO's work experience and firm's financial policies, *Journal of Financial Economics*. 114 (1), 125-154.
- Davidson, W.N., Worrell, D.L., 1992. The effect of product recall announcements on shareholder wealth. *Strategic Management Journal*. 13 (6), 467–473.
- Derrien, F., Kecskes, A., 2013. The real effects of financial shocks: evidence from exogenous changes in analyst coverage. *The Journal of Finance*. 68 (4), 1407–1440.
- Eilert, M., Jayachandran, S., Kalaignanam, K., & Swartz, T. A. 2017. Does it Pay to Recall your Product Early? An Empirical Investigation in the Automobile Industry. *Journal of Marketing*. 81(3), 111-129.
- Frank, K.A., 2000. Impact of a confounding variable on a regression coefficient. *Sociological Methods & Research*. 29(2), 147-194.
- Friedman, H., 2014. Implications of power: When the CEO can pressure the CFO to bias reports, *Journal of Accounting and Economics*. 58 (1), 117-141.
- Giannetti, V., Srinivasan, R., 2022. Corporate lobbying and product recalls: an investigation in the US medical device industry. *Journal of the Academy of Marketing Science*. 50(5), 941-960.
- Goldstein L., 2019. Boeing 737 MAX Incident a By-Product of Its Financial Mindset, available at <https://prospect.org/infrastructure/transportation/2024-01-09-boeing-737-max-financial-mindset/>

- Graham, J., Harvey, C., Rajgopal, S., 2005. The economic implications of corporate financial reporting. *Journal of Accounting and Economics*. 40, 3–73.
- Guajardo, J., Cohen, S., Netessine, S., Kim, H., 2012. Impact of performance-based contracting on product reliability: an empirical analysis. *Management Science*. 58 (5), 961–979.
- Hammond, R.G., 2013. Sudden unintended used-price deceleration? The 2009–2010 Toyota recalls. *Journal of Economics & Management Strategy*. 22 (1), 78–100.
- Han, S., Nanda, V.K. and Silveri, S. 2016. CEO Power and Firm Performance under Pressure. *Financial Management*. 45: 369-400.
- Hartman, R.S., 1987. Product quality and market efficiency: the effect of product recalls on resale prices and firm valuation. *The Review of Economics and Statistics*. 69 (2), 367–372.
- He, J., Tian, X. 2013. The dark side of analyst coverage: the case of innovation. *Journal of Financial Economics*. 109, 856–878.
- Health and Safety Executive, 2005. Promoting health and safety as a key goal of the corporate social responsibility agenda. <http://www.mentalhealthpromotion.net/resources/promoting-health-and-safety-as-a-key-goal-of-the-corporate-social-responsibility-agenda.pdf>.
- Herrmann, D., Inoue, T., Thomas, W., 2003. The sale of assets to manage earnings in Japan. *Journal of Accounting Research*. 41, 89–108.
- Holmstrom, B., 1982. Moral hazard in teams. *The Bell Journal of Economics*. 324-340.
- Hong, H., Lim, T., Stein, J.C., 2000. Bad news travels slowly: Size, analyst coverage, and the profitability of momentum strategies. *The Journal of Finance*. 55(1), 265-295.
- Hora, M., Bapuji., H., Roth, A.V., 2011. Safety hazard and time to recall: the role of recall strategy, product defect type, and supply chain player in the US toy industry. *Journal of Operations Management*. 29 (7–8), 766–777.
- Huang, S.X., Pereira, R., Wang, C., 2016. Analyst coverage and the likelihood of meeting or beating analyst earnings forecasts. *Contemporary Accounting Research*. 34 (2), 871–899.
- Irani, R., Oesch, D., 2016. Analyst coverage and real earnings management: quasi-experimental evidence. *The Journal of Financial and Quantitative Analysis*. 51, 589–627.
- Jarrell, G., Peltzman, S., 1985. The impact of recalls on the wealth of sellers. *Journal of Political Economy*. 93, 512–536.
- Javadinia, A., Gill, M. & Jayachandran, S. 2024 Recall environment and post-recall stock market response. *Journal of the Academy of Marketing Science*. 52, 1171–1194.
- Jia, X., Menon, R., 2023. Shareholder short-termism, corporate control and voluntary disclosure. *Management Science*. 69 (1), 702–721.
- Jones, J.J. 1991. Earnings management during import relief investigations. *Journal of Accounting Research*. 29 (2), 193–228.
- Karpoff, J.M., Lee, D.S., Martin, G.S., 2008. The consequences to managers for financial misrepresentation. *Journal of Financial Economics*. 88(2), 193-215.
- Kini, O., Shenoy, J., Subramaniam, V., 2017. Impact of financial leverage on the incidence and severity of product failures: evidence from product recalls. *The Review of Financial Studies*. 30, 1790–1829.
- Kwon, S., Kim, J., Yim, H., 2023, Looking far or close: The explanatory role of myopic management in the relationship between CEO-TMT power disparity and corporate social responsibility, *Journal of Business Research*. 167, 114090.
- Kunzmann A., Meier K., 2016. Does the Board of Directors Learn from Short Sellers? Evidence from CEO Turnovers. Working paper University of Mannheim
- Lam, H.K., Ding, L., Dong, Z., 2022. The impact of foreign competition on domestic firms' product quality: evidence from a quasi-natural experiment in the United States. *Journal of Operations Management*. 68(8), 881-902.
- Lee, L.F., Hutton, A.P. and Shu, S. 2015, The Role of Social Media in the Capital Market: Evidence from Consumer Product Recalls. *Journal of Accounting Research*, 53: 367-404.

- Li, H., Bapuji, H., Talluri, S., Singh, P.J., 2022. A Cross-disciplinary review of product recall research: A stakeholder-stage framework. *Transportation Research Part E: Logistics and Transportation Review*. 163, 102732.
- Li, H., Lam, H. K. S., Ho, W., Yeung, A. C. L. 2022. The impact of chief risk officer appointments on firm risk and operational efficiency. *Journal of Operations Management*. 68(3), 241–269.
- Liu, Y., Shankar, V., 2015. The dynamic impact of product-harm crises on brand preference and advertising effectiveness: an empirical analysis of the automobile industry. *Management Science*. 61 (10), 2514–2535.
- Liu, A.X., Liu, Y., Luo T., 2016. What drives a firm's choice of product recall remedy? The impact of remedy cost, product hazard, and the CEO. *Journal of Marketing*. 80, 79–95.
- Lu, S.F., Lu, L.X., 2017. Do mandatory overtime laws improve quality? Staffing decisions and operational flexibility of nursing homes. *Management Science*. 63 (11), 3566–3585.
- Mafael, A., Raithel, S. & Hock, S.J. 2022. Managing customer satisfaction after a product recall: the joint role of remedy, brand equity, and severity. *Journal of the Academy of Marketing Science. Sci.* 50, 174–194.
- Marcel, J., 2009, Why Top Management Team Characteristics Matter When Employing a Chief Operating Officer: A Strategic Contingency Perspective, *Strategic Management Journal*, Vol. 30, No. 6, pp. 647-658
- Matsunaga, S., Park, C., 2001. The effect of missing a quarterly earnings benchmark on the CEO's annual bonus. *The Accounting Review*. 76, 313–332.
- Marucheck, A., Greis, N., Mena, C., Cai, L., 2011. Product safety and security in the global supply chain: issues, challenges and research opportunities. *Journal of Operations Management*. 29 (7–8), 707–720.
- McKenzie, M., Henry, Ó.T., 2012. The determinants of short selling: evidence from the Hong Kong equity market. *Accounting and Finance*. 52, 183–216.
- McKinsey, 2023, Why do organizations have COOS?, 12/06/2023,<https://www.mckinsey.com/featured-insights/mckinsey-explainers/why-do-organizations-have-coos>
- McNichols, M., O'Brien, P.C., 1997. Self-selection and analyst coverage. *J. Account. Res.* 35, 167–199.
- Mergenthaler R., Rajgopal S., Srinivasan S., 2012. CEO and CFO career penalties to missing quarterly analysts forecasts. Available at SSRN 1152421.
- Mittal, V., A. Piazza, and S. Singh, 2024, Safety Should Be a Performance Driver: it's more than just a compliance issue. *Harvard Business Review*.
- Mola, S., Rau, P.R., Khorana, A., 2013. Is there life after the complete loss of analyst coverage? *The Accounting Review*. 88 (2), 667–705.
- Muellerleile, C. M., 2009. Financialization takes off at Boeing. *Journal of Economic Geography*. 9 (5), 663–677.
- Mukunda, G., 2014. The price of Wall Street's power. *Harvard Business Review*. 96, 70–78.
- Narayanan, M., 1985. Managerial incentives for short-term results. *The Journal of Finance*. 40(5), 1469–1484.
- NPR, 2024, Boeing names aerospace veteran Kelly Ortberg as its next CEO, <https://www.npr.org/2024/07/31/nx-s1-5058497/boeing-ceo-737max-kelly-ortberg>
- Puutio, A., 11/04/2024 Here's How The CEO And COO Can Best Work Together, <https://www.forbes.com/sites/alexanderpuutio/article/ceo-and-coo/>
- Ramdas, K., Randal, T., 2008. Does component sharing help or hurt reliability? An empirical study in the automotive industry. *Management Science*. 54 (5), 922–938.
- Rhee, M., Haunschild, P.R., 2006. The liability of good reputation: a study of product recalls in the U.S. automobile industry. *Organization Science*. 17 (1), 101–117.
- Ringgenberg M.C., 2014. Price pressure from short selling. Washington University in Saint Louis Olin Business School Working Paper No. 14/001, Available at SSRN: <https://ssrn.com/abstract=1715951>.
- Roychowdhury, S., 2006. Earnings management through real activities manipulation. *Journal of Accounting and Economics*. 42, 335–370.

- Shah, R., Ball, G., Netessine, S., 2016. Plant operations and recalls in the automotive industry, an empirical investigation. *Management Science*. 63 (8), 2439–2459.
- Shaheen, R., Smith S., 2019. Product responsibility and customer care, customer health and safety; marketing and labeling; and customer privacy. *Bus. Law Today*, https://www.americanbar.org/groups/business_law/publications/blt/2019/10/customer-care/.
- Shleifer, A., Vishny, R.W., 1990. Equilibrium short horizons of investors and firms. *Am. Econ. Rev.* 80 (2), 148–153.
- Shores, D., 1990. The association between interim information and security returns surrounding earnings announcements. *Journal of Accounting Research*. 28(1), 164-181.
- Speier, C., Whipple, J. M., Closs, D. J., Voss, M. D. 2011. Global supply chain design considerations: Mitigating product safety and security risks. *Journal of Operations Management*. 29(7–8), 721–736
- Singh, K., Grewal, R., 2023. Lobbying and Product Recalls: A Study of the US Automobile Industry. *Journal of Marketing Research*. forthcoming.
- Stein, J.C., 1988. Takeover threats and managerial myopia. *Journal of Political Economy*. 96, 61–80.
- Stein, J.C., 1989. Efficient capital markets, inefficient firms: a model of myopic corporate behavior. *The Quarterly Journal of Economics*. 104, 655–669.
- Steven, A.B., Britto, R.A., 2016. Emerging market presence, inventory, and product recall linkages. *Journal of Operations Management*. 46, 55–68.
- Steven, A.B., Dong Y., Corsi, T., 2014. Global sourcing and quality recalls: an empirical study of outsourcing-supplier concentration-product recalls linkages. *Journal of Operations Management*. 32 (5), 241–253.
- Taylor, P., 2011. Top 5 reasons for class I product recall. *Pharmafile* (April), <http://www.pharmafile.com/news/154814/top-5-reasons-class-i-product-recall>.
- Thirumalai, S., Sinha, K.K., 2011. Product recalls in the medical device industry: An empirical exploration of the sources and financial consequences. *Management Science*. 57(2), 376-392.
- Von Thadden, E.L., 1995. Long-term contracts, short-term investment and monitoring. *The Review of Economic Studies*. 62(4), 557-575.
- Wang, Y., Yin, S., 2018, CEO educational background and acquisition targets selection, *Journal of Corporate Finance*. 52, 238-259.
- Wang, J.; Zhao, L.; Huchzermeier, A., 2021. Operations-Finance Interface in Risk Management: Research Evolution and Opportunities, *Production and Operations Management*, 2021-02, 30 (2), 355-389.
- Welsh, D.T., Ordóñez, L.D., Snyder, D.G., Christian, M.S., 2015. The slippery slope: how small ethical transgressions pave the way for larger future transgressions. *Journal of Applied Psychology*. 100 (1), 114–127.
- Wowak, K.D., Ball, G.P., Post, C., Ketchen, D.J., Jr., 2021. The influence of female directors on product recall decisions. *Manufacturing & Service Operations Management*. 23 (4), 895–913.
- Wowak, K.D., Boone, C.A., 2015. So many recalls, so little research: A review of the literature and road map for future research. *Journal of Marketing & Supply Chain Management*. 51(4), 54-72.
- Wowak, A.J., Mannor, M.J., Wowak, K.D., 2015. Throwing caution to the wind: the effect of CEO stock option pay on the incidence of product safety problems. *Strategic Management Journal*. 36 (7), 1082–1092.
- Wu, J., Zang, A., 2009. What determines financial analysts' career outcomes during mergers? *Journal of Accounting and Economics*. 47, 59–86.
- Yu, F., 2008. Analyst coverage and earnings management. *Journal of Financial Economics*. 88, 245–271.