Stock Price Crash Risk and the Managerial Rhetoric Mechanism: Evidence from R&D Disclosure in 10-K filings

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Abstract

We utilize narrative disclosure in the Management Discussion and Analysis (MD&A) section of 10-K filings that emphasize forward-looking research and development (R&D) activities, as a proxy for managerial rhetoric. We employ a firm's future growth opportunities and use ChatGPT as an interpretive tool to demonstrate that this proxy is contextually relevant and aligns with cues indicative of investor optimism. Most notably, we conduct a battery of empirical tests supporting that the managerial rhetoric proxy is positively related to future idiosyncratic stock price crashes. This positive relation is driven by the sample of firms that face heightened competition, have weaker anti-takeover provisions and are followed by analysts. Intriguingly, stronger internal corporate governance does not appear to attenuate the positive managerial rhetoric-crash risk relation. Our findings underscore the existence of a rhetoric mechanism that managers strategically exploit to disseminate information that hypes investors' expectations and inflates a firm's stock price beyond its intrinsic value.

Keywords: Stock price crash risk; Managerial rhetoric channel; Narrative disclosure; Textual analysis; 10-K filings; Research and development; Agency theory; Corporate governance
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1 Introduction

The literature on stock price crash risk has undergone substantial development over the past two decades, whilst the investigation into the relation between crashes and their determinants remains a burgeoning field of study. This body of work builds on the seminal studies of Jin and Myers (2006), Hutton, Marcus, and Tehranian (2009), Kothari, Shu, and Wysocki (2009) and Benmelech, Kandel, and Veronesi (2010), which theorize the existence of a *bad news hoarding mechanism* to explain idiosyncratic stock price crashes. Accordingly, these crashes stem from agency problems, either because managers engage in earnings management to make their firms more opaque, or because they overinvest to pretend the continued flourishing of their firms' growth opportunities. In either case, self-interested managers take advantage of information asymmetries to strategically withhold bad news, aiming to pursue short-term price maximization at the expense of shareholders. However, recent empirical evidence by Andreou, Lambertides, and Magidou (2022) puts under dispute the managers' ability to persistently hoard bad news through systematic earnings management and overinvestment practices, especially in the post Sarbanes-Oxley Act period.

Our study advances the crash risk literature by introducing a novel concept, namely, the *managerial rhetoric mechanism*. We view this mechanism as an important narrative conduit through which managers disseminate information, often strategically utilized to portray a more optimistic outlook of their firms' future prospects. This view resonates with the notion that "narratives enable people to make sense of their environments by providing simple mental models of causal relations that focus their attention on particular variables and lead them to make particular predictions" (Akerlof and Snower, 2016, p. 70). Further, studies document that managers tend to engage in fluff narrative disclosure, or cheap talk, regarding their firm's prospects (Dimitrov and Jain, 2011; Balvers, Gaski, and McDonald, 2016; Yekini, Wisniewski, and Millo, 2016; Bushee, Taylor, and Zhu, 2022). In this context, managers can hype expectations by leveraging the inherent dynamism of storytelling, especially when narrating uncertain and difficult-to-verify outcomes they anticipate happening in the future.

This behavior can lead to unjustifiably high investor expectations and inflate a firm's stock price beyond its intrinsic value for prolonged periods. When these inflated expectations are not met, investors may abruptly downgrade their assessment of the firm's actual economic value, ultimately triggering an idiosyncratic stock price crash.

Corporate communication has long been conducted through the lens of narratives and storytelling (Akerlof and Snower, 2016; Shiller, 2017; Michalopoulos and Xue, 2021). Narratives exert significant power over investors and have in fact increased in the information age (Shiller, 2020). The narratological concepts employed in qualitative texts can be, if not more, equally informative as quantitative data. Empirical evidence lends support to the hypothesis that "soft" qualitative information—conveyed by linguistic content communication in managerial narrative—is incrementally useful to quantitative information in predicting future firm fundamentals (Mayew and Venkatachalam, 2012). If anything, managerial narrative disclosure in public reports, like a firm's 10-K filings, can bridge the gap between a firm's financial statement numbers and its underlying business fundamentals (Merkley, 2014; Bryan, 1997; Li, 2010; Muslu, Radhakrishnan, Subramanyam, and Lim, 2015).

Rhetoric signifies a powerful tool in narratives, enabling the formulation of compelling stories that can be used for either good or bad purposes. As the Greek philosopher Aristotle argued, *rhetoric is the art of obtaining all the available means to persuade others*. The rhetorical devices of persuasion consist of employing convincing language and techniques to engage the audience, evoke emotions, and guide their understanding of the story being told (Kallendorf and Kallendorf, 1985). In his book "Narrative economics: How stories go viral and drive major economic events," Robert Shiller emphasizes the power of narratives, detailing how they can shape people's perceptions and propagate rapidly among the public (Shiller, 2020). According to Shiller, narratives don't merely convey facts; they can be leveraged as vehicles for rhetorical strategies with the objective to influence people's beliefs, emotions, and actively shape decision-making in the economic domain. Whilst his work does not directly pertain to rhetoric, the themes that Shiller (2020) investigates illustrate how narratives in economics can be strategically constructed to persuade, inform public opinion, and exert influence on financial decisions at a large scale.

To the best of our knowledge, it remains unexplored whether the power of rhetoric, facilitated through narrative disclosures in public reports such as the Management's Discussion and Analysis (MD&A) section in 10-K filings, can be utilized as a communication channel for managerial "cheap talk" intended to foster investor optimism. MD&A is an important tool that enables managers to convey "soft" qualitative information to stakeholders, making this section valuable for forecasting a firm's future prospects (Davis, Piger, and Sedor, 2012; Li, 2008; Kim and Park, 2012; Mayew and Venkatachalam, 2012; Li, 2019). Managerial narrative disclosure in MD&A is not subject to explicit disclosure rules, thus allowing executives significant leeway and autonomy in their qualitative disclosure.[1] It is noteworthy that even if the disclosed qualitative narrations do not ultimately occur, managers are rarely threatened with legal consequences (Cazier, Merkley, and Treu, 2020). Therefore, managers might be tempted to positively skew information concerning performance prospects by engaging in fluff disclosure to distort the firm's prospects to maximize short-term value (Balvers et al., 2016; Bushee et al., 2022). The latter is strengthen by the fact that managerial narratives about anticipated future events can lead to significant price increases, even when these are not backed by the firm's current economic fundamentals (Shiller, 2020).

The aim of this paper is to investigate whether the managerial disclosure woven into 10-K filings is exploited as a rhetorical mechanism, through which managers convey fluff information to hype investor expectations and inflate stock prices beyond their intrinsic value. In this vein, we examine narratives from the MD&A section that emphasize forward-looking research and development (R&D) activities, and investigate their relation to future idiosyncratic stock price crashes.

We focus our analysis on the MD&A section of the 10-K filings as managers are instructed

[1] Whilst the Securities Act Release No. 6231 (SEC, 1980) mandates the inclusion of the Management's Discussion and Analysis of financial conditions and results of operations in 10-K filings, not all sections of these financial statements are audited. Importantly, the MD&A disclosures are exempt from auditing standards.

by the Securities and Exchange Commission (SEC) to present a "discussion and analysis of a company's business as seen through the eyes of those who manage that business" and it expects a firm's management to "tell its story in its own words" (SEC, 1980).[2] It is the management's opportunity to explain to investors what the financial statements reveal and do not reveal, as well as to highlight important trends and risks that have shaped the past or are reasonably likely to shape the firm's future (SEC, 2007). The narrative nature of MD&A enables managers to be more flexible in communicating with stakeholders and providing forward-looking information that is expected to materially influence the firm (Cole and Jones, 2005). Additionally, as prior research suggests, the users of financial statements base their decision making on information disclosed on MD&A instead of relying on the audited sections of financial statements (AICPA, 2010; Epstein and Palepu, 1999). Ergo, the MD&A section should play a critical role in facilitating the managerial communication regarding forward-looking R&D activities to the entire investment community.

Our motivation for considering R&D managerial narrative disclosure, arises from the fact that R&D is one of the most significant activities that strongly affects firm's long-term viability (Gu, 2016). As noted by Merkley (2014), qualitative information related to R&D activities underscores the importance of narrative disclosure in firms' 10-K filings, particularly given that firms annually invest billions of dollars in R&D projects to create future value and growth. However, in this rapidly changing corporate environment we are experiencing, it is also challenging for investors to accurately assess the value relevance of innovative capabilities fostered by R&D activities (Wyatt, 2008; Cañibano, Garcia-Ayuso, and Sánchez, 2000; Lin, Lee, and Hung, 2006). In this regard, Haddad, Ho, and Loualiche (2022) provide striking evidence that the mere announcement of a potential innovation (*e.g.*, the development of a new product, technology, or methodology) can lead to a 40% increase in the stock price, relative to the actual outcomes or financial benefits that the innovation will generate in the future. This creates a temptation for managers to strategically use

[2] See, also, page 3 of the SEC "Investor Bulletin: How to Read a 10-K".

R&D-related narrative disclosure in 10-K filings, possibly aiming to shape the perception that their firm is forward-thinking and that it is taking actions to succeed in the future.[3]

Going forward, the main research question we consider is whether forward-looking R&D managerial narrative disclosure is an important predictor of stock price crashes. The dependent variable we employ captures the incidence of an extreme left-tail event in the distribution of idiosyncratic returns, which fall more than 3.09 standard deviations below the firm-specific weekly return over a fiscal year. Regarding the primary explanatory variable, we measure it as the percentage of sentences in 10-K filings that feature the co-occurrence of R&D-related keywords or phrases with forward-looking words. We identify a sentence as related to R&D activities if it contains specific R&D keywords or phrases, following a slightly modified dictionary based on Merkley (2014) to which we have added the plural or singular forms of the lexical tokens included in the original one. A sentence is counted only if the R&D keywords or phrases are combined with the word list of forward looking statements as per Li (2010). We provide analysis supporting the notion that this measure is contextually relevant and resonates with cues of investor optimism. Specifically, based on a construct validation test, this measure is positively associated with future growth opportunities, and, utilizing ChatGPT as an interpretative tool, we demonstrate that it conveys information with the power to positively elevate expectations and fuel optimism among investors.

Using a sample of 16,202 firm-year observations for U.S.-listed firms from 1994 to 2018, and consistent with our expectations, we provide evidence suggesting that managerial narratives featuring forward-looking R&D activities in 10-K filings are positively associated with one-year-ahead stock price crashes. This result remains robust across various measurements of the R&D narratives and within subsamples limited to firms with non-missing R&D expenses. It also persists in the presence of variables controlling for actual innovation activity

[3] Empirical evidence supports that the R&D expenditures found in financial statements are imprecise measures of a firm's capacity to innovate. Due to accounting standards, they often fail to communicate the true value of R&D, effectively leading to information problems (Lev, 1999; Aboody and Lev, 2000; Merkley, 2014). This naturally strengthens even more the management's temptation to disclose R&D information in 10-K filings.

(such as patents and citations), earnings management alternatives, and additional textual control variables. Moreover, the result remains strong when we account for equity-based incentives and institutional ownership controls. To mitigate endogeneity concerns, we employ several econometric approaches and conduct a difference-in-difference test.

In cross-sectional analysis, we find evidence that the positive managerial rhetoric-crash risk relation is moderated by various *external* corporate governance measures, often associated with incentivized managers who tend to act strategically to the detriment of shareholders. Specifically, this positive relation prevails only among firms facing high competition, having fewer anti-takeover provisions, and being actively covered by financial analysts. Interestingly, strong *internal* corporate governance practices−known from prior research to be effective in curbing managerial opportunism−do not appear to weaken this relation. For example, dividing the data into subsets based on the percentage of independent directors (minority *vs.* majority) does not alter the persisting positive relation between narrative disclosures and crash risk. This finding persists when we analyze subsets differentiated by board size, gender diversity on the board, directorship workload, and directors' attendance at board meetings.

This study documents two key contributions to the existing literature. First, our results inform the burgeoning field of stock price crash risk research. Specifically, our findings suggest the existence of a managerial rhetoric mechanism utilized by managers as a vital conduit to convey favorable information and amplify investor optimism. This mechanism is very distinct from the widely used mechanism of hoarding of bad news as delineated in the renowned studies of Jin and Myers (2006), Hutton et al. (2009), Kothari et al. (2009) and Benmelech et al. (2010). Whilst the hoarding of bad news mechanism assumes managers' willingness to hide or bury adverse information to maintain the stock price relative to reduced intrinsic value, the managerial rhetoric mechanism postulates that managers strategically use their narrative disclosure to hype investors expectations and inflate the stock price beyond its intrinsic value.

In addition to the aforementioned aspect, our main result demonstrates that managerial disclosure relating to forward-looking R&D narratives in the management's discussion and analysis section is positively related to one-year-ahead stock price crashes. Our research is complementing a growing body of work that consider the significance of managerial narratives in shaping economic decisions and outcomes (Frankel, Mayew, and Sun, 2010; Davis and Tama-Sweet, 2012; Huang, Teoh, and Zhang, 2014; Akerlof and Snower, 2016; Shiller, 2020; Michalopoulos and Xue, 2021; Garcia, Hu, and Rohrer, 2023). Within this context, prior research has investigated, *inter alia*, earnings announcements and conference calls (Davis et al., 2012; Demers and Vega, 2010; Francis, Schipper, and Vincent, 2002; Price, Doran, Peterson, and Bliss, 2012; Bushee et al., 2022; Hirshleifer, Peng, and Wang, 2023), press releases (Ahern and Sosyura, 2014), linguistic content of media coverage (Chan, 2003; Tetlock, Saar-Tsechansky, and Macskassy, 2008), and the complexity of 10-K filings (Li, 2008; Ertugrul, Lei, Qiu, and Wan, 2017; Kim, Wang, and Zhang, 2019). Whilst offering significant insights, the literature is still in a nascent stage, lacking conclusive evidence on whether managers disclose narratives in an opportunistic fashion. Our findings contribute to this debate, suggesting that managers may exploit sections of the 10-K filings—particularly those less constrained by SEC regulations and accounting standards—to disclose narratives that hype expectations and elevate investor optimism, potentially leading to inflated stock prices at the expense of shareholders.

Second, this paper contributes to the body of knowledge on corporate governance and specifically on the effectiveness of internal corporate governance regulations enforced by the Sarbanes-Oxley Act (SOX) to combat managerial opportunism and protect shareholder welfare (Bhagat and Bolton, 2013a; DeFond, Hung, Li, and Li, 2015; Andreou et al., 2022; Gayle, Li, and Miller, 2022). Whilst existing research provides evidence that the SOX resulted in stricter protection of property rights in governance, and more stringent penalties for fraudulent practices, our study shows that the managerial rhetoric-crash relation persists even under the presence of strong internal corporate governance. Collectively, the results underscore the limitations of internal oversight to prevent managers from exploiting the rhetoric mechanism to engage in short-sighted price maximization at the expense of shareholders.

The remainder of this paper is organized as follows. The next section describes the data and the construction of the study's variables. Section 3 presents the empirical findings and assesses their robustness. Section 4 presents the subsample analyses. Finally, Section 5 provides the conclusions.

2 Research design

In this section, we discuss the data employed in our analysis, outline our sample selection criteria and describe how relevant variables are measured. Supplementary to this discussion, Appendix A provides variable definitions and details of their calculation. Appendix B presents the dictionary featuring the R&D-related lexical tokens used to construct our main textual variables. Additionally, Appendix C presents empirical evidence to support that R&D managerial narrative disclosure in 10-K filings associates with the firm's value driven by future growth opportunities.

2.1 Data and sample

To construct our sample, we merge data for stock returns from Center for Research in Security Prices (CRSP) with CEO data from Execucomp and firm-level data from Compustat for the period 1994-2018. The intersection of these data sets is combined with textual-related variables, which we estimate using 10-K filings from the SEC Edgar database.

We then impose the following common selection criteria in the spirit of prior studies (Hutton et al., 2009; Kim, Li, and Zhang, 2011a; Andreou, Louca, and Petrou, 2017). First, for computing the crash risk measures, we exclude firm-years with (*i*) a stock price less than \$2.5 at the end of fiscal year, and (*ii*) fewer than 26 weeks of stock returns in a fiscal year.

Additionally, firm-year observations where CEOs are also founders are excluded.[4] Second, we require the appointed CEOs to remain in their role for at least three years.[5] Third, we exclude financial firms (SIC 6000-6999) and utilities (SIC 4900-4999). The above procedure yields 16,202 firm-year observations, which correspond to 2,071 unique firms from various industries.

2.2 Measuring idiosyncratic stock price crashes

We define a stock price crash as the incidence of an *extreme left-tail event* in the distribution of idiosyncratic returns. Let $w = 1, 2, \dots, n$ the weeks within a fiscal year t. The *idiosyncratic return*, $R_{j,w}$, for firm j in week w is defined as:

$$R_{j,w} = ln\left(1 + \varepsilon_{j,w}\right), \tag{1}$$

where $\varepsilon_{j,w}$ is a *residual return* from an index model regression. Residual returns are log-transformed to treat for potential positive skewness in raw returns and enables to symmetrically identify extreme left- *vs.* right-tail events. Then, $\varepsilon_{j,w}$ is estimated as the residual from an expanded market and industry index model regression, as follows:

$$r_{j,w} = \alpha + \sum_{i=-2}^{i=+2} \beta_{i,j} r_{MKT,w+i} + \sum_{i=-2}^{i=+2} \gamma_{i,j} r_{IND,w+i} + \varepsilon_{j,w}, \tag{2}$$

where $r_{j,w}$ is firm's j stock return, $r_{MKT,w}$ is the CRSP value-weighted market index return, and $r_{IND,w}$ is the Fama and French (1997) value-weighted 48-industry index return in week w. The index model includes two lead and lag weekly return terms for the market and

[4] Founder-CEO firms differ systematically from their non-founder-CEO managed entities, in terms of firm valuation, investment behavior, and stock market performance (Fahlenbrach, 2009). In particular, founder CEOs due to a longer-term perspective, perceive their company as a lifetime achievement and tend to invest more in value-creating activities, such as research and development. Further empirical evidence show that founder-CEOs are less sensitive to performance incentives and appear more entrenched (Palia, Ravid, and Wang, 2008).

[5] CEOs with tenure less than two years are excluded to avoid attributing the decisions of the previous CEO to the subsequent (Andreou, Lambertides, and Magidou, 2020).

industry indices, to control for booms and busts that might happen around the week of interest allowing to measure the firm's residual return with higher precision. To preclude look-ahead bias that accounts for the effect of earnings release when the subsequent crash risk measures are matched with financial data, *Eq.* (2) is estimated over the 52-week window ending 13 weeks after the fiscal year-end.

We define $CRASH_{j,t}$ as an idiosyncratic, extreme left-tail event measured with a binary variable set equal to one if within fiscal t the firm j experiences at least one "crash week", *i.e.*, an extreme negative weekly idiosyncratic return that falls more than λ standard deviations below its mean idiosyncratic return, and zero otherwise. Specifically,

$$CRASH_{j,t} = \begin{cases} 1 & \text{if } \exists w = 1, 2, \ldots, n : R_{j,w} < \mu_{j,t} - \lambda \times \sigma_{j,t} \\ 0, & otherwise \end{cases}, \tag{3}$$

where $\mu_{j,t}$ and $\sigma_{j,t}$ are, respectively, the mean and standard deviation of the idiosyncratic returns over the weeks that fall within fiscal year t. Following the norm in the crash risk, we set λ equal to 3.09 to generate a frequency of 0.1% extreme left-tail events as per the normal distribution.

We employ a second measure of stock price crash, namely *PCRASH*. As proposed by Andreou et al. (2022), this is an improved version of the first measure aiming to address the misclassification of stock price crashes that can be reversed by subsequent or preceding jumps. *PCRASH* is defined as a restricted version of *CRASH* to identify firm-years that *purely* include extreme negative, left-tail events, as follows:

$$PCRASH_{j,t} = \begin{cases} 1 & \text{if } \forall w : R_{j,w} \leq \mu_{j,t} + \lambda \times \sigma_{j,t} \text{ and } \exists w : R_{j,w} < \mu_{j,t} - \lambda \times \sigma_{j,t}, w \in \{1, 2, \ldots n\} \\ 0, & otherwise \end{cases}, \tag{4}$$

with λ set equal to 3.09. This measure may address the instances, for example, whereby a "crash week" (*i.e.*, $R_{j,w} < \mu_{j,t} - \lambda \times \sigma_{j,t}$) occurs as a market correction to a preceding "jump week"(*i.e.*, $R_{j,w} \geq \mu_{j,t} + \lambda \times \sigma_{j,t}$), or vice versa. *PCRASH* is also resilient to the possibility that a crash event is merely the outcome of the market becoming more volatile, thus making stock returns more susceptible to both, idiosyncratic crash and jump events.

We also run the baseline models utilizing a continuous measure, the negative coefficient of skewness (*NCSKEW*). This is defined as in Chen, Hong, and Stein (2001) and calculated as the negative value of the third moment of idiosyncratic weekly returns divided by its standard deviation raised to the third power, as follows:

$$NCSKEW_{j,t} = -\Big(n(n-1)^{3/2}\sum_{w=1}^{n} R_{j,w}^{3}\Big)/\Big((n-1)(n-2)(\sum_{w=1}^{n} R_{j,w}^{2})^{3/2}\Big) \tag{5}$$

2.3 Measuring forward-looking narrative disclosure of R&D activities

Prior studies provide supporting evidence that managers exert significant influence on the quality of financial reporting (Amernic, Craig, and Tourish, 2010). In this context, Li (2008) reports that managers tend to alter the tone of R&D disclosures and rely on vague wording to obscure or positively spin earnings performance, whilst Merkley (2014) provides evidence suggesting that CEOs adjust R&D disclosures based on earnings performance to convey information to the investors. Furthermore, more recent work in this direction provides stimulating evidence suggesting that managerial narratives in firms that disclose R&D in their 10-K filings are attracting short-term horizon investors and become susceptible to idiosyncratic crashes (Andreou, Drivas, Philip, and Wood, 2021).

A stream of literature provides evidence supporting the notion that the users of financial disclosures, instead of basing their decisions mainly on the audited parts of financial statements, they may rely more on the Management Discussion and Analysis (MD&A) (AICPA, 2010; Epstein and Palepu, 1999). At the same time, the MD&A is one of the most widely read disclosures in annual reports (Li, 2019). However, questions have been raised about the trustworthiness of prolonged use of the narrative sections of 10-K filings, especially when the information is not combined with data extracted from firm's fundamentals. In fact, the nature of management disclosures, which often consists of qualitative and unverifiable information rather than quantifiable data, offer the leeway to self-interested managers to intentionally tailor them in ways that hype investor optimism (Neu, Warsame, and Pedwell, 1998).

To serve the purpose of our study, we use a firm's forward-looking narrative disclosure of R&D activities in the MD&A section of its 10-K filing as a proxy for managerial rhetoric. This is done in two-steps. In the first step, for firm j in fiscal year t, we define the percentage of narrative disclosure of R&D activities in the MD&A section, as follows:

$$Narrative\ MD\&A_{j,t} = \frac{Total\ number\ of\ R\&D\ sentences}{Total\ number\ of\ sentences} \times 100. \tag{6}$$

For identifying narrative R&D activity disclosures at the sentence level, we utilize a slightly modified dictionary of Merkley (2014) by adding the plural or singular forms of the lexical tokens included in the original one. Based on this dictionary, the numerator of *Eq.* (6) counts sentences when they include at least one R&D-related lexical token such as "*research and development,*" "*R&D,*" "*product/s development,*" "*development of new product/s,*" "*technological breakthrough/s,*" "*development of proprietary technology/ies,*" *et cetera* (Appendix B features the list of lexical tokens).

In the second step, our aim is to operationale a proxy for managerial rhetoric to capture the managers' tendencies to disclose R&D-related activities in the MD&A section, which could potentially hype investor expectations regarding the firms' future prospects. We posit that this is more likely when managers are narrating *forward-looking* R&D activities, which are intrinsically challenging to evaluate and verify for their value relevance. Ergo, for firm j in fiscal year t, we define our main explanatory variable as the percentage of forward-looking narrative disclosures of R&D activities within the MD&A section, as follows:

$$Narrative\ FLS{-}MD\&A_{j,t} = \frac{Total\ number\ of\ R\&D\ sentences\ including\ FLS}{Total\ number\ of\ sentences} \times 100, \quad (7)$$

whereby FLS contains the word list of forward looking statements as per Li (2010): "*will,*" "*could,*" "*should,*" "*expect,*" "*anticipate,*" "*plan,*" "*hope,*" "*believe,*" "*can,*" "*may,*" "*might,*" "*intend,*" "*project,*" "*forecast,*" "*objective*" and "*goal*". Consequently, our proposed proxy treats an R&D sentence as forward-looking if it contains any of these future tense words, indicating narratives referring to activities that managers anticipate happening in the future.

2.3.1 Forward-looking narrative disclosure of R&D activities and investor optimism

To ensure that the managerial rhetoric proxy from *Eq.* (7) is contextually relevant, we investigate whether it resonates with cues of investor optimism. We perform two tests, specifically, a construct validation test, and an interpretation of excerpts from the MD&A section of 10-K filings using ChatGPT.

Validating a measure is an essential step in ensuring the accuracy and integrity of research endeavors. As Kerlinger, Lee, and Bhanthumnavin (2000) and Short, Broberg, Cogliser, and Brigham (2010) point out, construct validity is a pivotal aspect of allowing researchers to demonstrate the appropriateness of their measures in capturing the concepts they intend to study. Accordingly, we investigate whether our measure is positively associated with future growth opportunities. By demonstrating a positive relation between *Narrative FLS−MD&A* and growth opportunities, we could underscore the persuasive power of managerial rhetoric in shaping investor expectations regarding a firm's future prospects.

We focus on growth opportunities because is a powerful variable and reflects investors' expectation about the firm's effectiveness in managing its mix of future growth options *vs.* committed assets-in-place (Bali, Del Viva, Lambertides, and Trigeorgis, 2020). At the same time, the proportion of a firm's value arising from future growth opportunities is further enhanced by the systematic efforts of R&D intensive firms to create, cultivate, or develop future growth options (Trigeorgis and Lambertides, 2014). This can be reasonably justified by the fact that R&D activities are associated with the generation of new products, technologies, or processes that may fuel future growth (Lin, 2012). In this respect, it is reasonable to argue that the market assesses the potential for growth by considering the information disclosed by the firm, including narrative disclosure of R&D activities combined with forward-looking statements.

For the *Narrative FLS−MD&A* to proxy managerial rhetoric, we posit that it should have a positive relation with future growth opportunities, as implied by a firm's stock price, which inherently reflects investor expectations. For this purpose, we adopt the approach of Bali et al. (2020), which infers growth opportunities (GO) by subtracting the perpetual discounted stream of expected operating cash flows (CF) from the current market value of the firm (V). This is done under the assumption of a no-further growth policy and discounted at a rate k, the firm's weighted average cost of capital. Consequently, GO signifies the residual potential for future-oriented growth opportunities ($PVGO/V$), as follows:

$$GO \equiv \frac{PVGO}{V} = 1 - \frac{CF/V}{k}. \tag{8}$$

The results are reported in Appendix C. Model (1) shows the OLS regression estimates for the relation between *Narrative FLS−MD&A* and GO. Consistent with our expectations, the results support that firms emphasizing forward-looking R&D activities are perceived to have greater growth opportunities.

To ensure the robustness of the above validation exercise, we consider a falsification test to discern whether a firm's R&D expenditure is also positively affecting its future growth opportunities. In contrast to the previous results, the relation between R&D expenditure and GO as shown in model (2) is non-significant. Interestingly, the positive relation between *Narrative FLS−MD&A* and GO remains strongly positive if we control for R&D expenditure as in model (3). This suggests that the managerial forward-looking narratives are not merely capturing the reflections of actual R&D activity (as measured by a firm's R&D expenditure), but rather firm value that is driven by investor expectations regarding anticipated future events.

The evidence in Appendix C also substantiates a link between managerial narrative disclosure of R&D activities and investor optimism. Empirical evidence suggests that investors tend to be particularly optimistic about innovative companies, driving up their valuations to unjustifiable levels. In support, Haddad et al. (2022) document that an innovative company experiences a 40% increase in its stock price, an increase that goes beyond what its future outcomes can justify. Accordingly, investors' excessive optimism towards breakthroughs can lead to inflated asset valuations, and subsequently speculative bubbles as the ones described by Shiller (2020).

For our second test, we employ ChatGPT as an interpretative tool to discern whether excerpts used to construct *Narrative FLS−MD&A* align with cues indicative of investor optimism. To do so, we hand collect statements from the MD&A section of 10-K filings and present them to ChatGPT to interpret their content, accompanied by a set of instructions. Particularly, the AI is tasked to determine (1) whether the statements indicate positive or negative future prospects for the firm; (2) the nature of expectations these statements establish−positive or negative; and (3) the potential of these statements to fuel investor optimism. An indicative set of excerpts are illustrated in the Internet Appendix.

To exemplify this methodological approach, we reference an excerpt from Intel's MD&A section from its 2010 10-K filing:

> *With the launch of our 32nm products and fourth quarter record shipments of microprocessor units, we are entering 2010 in a strong competitive position as we continue delivering improvements in our product offerings through the "tick-tock" manufacturing process technology and product development cadence. We are also focusing on the development of a new highly scalable, many-core architecture aimed at parallel processing, the simultaneous use of multiple cores to execute a computing task. This architecture*

will initially be used as a software development platform for graphics and throughput computing (the need for large amounts of computing performance consistently over a long period of time). Over time, this architecture may be utilized in the development of products for scientific and professional workstations as well as high-performance computing applications.

ChatGPT's interpretation vis-à-vis to the above instructions is as follows:

(1) ***Based on the provided statements, the company has positive future prospects.*** *The statements highlight the launch of 32nm products, record shipments of microprocessor units, and improvements in product offerings through the "tick-tock" manufacturing process technology and product development cadence. This indicates a strong competitive position and a focus on delivering advancements in their product lineup.*

(2) ***The statements create positive expectations.*** *The mention of the launch of new products, record shipments, and a focus on continuous improvements through manufacturing process technology and product development cadence indicates a commitment to innovation and staying competitive in the market. The company's focus on developing a highly scalable, many-core architecture for parallel processing further reinforces its dedication to advancing its technology offerings. These factors generate positive expectations for the company's future performance.*

(3) ***These statements possess a strong potential to fuel investor optimism.*** *The company's achievements, such as the launch of new products, record shipments, and a commitment to continuous improvements, are positive indicators for investors. Investors generally value companies that demonstrate a strong competitive position, innovation, and a focus on staying ahead of market trends. The mention of the development of a highly scalable, many-core architecture for parallel processing expands the potential market reach, which can further fuel investor optimism about the company's growth potential and market opportunities.*

Altogether, based on the insights derived from the ChatGPT assessment, it appears that managerial narratives emphasizing forward-looking R&D activities predominantly convey positive information. This style of narrative disclosure inherently possesses the power to elevate expectations and fuel optimism among investors. Further, by emphasizing forward-looking R&D activities, managers accentuate their dedication to persistent growth and consistent innovation, even though the realization of outcomes lies in the future.

2.4 Control variables

Following prior studies (Hutton et al., 2009; Kim and Zhang, 2016; Callen and Fang, 2013; Andreou et al., 2022; He and Ren, 2022), we account for *Leverage*, estimated as the ratio of total liabilities to total assets; *Market to Book*, the ratio of market value to book value of equity; *Return on Equity*, estimated as the ratio of income before extraordinary items to equity; *Size*, estimated as the natural logarithm of total assets; and *Firm Age*, estimated as the number of years that the firm is covered in the Compustat universe. Consistent with Merkley (2014), we control for current earnings performance by using adjusted return on assets, *Return on Assets*, measured as annual operating earnings before R&D and advertising expense scaled by total assets. Further, we control for past *Stock Return* estimated as the average of the idiosyncratic weekly returns during the fiscal year (Chen et al., 2001). The inclusion of *Detrended Turnover*, estimated as the detrended average weekly stock trading volume during the fiscal year, controls for time-varying impacts on skewness. We also include lagged values of the negative coefficient of skewness, *NCSKEW*, to circumvent endogeneity concerns. To control for the tone of the text features, we include *Sentiment−MD&A*, which is measured as the percentage of positive words minus the percentage of negative words as defined by Loughran and McDonald (2011) dictionary, sourced from the MD&A section of 10-K filings. Additionally, since CEOs are appeared to act opportunistically in the years prior to their departures by overly hiding negative news from investors, to increase their personal wealth (Andreou et al., 2020), we control for departing CEOs. Specifically, *CEO Depart* is proxied by an indicator variable set equal to one if there is a departure of firm's CEO, during the fiscal year t, and zero otherwise. We also use binary variables set equal to one for one, two or three fiscal years before the year of the CEO's departure, (denoted as

CEO Depart 1Y Before, *CEO Depart 2Y Before* and *CEO Depart 3Y Before*, respectively), to capture the opportunistic behavior which could be more severe during this timing.

3 Discussion of empirical findings

In this section, we conduct a series of empirical analyses to examine the relation between R&D narrative disclosure and future stock price crashes. We begin by summarizing the sample and discussing the univariate associations. Subsequently, we undertake multivariate regression analysis, incorporating controls for a range of firm-specific attributes. We also present several robustness checks and additional analyses including a difference-in-differences test.

3.1 Summary statistics and correlation analysis

Table 1 presents summary statistics for the variables employed in the baseline empirical analysis. The 0.214 and 0.197 mean value of the *CRASH* and *PCRASH* respectively suggests that approximately 20% of firm-years demonstrate at least one crash week. The mean and standard deviation of the crash risk measures are comparable to those reported in prior studies (*e.g.*, Kim et al., 2011a; Kim, Li, and Zhang, 2011b; Andreou, Antoniou, Horton, and Louca, 2016). On average the percentage of R&D-related sentences (*Narrative MD&A*) is 1.157, whilst for the forward-looking R&D-related sentences (*Narrative FLS−MD&A*) is 0.661. In terms of *Sentiment−MD&A*, the mean is -0.001 indicating that the average negative tone slightly prevails over the positive.

The distribution characteristics of control variables are largely consistent with those reported in prior studies. For instance, the average firm in our sample has total assets of 7045.870 million USD, firm age of 18.755 years, market to book ratio of 3.250 and total liabilities to total assets of 0.508. The sample firms have mean return on assets 0.088, return on equity 0.106 and weekly return -0.126. The detrended average weekly stock trading volume is 0.001 and the mean negative coefficient of skewness is 0.028. Finally, the mean of CEO Depart is 0.101, indicating that approximately 10% of firm-years indicate a change in firm's management.

[Insert Table 1, here]

Table 2 reports the Pearson correlation coefficients between the variables considered in the baseline analysis. As expected, *CRASH* and *PCRASH* are highly correlated (0.949), since pure crash measures differ only in the recognition of stock price crashes which are not being offset by corresponding jumps during the fiscal year. However, the correlation of the continuous crash risk measure (*NCSKEW*) with the rest two dichotomous measures is only approximately 0.650. As expected, a high correlation is evident between the two narrative proxies, *Narrative FLS−MD&A* and *Narrative MD&A*. The univariate analysis results show a statistically significant positive correlation between stock price crash risk (as measured by *CRASH*, *PCRASH* or *NCSKEW*) and the narrative disclosure of R&D activities in 10-K filings (represented by either *Narrative FLS−MD&A* or *Narrative MD&A*). All other variables do not show high correlations to raise concerns of multicollinearity.

[Insert Table 2, here]

3.2 Baseline regression results

This section provides insights into how managers hype investors' expectations using the managerial narratives disclosed in publicly available annual reports. To this end, we examine the relation between managerial narrative and future stock price crashes using multivariate regression analysis. The main analysis is presented in Table 3. Specifically, models (1), (3) and (5) utilize the main explanatory variable *Narrative FLS−MD&A*, whilst models (2), (4) and (6) utilize the alternative measure *Narrative MD&A*. Models (1) and (2) report regression results for *CRASH*, models (3) and (4) for *PCRASH*, and models (5) to (6) for *NCSKEW*. The estimates include industry and year fixed effects to control for unobserved time-invariant effects. Robust standard errors provided in parentheses below the coefficient estimates are clustered at the firm level.

The estimates reported in Table 3, Panel A are obtained using the full sample. The results show a positive statistically significant (p-value<0.01) relation between the two narrative measures and one-year-ahead stock price crash risk. To ensure that these findings are not driven by firms with zero R&D expense, in Panel B we re-examine our analysis on the subsample with non-missing R&D expense data. The results suggest an even stronger positive and statistically significant relation between R&D narrative disclosure and future stock price crash risk.

Further, in all model specifications, *Sentiment−MD&A* is positive and statistically significant in predicting one-year-ahead stock price crash risk. This suggests that when the positive tone outweighs the negativetone in the MD&A section of 10-K filings, firms are more likely to experience a stock price crash. All control variables generally have the expected sign. For instance, younger firms and smaller firms are more prone to experience a stock price crash, consistent with Chen et al. (2001). *Return on Assets* is highly significant with a negative coefficient, suggesting that firms with better operating performance are less vulnerable to experience crashes, whilst the *Market to Book* ratio is weakly significant in predicting future crash risk, consistent with Hutton et al. (2009). There is also a positive and statistically significant relation between the idiosyncratic weekly returns, the detrended turnover and the negative coefficient of skewness with the occurrence of stock price crashes. Finally, the probability to experience a stock price crash is higher one (*CEO Depart 1Y Before*) and two years (*CEO Depart 2Y Before*) prior to the CEO departure.

[Insert Table 3, here]

3.3 Support of the managerial rhetoric mechanism

Rhetoric can be considered as the art of utilizing effectively convincing communication. It entails the clear and convincing narratological concepts in order to persuade people and influence their opinions by conveying a message through specific rhetorical devices. In the corporate world, these rhetorical devices are utilized to convince investors for future success using strategic communication. In this vein, we *expect* that the R&D narrative disclosed in the MD&A section to persuasively convey messages and convince or shape the opinions of investors. In contrast, we would *not expect* these rhetorical devices to exist either in the entire 10-K filing or the Risk Factors section. If this is the case, then the absence of evidence from the entire 10-K and Risk Factor section can be supportive for the existence of a managerial rhetoric mechanism that derives from the MD&A section.

Accordingly, we move forward to alleviate concerns that the positive impact of narratives on future stock price crash risk is also prevalent among the entire 10-K Filing (10-K) or the Risk Factor's section (RF). In the analysis presented in Table 4, we employ the same narrative proxies as those in Table 3, with the difference that the source of textual information for the analysis for models (1) to (3) it is derived from the entire 10-K filing, whilst for models (4) to (6) it is derived from the Risk Factors section.

The relation between narrative and future stock price crashes presented in Table 4 diverges from the one in Table 3. In both contexts−whether considering the entire 10-K filings or the Risk Factors−the relation is non-significant. This indicates that investors particularly value the narratives within the MD&A section, whereas content from other sections might not significantly skew their perceptions. These results align with our expectations, highlighting the presence of a managerial rhetoric mechanism wherein managers tailor narratives to positively influence public impressions.

[Insert Table 4, here]

3.4 Robustness tests

In this section, we conduct certain robustness tests. First, we aim to test whether our main finding of the relation between narratives R&D and crash risk is not the reflection of the actual R&D activity along with its output efficiency. In Table 5 we control for actual

R&D activity and corresponding efficiency by including in our baseline model five alternative proxies, specifically: R&D expenditure divided by sales in model (1); R&D expenditure divided by total assets in model (2); number of patents granted to the firm weighted with their citations in model (3); patents granted divided by R&D capital (as in Hirshleifer, Hsu, and Li, 2013) in model (4); and patents granted weighted with their citations scaled by R&D capital in model (5). Altogether, the results show that the coefficients of *Narrative FLS−MD&A* remain statistically positive in predicting future stock price crash risk after controlling for the above-mentioned proxies of actual R&D activity and efficiency.

[Insert Table 5, here]

Second, we augment our baseline regressions by considering alternative earnings management proxies. This analysis is motivated by two reasons. One reason is that prior research suggests that earnings management is usually achieved via management's use of discretionary accruals (Dechow, Sloan, and Sweeney, 1995). Systematic accrual-based earnings management resulting in a lack of transparency, *i.e.*, financial reporting opacity, enables managers to withhold bad news from the investors. Consequently, when the hoarded negative information is released all at once a stock price crashes is triggered (Jin and Myers, 2006; Hutton et al., 2009). Another reason is that prior evidence acknowledges depreciation manipulation as an earnings management tool that is explored to smooth the fluctuation of earnings (Bartov, 1993; Bushee, 1998; Breton and Stolowy, 2004). Additionally, research supports the pruning of the R&D expenditure as a means to meet financial objectives and enhance earnings performance (Baber, Fairfield, and Haggard, 1991; Perry and Grinaker, 1994; Bange and De Bondt, 1998; Cheng, 2004). Admittedly, this step becomes necessary to enable us to show that the variables, which are strongly associated with the hoarding of bad news mechanism, do not confound our results.

Therefore, we take into consideration the following three alternative earnings management proxies (*i*) *Opacity*, which is measured as the cumulative sum of the absolute value of discretionary accruals (based on the modified Jones approach) over the previous three years, is estimated in the spirit of Hutton et al. (2009), (*ii*) *Depreciation*, which is measured as the depreciation expense divided by total assets, and (*iii*) *R&D Cut*, which is an binary variable set equal to one when the R&D expenditure has decreased from previous year, and zero otherwise.

The results reported in Table 6 show that the inclusion of these alternative earnings management measures does not affect in any material way the positive relation between managerial narrative and crash risk. Interestingly, the results show that none of these earnings management measures is significant in predicting future stock price crashes. This finding is consistent with Andreou et al. (2022) who suggest that accrual-based earnings management has lost statistical significance in the post-SOX era (see, also, Hutton et al. 2009; Cohen, Dey, and Lys 2008; Krishnan, Raman, Yang, and Yu 2011; Kuang, Qin, and Wielhouwer 2014; Andreou et al. 2016). In this regard, this finding also supports that our proposed mechanism is distinct from that based on the hoarding of bad news.

[Insert Table 6, here]

Next, we proceed to provide robustness tests to the exposure in other unobserved 10-K textual features that may be driving the relation between R&D narrative disclosure and crash risk. Accordingly, we follow prior studies that have examined the relation between the quality of financial reporting through narrative disclosures and stock price crashes. For instance, Ertugrul et al. (2017) investigate the impact of various characteristics related to 10-Ks (*i.e.*, the size and the tone of the filings) on idiosyncratic crashes. They show that larger 10-K filings, which include more words related to the uncertainty and weakness, are positively related to future stock price crashes. Following this literature, we also incorporate in the analysis several textual variables as defined by the Loughran and McDonald's (2011) dictionary. We consider the following measures: *Uncertainty*, which is measured as the percentage of words conveying uncertainty; *Modal Weak*, which is measured as the percentage of modal weak words; *Litigious*, which is measured as the percentage of words related to litigation; and *Readability*, which is measured as the natural logarithm of the file size in megabytes of the 10-K filing.[6]

For brevity, in Table 7 we present the results obtained using only the main managerial narrative proxy, *Narrative FLS−MD&A*, because the results using the other proxy are qualitatively similar. The results show that none of these alternative textual variables is significant or able to attenuate the statistical significance of *Narrative FLS−MD&A*. Our main findings are not driven by widely applied word lists associated with uncertainty, modal weak or litigation, nor are they affected by the readability of the 10-K filing. Importantly, these findings are reassuring that our main conclusions are not sensitive to the model specification, as the positive relation between R&D narrative disclosure and stock price crash risk is prevalent regardless of additional textual controls.

[Insert Table 7, here]

Finally, to preclude the possibility that our results are driven by equity compensation incentives or pressure exerted by institutional investors, we proceed with the inclusion of option incentives, stock incentives and transient institutional ownership in the baseline model. This motivation follows the reasoning of a number of studies that investigate the relation between equity compensation incentives and institutional ownership with stock price crashes. For instance, Kim et al. (2011a) document a positive relation between variables of equity-based incentives and one-year-ahead crash risk. Further, Callen and Fang (2013) and Andreou et al. (2016) provide evidence suggesting that transient institutional holdings are positively associated to future crash risk, especially when financial statements are opaque. The results reported in Table 8 show that the R&D narrative disclosure remains positive and statistically significant beyond these controls, suggesting that the effect of the managerial rhetoric mechanism is over and above the one of compensation schemes and institutional investors.

[Insert Table 8, here]

[6] Given that both, modal weak words and words conveying uncertainty, reflect the ambiguous tone of financial disclosures and they are highly correlated, the full set of textual variables include only the latter.

3.5 Endogeneity treatments

In this section, we employ alternative econometric approaches to address potential endogeneity concerns and provide evidence in support of a causal relation between managerial narrative and stock price crash risk. For this purpose, we conduct four different tests.

First, to achieve a relatively more powerful approach towards time-invariant omitted variables, we include firm fixed effects in our baseline model. Also, we add high dimensional fixed effects, which are interactions of firm quintiles (*i.e.*, grouping firms into quintiles based on their basic characteristics) and time dummies. In doing so, we account for unobserved firm heterogeneity that may confound the estimation of the effect of our variables of interest (Gormley and Matsa, 2014). Second, we mitigate reverse causality issues by estimating regression models where we swap crash risk with managerial narrative. Third, to account for measurement error, we perform an additional iteration of the baseline model, where we substitute the original continuous explanatory variable with a categorical variable. These newly created categorical variables are constructed based on the deciles, quintiles, and tertiles derived from the original continuous variable. The results of this analysis lend further support to the positive relation between managerial R&D narrative and one-year-ahead crash risk. An extensive discussion of these results is provided in the Internet Appendix.

Finally, we strengthen our inferences by conducting a difference-in-differences (DiD) analysis utilizing tariff cuts as a quasi-natural experiment that causes an exogenous change of managerial narrative. The exogenous event of a tariff cut satisfies the requirements of representing an ideal framework to establish causality. Import tariffs, as per Bernard, Jensen, Redding, and Schott (2007) and Erdem and Tybout (2003), act as a significant barrier of entry for foreign competition and accordingly minimize pressure exerted from competitors. We can reasonably assume that a tariff cut will affect managerial narrative through an increase to competition. Additionally, according to Li and Zhan (2019a), tariff cuts fulfil the exclusion condition because they are not associated with idiosyncratic stock price crash risk.

We obtain annual product-level U.S. import data from the publicly available U.S. International Trade Commission (USITC) DataWeb. This data set is then aggregated by district, year, and industry, as defined by NAIC number. Each firm-year observation in our sample is classified into its respective state based on the district. Following the methodology outlined by Li and Zhan (2019b), we identify a tariff reduction within a specific industry-year when a change results in at least a three times increase in imports compared to the median change. Subsequently, we employ a DiD framework based on this exogenous event. To accomplish this, we restrict our sample to U.S. states that have undergone a tariff cut and apply the before-after model, as suggested by Duchin, Ozbas, and Sensoy (2010). Accordingly, we construct the binary indicator variable *After*, which is set equal to one if an industry has experienced a tariff cut over the last three years. This variable, along with its interaction with managerial rhetoric, is integrated into the baseline models.

The DiD setting enables us to estimate−through the tariff cut−the causal effect of the relation between R&D narrative disclosure and stock price crash risk. The DiD estimator (*After**Narrative FLS−MD&A*) captures the average differential change in stock price crash risk in the post-tariff cut period, thereby enabling us to identify the causal effect under scrutiny. The results reported in Table 9 show a statistically significant positive interaction term. This suggests that, notwithstanding the substantial fluctuations in trade barriers induced by the exogenous tariff reduction, there is evidence to suggest a causal relation between managerial narrative and the likelihood of subsequent stock price crashes.

[Insert Table 9, here]

4 The role of corporate governance

The empirical analysis provided in this section investigates the relation between managerial narrative and crash risk through the lenses of external and internal corporate governance mechanisms. This taxonomy abides by the literature that extensively emphasizes the importance of certain corporate governance functions in mitigating the agency-based reasons responsible for stock price crashes (*e.g.*, Jensen 1993; Ashbaugh-Skaife, Collins, and LaFond 2006; Fich and Shivdasani 2006; Coles, Daniel, and Naveen 2008; Callen and Fang 2013; Andreou et al. 2016; Li and Zeng 2019). Further, corporate governance mechanisms that fall under these categories are designed to increase or enhance the monitoring of management actions to promote effective decision-making, limit opportunistic behavior and reduce the information asymmetry between the firm and its external stakeholders.

In the absence of appropriate monitoring and disciplining corporate governance functions, managers have more leeway to act opportunistically in hoarding bad news to maximize their own wealth to the detriment of shareholder welfare (Callen and Fang, 2013, 2015; Andreou et al., 2016). In this vein, the extensive body of research on crash risk suggests that the fundamental trigger behind stock price crashes is the hoarding of bad news mechanism. The bulk of the literature which focuses on firm-specific explanations primarily draws from the agency models developed by Jin and Myers (2006) and Benmelech et al. (2010) and proposes opacity and overinvestment as the channels through which managers strategically hide unfavorable news. As a result, exploiting the ideal environment of inadequate monitoring, these two channels provide managers with the means to consistently participate in opportunistic actions through the concealment of unfavorable information that could be proved detrimental for the firm.

However, over the past twenty years, there has been a notable improvement in the corporate governance regulations aimed at addressing managerial opportunism and safeguarding the interests of shareholders (Bhagat and Bolton, 2013b; DeFond and Zhang, 2014; Company, 2018; O'Kelley R. and Reynolds, 2018; Wintoki, 2007). Recent empirical evidence suggests the inefficacy of opacity and overinvestment to rationalize the upsurge in the stock price crash risk phenomenon and ascribed it to the sustained efforts of gatekeepers and fiduciary agents that have significantly contributed to improving corporate governance, fostering in this fashion more effective monitoring and disciplining processes for U.S.-listed firms (Andreou et al., 2022). These improvements aid in alleviating agency-related concerns for the typical firm and highlight the crucial role of corporate governance in mitigating stock price crashes by shaping the transparency, accountability, and decision-making processes within a company. However, while corporate governance has shown promise in addressing the hoarding of bad news mechanism, it's uncertain whether it can curtail managers from exploiting the managerial rhetoric mechanism. This is the gist of our empirical investigation in this section.

4.1 External governance

We perform a subsample analysis to investigate whether external corporate governance has any impact on the relation between managerial narrative and stock price crash risk. Specifically, we consider variables related to competitive environment (*Competitiveness*) measured as the industry adjusted price-cost margin (Andreou et al., 2017), managerial power (*Gindex*) measured as the number of anti-takeover provisions (Gompers, Ishii, and Metrick, 2003), and investors' attention (*Analysts*) measured by a binary variable set equal to one if the firm has at least one analyst following, and zero otherwise. We divide firms into subsamples based on their level of external governance. The High/Low *Competitiveness* subsamples comprise observations as defined by the higher/lower tertiles of the *Competitiveness*. The High/Low *Gindex* subsamples comprise observations as defined by the higher/lower tertiles of the *Gindex*. The *Analysts* subsamples comprise observations where the number of analysts is either at least one or zero.

These results are reported in Table 10. Models (1) and (2) show that the positive relation between the managerial narrative and crash risk is only prevalent among firms that are facing relatively high competition. This finding is in line with the view that a highly competitive environment exert pressure to firms facing more threats, which in turn make their firms more vulnerable in experiencing a stock price crash (Li and Zhan, 2019a). Models (3) and (4) show a stronger relation between managerial narrative and crash risk among the low *Gindex* subsample in which managers have a relatively low power, resulting from shareholders' high ability to replace directors. A higher number of anti-takeover provisions safeguards CEOs from takeover threats and reduces the likelihood of losing their job (Gompers et al., 2003). Therefore, in such cases, managers feel more secured and have lower incentives to utilize the power of narrative to cater to investor expectations. Models (5) and (6) show that the managerial rhetoric-crash relation appears only among firms with analysts' coverage consistent with the view that analysts serve as transponders of firms' information to the investment community. This is reasonable considering that such firms are more likely to attract investors' attention.

Overall, the results indicate that external pressures−such as a highly competitive environment, takeover threats, or investors' attention−possibly stipulate managers to exploit rhetorical devices as a mean to strategically bias their narratives in a self-serving fashion.

[Insert Table 10, here]

4.2 Internal governance

Likewise, we conduct a subsample analysis to examine whether internal corporate governance. In this context, we consider variables related to the composition and characteristics of the board of directors, such as the board size, the majority of independent directors and the number of female, busy and not attended directors (*e.g.*, Andreou et al., 2016; Li and Zeng, 2019; Kim, Li, and Li, 2014; Dang, Lee, Liu, and Zeng, 2018; Ni, Peng, Yin, and Zhang, 2020; Hasan, Taylor, and Richardson, 2022). We divide firms into subsamples based on their level of internal governance. The High/Low *Board Size* subsamples comprise observations as defined by the higher/lower tertiles of the number of board members. The *Percentage of Independent Directors* subsamples comprises observations where the independent directors on a board have the majority or minority. The *Number of Female Directors* subsamples comprise observations where the number of female directors is greater than one, or equal or less than one. The *Number of Busy Directors* subsamples comprise observations where the number of busy directors is either at least one or zero. The *Number of Not Attended Directors* subsamples comprise observations where the number of directors who did not attend is either at least one or zero.

These results are reported in Table 11, presenting various models examining the relation between managerial narrative and future stock price crashes under the different subsamples. Interestingly, the results show a prevalent managerial narrative−crash relation across all subsamples, regardless of the condition considered. This evidence suggests that internal corporate governance does not affect the observed relation. The results feature a contradiction with prior studies highlighting the importance of internal corporate governance in mitigating the adverse effect of crash determinants. Particularly, our findings support the notion that traditional internal governance mechanisms are not effective in monitoring how managerial rhetoric influences information flow to investors. In this vein, boards should consider implementing more robust oversight systems to identify and control the use of managerial narratives as a tool for shaping investor perceptions.

[Insert Table 11, here]

5 Conclusions

A growing body of literature has focused on rationalizing stock price crashes through the hoarding of bad news mechanism, placing an overly emphasis on the agency-based channel of opacity and, to a lesser extent, overinvestment. Nonetheless, recent evidence suggests that the opacity- and overinvestment-crash relations are non-significant, especially in the period following the enforcement of the Sarbanes–Oxley Act. Possibly, this occurs because the period following the Sarbanes-Oxley Act has seen a surge in corporate governance regulations, laws, and exchange listing standards that hold executives accountable for the accuracy and credibility of the information they disclose to investors and the public.

Admittedly, whilst managers may risk allegations of using creative accounting techniques to obfuscate a firm's financial standing, they are not legally liable for setting unrealized expectations through their managerial narratives. In this spirit, we present evidence that managerial rhetoric acts as an important channel for managers to convey anticipated favorable soft information to investors. This mechanism serves as a protective measure to shield executives from potential legal liability, while also minimizing the risk of litigation arising from potentially misleading numerical disclosures in financial statements. Consequently, when the information disclosed is inconsistent with the subsequent performance and the pre-established expectations, investors abruptly revise their expectations and causing extreme sudden declines in idiosyncratic returns. Ergo, the managerial rhetoric mechanism emerges as a powerful communication tool that self-interested executives may strategically exploit to hype investor expectations at unjustifiable levels and inflate a firm's stock price beyond its intrinsic value at the expense of shareholders.

Our findings suggest that narrative disclosures describing forward-looking R&D activities, sourced from the MD&A section of 10-K filings, are positively associated with future stock price crash risk. The results remain robust when using different proxies of R&D activity narratives and become stronger in subsamples restricted only to firms with non-missing R&D expenditures. In testing the robustness of our findings, we control for actual innovation activity, alternative earnings management measures, prominent textual variables, equity-based incentives and transient institutional ownership. Overall, the results withstand these prominent controls proposed in prior studies and suggest the existence of an alternative, yet important, conduit that enables managers to portray a more favorable outlook for their firms' prospects.

Moreover, our findings feature the importance of the external mechanisms that urge CEOs to utilize the managerial rhetoric mechanism to self-control the flow of information to the investment community. In particular, the results show that the adverse impact of managerial narrative prevails among firms that face high competition, firms with lower anti-takeover provisions and firms covered by analysts. Finally, the results demonstrate the inefficacy of internal corporate governance to identify the utilization of the managerial rhetoric mechanism, and accordingly its failure to offset any risks that may be associated with exploiting the management discussion at the expense of shareholders. In summary, our findings provide a plausible reason for the utilization of the conduit for delivering self-serving information, when external pressure put at risk the management's empire.

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Tables

Table 1. Summary Statistics

This table presents summary statistics for key variables over the period 1994-2018. These statistics are obtained using a sample with sufficient data to estimate the main variables, consisting of 2,071 firms with 16,202 firm-year observations. The crash risk variables (*CRASH*, *PCRASH* and *NCSKEW*) are measured in fiscal year $t+1$, whereas all the other variables are measured in fiscal year t. All continuous variables are winsorized at the 1st and 99th percentile. For variable definitions and details of their calculation, see Appendix A.

Variable	Mean	Std. Dev.	Q1	Median	Q3
Panel A: Dependent variables					
CRASH	0.214	0.410	0.000	0.000	0.000
PCRASH	0.197	0.397	0.000	0.000	0.000
NCSKEW	0.037	0.732	-0.382	-0.003	0.394
Panel B: Explanatory variables					
Narrative FLS−MD&A	0.661	1.943	0.000	0.000	0.671
Narrative−MD&A	1.157	2.689	0.000	0.000	1.316
Panel C: Baseline control variables					
Sentiment−MD&A	-0.001	0.002	-0.002	-0.001	0.000
Total Assets	7,045.9	2,7552.1	514.6	1,410.3	4,350.9
Firm Age	18.755	8.723	12.000	18.000	25.000
Market to Book	3.250	3.855	1.549	2.400	3.856
Leverage	0.508	0.216	0.359	0.510	0.641
Return on Assets	0.088	0.136	0.040	0.083	0.142
Return on Equity	0.106	0.301	0.050	0.120	0.190
Stock Return	-0.126	0.136	-0.156	-0.080	-0.042
Detrended Turnover	0.001	0.019	-0.006	0.000	0.007
NCSKEW	0.028	0.706	-0.386	-0.009	0.376
CEO Depart	0.101	0.301	0.000	0.000	0.000

Table 2. Correlation coefficients matrix

This table presents the Pearson correlation coefficients matrix for key variables over the period 1994-2018. The coefficients are obtained using a sample with sufficient data to estimate the main variables, consisting of 2,071 firms with 16,202 firm-year observations. The crash risk variables (*CRASH*, *PCRASH* and *NCSKEW*) are measured in fiscal year $t+1$, whereas all the other variables are measured in fiscal year t. All continuous variables are winsorized at the 1st and 99th percentile. For variable definitions and details of their calculation, see Appendix A. The symbols ***, **, and * denote two-tailed statistical significance at the 1%, 5%, and 10% level, respectively.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1)	CRASH	1														
(2)	PCRASH	0.949***	1													
(3)	NCSKEW	0.646***	0.665***	1												
(4)	Narrative FLS−MD&A	0.039***	0.036***	0.017**	1											
(5)	Narrative−MD&A	0.037***	0.035***	0.015*	0.937***	1										
(6)	Sentiment−MD&A	0.003	0.011	0.026***	-0.040***	-0.036***	1									
(7)	Total Assets	-0.020***	-0.016**	0.025***	-0.154***	-0.207***	-0.037***	1								
(8)	Firm Age	-0.012	-0.012	-0.010	-0.101***	-0.140***	-0.038***	0.360***	1							
(9)	Market to Book	0.028***	0.035***	0.048***	0.093***	0.113***	0.076***	0.023***	-0.028***	1						
(10)	Leverage	-0.014*	-0.012	-0.019**	-0.154***	-0.213***	-0.006	0.406***	0.152***	0.040***	1					
(11)	Return on Assets	-0.019**	-0.016**	-0.023***	0.078***	0.102***	0.090***	-0.050***	-0.001	0.232***	-0.120***	1				
(12)	Return on Equity	0.013*	0.018**	0.036***	-0.080***	-0.094***	0.121***	0.114***	0.063***	0.347***	0.043***	0.219***	1			
(13)	Stock Return	0.004	0.005	0.019**	-0.150***	-0.193***	0.105***	0.366***	0.307***	0.046***	0.084***	0.131***	0.218***	1		
(14)	Detrended Turnover	0.012	0.010	0.014*	0.009	0.005	0.029***	-0.005	-0.012	0.034***	0.042***	-0.025***	0.021***	-0.168***	1	
(15)	CEO Depart	0.003	0.000	0.012	-0.013	-0.014*	0.000	0.019**	0.004	-0.014*	0.037***	-0.056***	-0.040***	-0.017**	0.002	1

Table 3. The effect of R&D managerial narrative disclosure on future stock price crash risk

This table presents logistic and OLS regression estimates examining the relation between R&D managerial narrative disclosure and future stock price crash risk. The estimates of Panel A are obtained using the full sample, whilst the estimates of Panel B are obtained using a sample with non-missing R&D expense data. The dependent variable is *CRASH* in models (1) and (2), *PCRASH* in models (3) and (4), constituting a dichotomous measure of stock price crashes, and *NCSKEW* in models (5) and (6), constituting a continuous crash risk measure. The dependent variables are measured in fiscal year $t+1$. The main explanatory variables are *Narrative FLS−MD&A*, which measures the percentage of sentences containing forward-looking R&D-related keywords, and *Narrative−MD&A*, which measures the percentage of sentences containing R&D-related keywords, both sourced from the Management's Discussion and Analysis section of the 10-K filing. All explanatory variables are measured in fiscal year t. For variable definitions and details of their calculation, see Appendix A. The estimates include a constant and different fixed effects (as indicated at the bottom of the table) whose coefficients are suppressed. Industry fixed effects are defined based on the Fama–French 48-industry classification. All continuous variables are winsorized at the 1st and 99th percentile and are standardized to have a mean value of zero and variance of one. Robust standard errors clustered at the firm level are shown in parentheses. The symbols ***, **, and * denote two-tailed statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A: Full data

	(1)	(2)	(3)	(4)	(5)	(6)
	CRASH		PCRASH		NCSKEW	
Narrative FLS−MD&A	0.070***		0.070***		0.020***	
	(0.02)		(0.02)		(0.01)	
Narrative−MD&A		0.059***		0.061***		0.015*
		(0.02)		(0.02)		(0.01)
Sentiment−MD&A	0.066***	0.065***	0.083***	0.082***	0.030***	0.030***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)
Ln(Total Assets)	-0.069***	-0.069***	-0.056**	-0.055**	0.025**	0.026**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.01)	(0.01)
Ln(Firm Age)	-0.077***	-0.076***	-0.070***	-0.069***	-0.029***	-0.029***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)
Market to Book	0.041**	0.041**	0.060***	0.060***	0.040***	0.040***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)
Leverage	0.008	0.009	0.006	0.007	-0.032***	-0.032***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)
Return on Assets	-0.094***	-0.094***	-0.089***	-0.089***	-0.045***	-0.045***

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	(1)	(2)	(3)	(4)	(5)	(6)
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)
Return on Equity	0.043*	0.042*	0.046**	0.045**	0.027***	0.027***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)
Stock Return	0.058**	0.058**	0.055**	0.056**	0.041***	0.041***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.01)	(0.01)
Detrended Turnover	0.044**	0.045**	0.036	0.036	0.018**	0.018**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)
NCSKEW	0.037*	0.037*	0.035*	0.034*	0.003	0.003
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)
CEO Depart 3Y Before	-0.024	-0.025	0.018	0.017	0.093***	0.093***
	(0.08)	(0.08)	(0.08)	(0.08)	(0.03)	(0.03)
CEO Depart 2Y Before	0.196***	0.194***	0.238***	0.237***	0.113***	0.113***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.03)	(0.03)
CEO Depart 1Y Before	0.309***	0.308***	0.306***	0.305***	0.164***	0.164***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.03)	(0.03)
CEO Depart	0.067	0.066	0.052	0.052	0.077***	0.077***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.03)	(0.03)
CEO Depart 1Y After	-0.100	-0.100	-0.103	-0.103	-0.030	-0.031
	(0.07)	(0.07)	(0.07)	(0.07)	(0.03)	(0.03)
Fixed effects	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry
Number of observations	16,202	16,202	16,202	16,202	16,202	16,202
Pseudo Log-likelihood	-8,181.5	-8,183.5	-7,837.7	-7,839.4		
Pseudo R-squared	0.026	0.026	0.024	0.024		
R-squared					0.025	0.025

Panel B: Data with non-missing R&D expense

	(1)	(2)	(3)	(4)	(5)	(6)
	CRASH		PCRASH		NCSKEW	
Narrative FLS−MD&A	0.077***		0.073***		0.020***	
	(0.02)		(0.02)		(0.01)	
Narrative−MD&A		0.066***		0.064***		0.016*
		(0.02)		(0.02)		(0.01)
Sentiment−MD&A	0.055*	0.053*	0.072***	0.071**	0.039***	0.039***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.01)	(0.01)

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Ln(Total Assets)	-0.059*	-0.058*	-0.041	-0.040	0.032***	0.032***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.01)	(0.01)
Ln(Firm Age)	-0.064**	-0.063**	-0.068**	-0.067**	-0.043***	-0.042***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.01)	(0.01)
Market to Book	0.020	0.020	0.042*	0.042*	0.033***	0.033***
	(0.02)	(0.02)	(0.03)	(0.02)	(0.01)	(0.01)
Leverage	-0.009	-0.007	-0.017	-0.015	-0.039***	-0.039***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.01)	(0.01)
Return on Assets	-0.077***	-0.077***	-0.076***	-0.076***	-0.041***	-0.041***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.01)	(0.01)
Return on Equity	0.051*	0.051*	0.057**	0.057**	0.025**	0.025**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.01)	(0.01)
Stock Return	0.052	0.052*	0.052	0.052	0.043***	0.043***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.01)	(0.01)
Detrended Turnover	0.036	0.036	0.025	0.026	0.016	0.017
	(0.03)	(0.03)	(0.03)	(0.03)	(0.01)	(0.01)
NCSKEW	0.036	0.036	0.030	0.029	-0.004	-0.004
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)
CEO Depart 3Y Before	-0.093	-0.094	-0.075	-0.076	0.083**	0.082**
	(0.10)	(0.10)	(0.10)	(0.10)	(0.04)	(0.04)
CEO Depart 2Y Before	0.223***	0.220***	0.285***	0.283***	0.125***	0.125***
	(0.08)	(0.08)	(0.09)	(0.09)	(0.04)	(0.04)
CEO Depart 1Y Before	0.274***	0.273***	0.297***	0.296***	0.172***	0.171***
	(0.08)	(0.08)	(0.08)	(0.08)	(0.03)	(0.03)
CEO Depart	0.024	0.023	0.016	0.015	0.053	0.053
	(0.08)	(0.08)	(0.08)	(0.08)	(0.03)	(0.03)
CEO Depart 1Y After	-0.128	-0.128	-0.144*	-0.144*	-0.058*	-0.058*
	(0.08)	(0.08)	(0.09)	(0.09)	(0.03)	(0.03)
Fixed effects	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry
Number of observations	10,567	10,567	10,567	10,567	10,567	10,567
Pseudo Log-likelihood	-5,421.1	-5,423.0	-5,193.7	-5,195.4		
Pseudo R-squared	0.024	0.023	0.023	0.022		
R-squared					0.0288	0.0286

Table 4. The effect of R&D managerial narrative disclosure on future stock price crashes: Evidence from the entire 10-K and Risk Factors section

This table presents logistic regression estimates examining the relation between R&D managerial narrative disclosure and future stock price crashes. The dependent variable is *PCRASH*, constituting a dichotomous measure of stock price crashes in fiscal year $t+1$. The main explanatory variable in model (1) is *Narrative FLS−10K*, which measures the percentage of sentences containing forward-looking R&D-related keywords, whilst in model (2) is *Narrative−10K*, which measures the percentage of sentences containing R&D-related keywords, both sourced from the entire 10-K filing. The main explanatory variable in model (3) is *Narrative FLS−RF*, which measures the percentage of sentences containing forward-looking R&D-related keywords, whilst in model (4) is *Narrative−RF*, which measures the percentage of sentences containing R&D-related keywords, both sourced from the Risk Factors section of the 10-K filing. All explanatory variables are measured in fiscal year t. For variable definitions and details of their calculation, see Appendix A. The estimates include a constant and different fixed effects (as indicated at the bottom of the table) whose coefficients are suppressed. Industry fixed effects are defined based on the Fama–French 48-industry classification. All continuous variables are winsorized at the 1st and 99th percentile and are standardized to have a mean value of zero and variance of one. Robust standard errors clustered at the firm level are shown in parentheses. The symbols ***, **, and * denote two-tailed statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Narrative FLS−10K	0.001			
	(0.03)			
Narrative−10K		-0.004		
		(0.03)		
Narrative FLS−RF			0.009	
			(0.02)	
Narrative−RF				0.000
				(0.02)
Sentiment−10K	0.015	0.016		
	(0.02)	(0.02)		
Sentiment−RF			0.060**	0.061**
			(0.03)	(0.03)
Ln(Total Assets)	-0.062**	-0.062**	-0.067**	-0.068**
	(0.03)	(0.03)	(0.03)	(0.03)
Ln(Firm Age)	-0.069***	-0.070***	-0.074***	-0.074***
	(0.02)	(0.02)	(0.02)	(0.02)
Market to Book	0.067***	0.068***	0.066***	0.066***
	(0.02)	(0.02)	(0.02)	(0.02)

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Leverage	0.002	0.002	-0.001	-0.001
	(0.02)	(0.03)	(0.02)	(0.02)
Return on Assets	-0.084***	-0.084***	-0.084***	-0.083***
	(0.02)	(0.02)	(0.02)	(0.02)
Return on Equity	0.044*	0.043*	0.045**	0.044**
	(0.02)	(0.02)	(0.02)	(0.02)
Stock Return	0.059**	0.058**	0.060**	0.060**
	(0.03)	(0.03)	(0.03)	(0.03)
Detrended Turnover	0.038*	0.038*	0.038*	0.038*
	(0.02)	(0.02)	(0.02)	(0.02)
NCSKEW	0.036*	0.036*	0.036*	0.036*
	(0.02)	(0.02)	(0.02)	(0.02)
CEO Depart 3Y Before	0.016	0.016	0.016	0.016
	(0.08)	(0.08)	(0.08)	(0.08)
CEO Depart 2Y Before	0.232***	0.232***	0.232***	0.232***
	(0.07)	(0.07)	(0.07)	(0.07)
CEO Depart 1Y Before	0.299***	0.298***	0.298***	0.298***
	(0.07)	(0.07)	(0.07)	(0.07)
CEO Depart	0.049	0.049	0.048	0.048
	(0.07)	(0.07)	(0.07)	(0.07)
CEO Depart 1Y After	-0.108	-0.108	-0.111	-0.110
	(0.07)	(0.07)	(0.07)	(0.07)
Fixed effects	Year, Industry	Year, Industry	Year, Industry	Year, Industry
Number of observations	16,202	16,202	16,202	16,202
Pseudo Log-likelihood	-7,849.9	-7,849.9	-7,847.5	-7,847.6
Pseudo R-squared	0.022	0.022	0.023	0.023

Table 5. The effect of R&D managerial narrative disclosure on future stock price crashes: Controlling for innovation activity

This table presents logistic regression estimates examining the relation between R&D managerial narrative disclosure and future stock price crashes. The dependent variable is *PCRASH*, constituting a dichotomous measure of stock price crashes in fiscal year $t+1$. The main explanatory variable is *Narrative FLS−MD&A*, which measures the percentage of sentences containing forward-looking R&D-related keywords sourced from the Management's Discussion and Analysis section of the 10-K filing. The baseline regression model is augmented with variables that serve as proxies for innovation activity. Specifically, model (1) includes *R&D Sale*, which is the research and development expense divided by total sales, model (2) includes *R&D Asset*, which is the research and development expense divided by total assets, model (3) includes *Patents Cites*, which is the number of firm's patents granted weighted with their citations, model (4) includes *Innovation Efficiency (R&D-Capital)*, which is the number of patents granted scaled by R&D capital, and model (5) includes *Innovation Efficiency (Cites-R&D-Capital)*, which is the number of patents granted weighted with their citations scaled by R&D capital. All explanatory variables are measured in fiscal year t. For variable definitions and details of their calculation, see Appendix A. The estimates include a constant and different fixed effects (as indicated at the bottom of the table) whose coefficients are suppressed. Industry fixed effects are defined based on the Fama–French 48-industry classification. All continuous variables are winsorized at the 1st and 99th percentile and are standardized to have a mean value of zero and variance of one. Robust standard errors clustered at the firm level are shown in parentheses. The symbols ***, **, and * denote two-tailed statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Narrative FLS−MD&A	0.072***	0.072***	0.045**	0.046**	0.041**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
R&D Sale	-0.010*				
	(0.01)				
R&D Asset		-0.010*			
		(0.01)			
Ln(Patents Cites)			0.047		
			(0.04)		
Innovation Efficiency (R&D-Capital)				0.033	
				(0.03)	
Innovation Efficiency (Cites-R&D-Capital)					0.041*
					(0.02)
Sentiment−MD&A	0.083***	0.083***	0.069	0.073	0.063
	(0.02)	(0.02)	(0.05)	(0.05)	(0.05)
Ln(Total Assets)	-0.056**	-0.056**	-0.129***	-0.103**	-0.122***
	(0.03)	(0.03)	(0.04)	(0.05)	(0.05)

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Ln(Firm Age)	-0.069***	-0.069***	-0.066	-0.052	-0.056
	(0.02)	(0.02)	(0.05)	(0.05)	(0.06)
Market to Book	0.061***	0.061***	0.072**	0.071**	0.070**
	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
Leverage	0.005	0.005	0.047	0.030	0.048
	(0.02)	(0.02)	(0.04)	(0.04)	(0.05)
Return on Assets	-0.092***	-0.092***	-0.077*	-0.055	-0.044
	(0.02)	(0.02)	(0.04)	(0.04)	(0.04)
Return on Equity	0.045*	0.045*	0.032	0.033	0.035
	(0.02)	(0.02)	(0.04)	(0.04)	(0.04)
Stock Return	0.054**	0.054**	0.060	0.021	0.039
	(0.03)	(0.03)	(0.05)	(0.05)	(0.06)
Detrended Turnover	0.035	0.035	0.033	0.037	0.034
	(0.02)	(0.02)	(0.04)	(0.04)	(0.05)
NCSKEW	0.035*	0.035*	-0.040	-0.039	-0.038
	(0.02)	(0.02)	(0.04)	(0.04)	(0.04)
CEO Depart 3Y Before	0.019	0.019	0.002	-0.087	-0.104
	(0.08)	(0.08)	(0.14)	(0.16)	(0.16)
CEO Depart 2Y Before	0.238***	0.238***	0.255**	0.267**	0.303**
	(0.07)	(0.07)	(0.13)	(0.13)	(0.14)
CEO Depart 1Y Before	0.306***	0.306***	0.248**	0.291**	0.285**
	(0.07)	(0.07)	(0.12)	(0.12)	(0.13)
CEO Depart	0.052	0.052	-0.042	0.042	-0.000
	(0.07)	(0.07)	(0.13)	(0.13)	(0.14)
CEO Depart 1Y After	-0.104	-0.104	-0.032	-0.032	0.021
	(0.07)	(0.07)	(0.13)	(0.14)	(0.14)
Fixed effects	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry
Number of observations	16,202	16,202	5,049	4,623	4,387
Pseudo Log-likelihood	-7,836.8	-7,836.8	-2,402.4	-2,214.7	-2,099.7
Pseudo R-squared	0.024	0.024	0.027	0.027	0.028

Table 6. The effect of R&D managerial narrative disclosure on future stock price crashes: Controlling for earnings management

This table presents logistic regression estimates examining the relation between R&D managerial narrative disclosure and future stock price crashes. The dependent variable is *PCRASH*, constituting a dichotomous measure of stock price crashes in fiscal year $t+1$. The main explanatory variable is *Narrative FLS−MD&A*, which measures the percentage of sentences containing forward-looking R&D-related keywords sourced from the Management's Discussion and Analysis section of the 10-K filing. The baseline regression model is augmented with variables that measure earnings management. Specifically, these variables are *Opacity*, which is the three-year moving sum of the absolute value of discretionary accruals, *Depreciation*, which is the depreciation expense divided by sales, and *R&D Cut*, which is a binary variable set equal to one if a firm experiences a negative change in research and development expenditure relative to the prior year, and zero otherwise. All explanatory variables are measured in fiscal year t. For variable definitions and details of their calculation, see Appendix A. The estimates include a constant and different fixed effects (as indicated at the bottom of the table) whose coefficients are suppressed. Industry fixed effects are defined based on the Fama–French 48-industry classification. All continuous variables are winsorized at the 1st and 99th percentile and are standardized to have a mean value of zero and variance of one. Robust standard errors clustered at the firm level are shown in parentheses. The symbols ***, **, and * denote two-tailed statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Narrative FLS−MD&A	0.071***	0.071***	0.071***	0.072***
	(0.02)	(0.02)	(0.02)	(0.02)
Opacity	-0.030			-0.030
	(0.02)			(0.02)
Depreciation		-0.054		-0.052
		(0.03)		(0.03)
R&D Cut			-0.065	-0.059
			(0.06)	(0.06)
Sentiment−MD&A	0.082***	0.084***	0.082***	0.082***
	(0.02)	(0.02)	(0.02)	(0.02)
Ln(Total Assets)	-0.060**	-0.023	-0.056**	-0.028
	(0.03)	(0.03)	(0.03)	(0.03)
Ln(Firm Age)	-0.072***	-0.068***	-0.070***	-0.070***
	(0.02)	(0.02)	(0.02)	(0.02)
Market to Book	0.062***	0.060***	0.060***	0.061***
	(0.02)	(0.02)	(0.02)	(0.02)
Leverage	0.007	0.001	0.007	0.003
	(0.02)	(0.03)	(0.02)	(0.03)

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Return on Assets	-0.090***	-0.089***	-0.089***	-0.090***
	(0.02)	(0.02)	(0.02)	(0.02)
Return on Equity	0.044*	0.046**	0.045**	0.044*
	(0.02)	(0.02)	(0.02)	(0.02)
Stock Return	0.050*	0.050*	0.054*	0.044
	(0.03)	(0.03)	(0.03)	(0.03)
Detrended Turnover	0.035	0.035	0.035	0.033
	(0.02)	(0.02)	(0.02)	(0.02)
NCSKEW	0.034*	0.034*	0.034*	0.033*
	(0.02)	(0.02)	(0.02)	(0.02)
CEO Depart 3Y Before	0.018	0.017	0.018	0.017
	(0.08)	(0.08)	(0.08)	(0.08)
CEO Depart 2Y Before	0.238***	0.237***	0.240***	0.238***
	(0.07)	(0.07)	(0.07)	(0.07)
CEO Depart 1Y Before	0.308***	0.306***	0.307***	0.309***
	(0.07)	(0.07)	(0.07)	(0.07)
CEO Depart	0.054	0.054	0.055	0.058
	(0.07)	(0.07)	(0.07)	(0.07)
CEO Depart 1Y After	-0.102	-0.101	-0.100	-0.096
	(0.07)	(0.07)	(0.07)	(0.07)
Fixed effects	Year, Industry	Year, Industry	Year, Industry	Year, Industry
Number of observations	16,202	16,202	16,202	16,202
Pseudo Log-likelihood	-7,836.8	-7,836.0	-7,837.1	-7,834.6
Pseudo R-squared	0.024	0.024	0.024	0.024

Table 7. The effect of R&D managerial narrative disclosure on future stock price crashes: Controlling for textual-related variables

This table presents logistic regression estimates examining the relation between R&D managerial narrative disclosure and future stock price crashes. The dependent variable is *PCRASH*, constituting a dichotomous measure of stock price crashes in fiscal year $t + 1$. The main explanatory variable is *Narrative FLS−MD&A*, which measures the percentage of sentences containing forward-looking R&D-related keywords sourced from the Management's Discussion and Analysis section of the 10-K filing. The baseline regression model is augmented with three textual-related variables sourced from the Management's Discussion and Analysis section of the 10-K filing following the dictionary of Loughran and McDonald (2011). Specifically, these variables are *Uncertainty−MD&A*, which is the percentage of words conveying uncertainty, *Modal Weak−MD&A*, which is the percentage of the modal weak words, and *Litigious−MD&A*, which is the percentage of the words related to litigation. The table also presents models including *Readability*, which is the natural logarithm of the file size in megabytes of the SEC EDGAR "complete submission text file" for the 10-K filing. All explanatory variables are measured in fiscal year t. For variable definitions and details of their calculation, see Appendix A. The estimates include a constant and different fixed effects (as indicated at the bottom of the table) whose coefficients are suppressed. Industry fixed effects are defined based on the Fama–French 48-industry classification. All continuous variables are winsorized at the 1st and 99th percentile and are standardized to have a mean value of zero and variance of one. Robust standard errors clustered at the firm level are shown in parentheses. The symbols ***, **, and * denote two-tailed statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Narrative FLS−MD&A	0.066***	0.070***	0.071***	0.070***	0.066***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Uncertainty−MD&A	0.029				0.029
	(0.02)				(0.02)
Modal Weak−MD&A		0.009			
		(0.02)			
Litigious−MD&A			0.010		0.013
			(0.02)		(0.02)
Readability				0.096	0.095
				(0.06)	(0.06)
Sentiment−MD&A	0.091***	0.086***	0.084***	0.083***	0.093***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Ln(Total Assets)	-0.055**	-0.056**	-0.056**	-0.071**	-0.071**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Ln(Firm Age)	-0.068***	-0.070***	-0.071***	-0.068***	-0.067***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)

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Market to Book	0.060***	0.060***	0.060***	0.059***	0.059***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Leverage	0.007	0.006	0.006	0.002	0.002
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
Return on Assets	-0.089***	-0.089***	-0.089***	-0.088***	-0.088***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Return on Equity	0.045**	0.046**	0.046**	0.046**	0.046**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Stock Return	0.056**	0.055**	0.054**	0.059**	0.058**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Detrended Turnover	0.036	0.036	0.036	0.037*	0.037*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
NCSKEW	0.035*	0.035*	0.035*	0.034*	0.034*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
CEO Depart 3Y Before	0.018	0.018	0.018	0.017	0.016
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
CEO Depart 2Y Before	0.238***	0.238***	0.238***	0.237***	0.237***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
CEO Depart 1Y Before	0.306***	0.306***	0.305***	0.305***	0.305***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
CEO Depart	0.053	0.052	0.052	0.050	0.050
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
CEO Depart 1Y After	-0.103	-0.103	-0.104	-0.105	-0.105
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Fixed effects	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry
Number of observations	16,202	16,202	16,202	16,202	16,202
Pseudo Log-likelihood	-7,836.9	-7,837.6	-7,837.6	-7,836.4	-7,835.5
Pseudo R-squared	0.024	0.024	0.024	0.024	0.024

Table 8. The effect of R&D managerial narrative disclosure on future stock price crashes: Controlling for equity-based incentives and institutional ownership
This table presents logistic regression estimates examining the relation between R&D managerial narrative disclosure and future stock price crashes. The dependent variable is *PCRASH*, constituting a dichotomous measure of stock price crashes in fiscal year $t+1$. The main explanatory variable is *Narrative FLS−MD&A*, which measures the percentage of sentences containing forward-looking R&D-related keywords sourced from the Management's Discussion and Analysis section of the 10-K filing. The baseline regression model is augmented with variables that measure CEO incentives and ownership by institutional investors. Specifically, these variables are *Stock Incentives* and *Option Incentives*, which are the CEO stock and option holdings incentives ratio estimated as in Bergstresser and Philippon (2006), respectively, as well as *Transient Inst. Ownership*, which is the percentage of stock ownership in the firm by transient institutional investors as defined by Bushee (1998, 2001). All explanatory variables are measured in fiscal year t. For variable definitions and details of their calculation, see Appendix A. The estimates include a constant and different fixed effects (as indicated at the bottom of the table) whose coefficients are suppressed. Industry fixed effects are defined based on the Fama–French 48-industry classification. All continuous variables are winsorized at the 1st and 99th percentile and are standardized to have a mean value of zero and variance of one. Robust standard errors clustered at the firm level are shown in parentheses. The symbols ***, **, and * denote two-tailed statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Narrative FLS−MD&A	0.072***	0.075***	0.068***	0.072***
	(0.02)	(0.02)	(0.02)	(0.02)
Option Incentives	0.014			0.008
	(0.03)			(0.03)
Stock Incentives		0.009		0.014
		(0.02)		(0.03)
Transient Inst. Ownership			0.153***	0.160***
			(0.02)	(0.03)
Sentiment−MD&A	0.090***	0.084***	0.087***	0.093***
	(0.02)	(0.02)	(0.02)	(0.03)
Ln(Total Assets)	-0.058*	-0.057**	-0.060**	-0.062**
	(0.03)	(0.03)	(0.03)	(0.03)
Ln(Firm Age)	-0.071***	-0.071***	-0.049*	-0.054**
	(0.03)	(0.03)	(0.03)	(0.03)
Market to Book	0.058***	0.068***	0.061***	0.063***
	(0.02)	(0.02)	(0.02)	(0.02)
Leverage	-0.098***	-0.095***	-0.097***	-0.111***

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	(0.03)	(0.03)	(0.03)	(0.03)
Return on Assets	0.008	-0.002	0.007	0.002
	(0.03)	(0.03)	(0.02)	(0.03)
Return on Equity	0.044*	0.046*	0.037	0.039
	(0.02)	(0.02)	(0.02)	(0.03)
Stock Return	0.059**	0.057**	0.064**	0.068**
	(0.03)	(0.03)	(0.03)	(0.03)
Detrended Turnover	0.045*	0.035	0.028	0.028
	(0.02)	(0.02)	(0.02)	(0.02)
NCSKEW	0.034	0.033*	0.037*	0.042**
	(0.02)	(0.02)	(0.02)	(0.02)
CEO Depart 3Y Before	0.026	0.044	0.022	0.064
	(0.08)	(0.08)	(0.08)	(0.09)
CEO Depart 2Y Before	0.253***	0.255***	0.247***	0.272***
	(0.07)	(0.07)	(0.07)	(0.08)
CEO Depart 1Y Before	0.296***	0.336***	0.311***	0.339***
	(0.07)	(0.07)	(0.07)	(0.07)
CEO Depart	0.069	0.054	0.064	0.093
	(0.07)	(0.07)	(0.07)	(0.08)
CEO Depart 1Y After	-0.109	-0.058	-0.100	-0.047
	(0.08)	(0.07)	(0.07)	(0.08)
Fixed effects	Year, Industry	Year, Industry	Year, Industry	Year, Industry
Number of observations	14,414	15,595	15,973	13,796
Pseudo Log-likelihood	-6,970.3	-7,550.1	-7,706.1	-6,661.0
Pseudo R-squared	0.024	0.025	0.027	0.028

Table 9. Testing for the causal relation using large tariff cuts

This table presents logistic regression estimates examining the relation between R&D managerial narrative disclosure and future stock price crashes in a difference-in-differences setting. The dependent variable is *PCRASH*, constituting a dichotomous measure of stock price crashes in fiscal year $t + 1$. The main explanatory variable is *Narrative FLS−MD&A*, which measures the percentage of sentences containing forward-looking R&D-related keywords sourced from the Management's Discussion and Analysis section of the 10-K filing. The binary variable *After* is set equal to one for firms in an industry that has experienced a tariff cut over the last 3 years. All explanatory variables are measured in fiscal year t. For variable definitions and details of their calculation, see Appendix A. The estimates include a constant and different fixed effects (as indicated at the bottom of the table) whose coefficients are suppressed. Industry fixed effects are defined based on the Fama–French 48-industry classification. All continuous variables are winsorized at the 1st and 99th percentile and are standardized to have a mean value of zero and variance of one. Robust standard errors clustered at the firm level are shown in parentheses. The symbols ***, **, and * denote two-tailed statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
After	-0.115	-0.125	-0.121	-0.177*	-0.181*	-0.175
	(0.08)	(0.08)	(0.08)	(0.10)	(0.11)	(0.11)
After*Narrative FLS−MD&A	0.114**	0.125**	0.134**	0.149*	0.152*	0.159*
	(0.06)	(0.06)	(0.06)	(0.08)	(0.08)	(0.09)
Sentiment−MD&A			0.014			-0.022
			(0.07)			(0.10)
Ln(Total Assets)		-0.034	-0.038		0.411**	0.390*
		(0.04)	(0.04)		(0.20)	(0.20)
Ln(Firm Age)		-0.033	-0.034		0.182	0.178
		(0.04)	(0.04)		(0.24)	(0.23)
Market to Book		0.011	0.012		0.041	0.042
		(0.04)	(0.04)		(0.06)	(0.06)
Leverage		-0.006	-0.008		-0.097	-0.098
		(0.04)	(0.04)		(0.09)	(0.09)
Return on Assets		-0.069*	-0.063*		-0.021	-0.017
		(0.04)	(0.04)		(0.05)	(0.05)
Return on Equity		0.099***	0.100***		0.092*	0.094*
		(0.04)	(0.04)		(0.05)	(0.05)
Stock Return		0.086**	0.086**		0.201***	0.203***
		(0.04)	(0.04)		(0.07)	(0.07)
Detrended Turnover		0.031	0.030		0.075*	0.076*

Continued on the next page

		(0.03)	(0.03)		(0.04)	(0.04)
NCSKEW		0.037	0.035		-0.107***	-0.109***
		(0.03)	(0.03)		(0.04)	(0.04)
CEO Depart 3Y Before			0.067			0.050
			(0.12)			(0.15)
CEO Depart 2Y Before			0.193*			0.171
			(0.11)			(0.15)
CEO Depart 1Y Before			0.311***			0.319**
			(0.11)			(0.14)
CEO Depart			0.036			0.108
			(0.11)			(0.14)
CEO Depart 1Y After			-0.084			-0.047
			(0.12)			(0.15)
Fixed effects	Year, Industry	Year, Industry	Year, Industry	Year, Firm	Year, Firm	Year, Firm
Number of observations	5,889	5,874	5,874	4,903	4,889	4,889
Pseudo Log-likelihood	-3,097.1	-3,080.3	-3,074.7	-2,546.4	-2,519.1	-2,515.5
Pseudo R-squared	0.026	0.029	0.031	0.107	0.115	0.116

Table 10. The effect of R&D managerial narrative disclosure on future stock price crashes: The role of external corporate governance

This table presents logistic regression estimates examining the relation between R&D managerial narrative disclosure and future stock price crashes, considering the role of external governance. The dependent variable is *PCRASH*, constituting a dichotomous measure of stock price crashes in fiscal year $t+1$. The main explanatory variable is *Narrative FLS−MD&A*, which measures the percentage of sentences containing forward-looking R&D-related keywords sourced from the Management's Discussion and Analysis section of the 10-K filing. The baseline regression model is estimated in subsamples based on a firm's competitive environment (*Competitiveness*), managerial power (*Gindex*) and investors' attention (*Number of Analysts*). The High/Low *Competitiveness* subsamples comprise observations as defined by the higher/lower tertiles of the *Competitiveness*. The High/Low *Gindex* subsamples comprise observations as defined by the higher/lower tertiles of the *Gindex*. The *Number of Analysts* subsamples comprise observations where the number of analysts is either at least one (≥ 1) or zero ($= 0$). All explanatory variables are measured in fiscal year t. For variable definitions and details of their calculation, see Appendix A. The estimates include a constant and different fixed effects (as indicated at the bottom of the table) whose coefficients are suppressed. Industry fixed effects are defined based on the Fama–French 48-industry classification. All continuous variables are winsorized at the 1st and 99th percentile and are standardized to have a mean value of zero and variance of one. Robust standard errors clustered at the firm level are shown in parentheses. The symbols ***, **, and * denote two-tailed statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Competitiveness		Gindex		Number of Analysts	
	High	Low	High	Low	≥ 1	$= 0$
Narrative FLS−MD&A	0.070***	0.097	-0.032	0.134***	0.068***	0.040
	(0.02)	(0.06)	(0.10)	(0.05)	(0.02)	(0.32)
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry
Number of observations	5,092	5,047	2,865	3,873	15,566	534
Pseudo Log-likelihood	-2,408.0	-2,432.8	-1,440.3	-1,719.9	-7,564.2	-218.2
Pseudo R-squared	0.034	0.036	0.046	0.048	0.024	0.132

Table 11. The effect of R&D managerial narrative disclosure on future stock price crashes: The role of internal corporate governance

This table presents logistic regression estimates examining the relation between R&D managerial narrative disclosure and future stock price crashes, considering the role of internal governance. The dependent variable is *PCRASH*, constituting a dichotomous measure of stock price crashes in fiscal year $t+1$. The main explanatory variable is *Narrative FLS−MD&A*, which measures the percentage of sentences containing forward-looking R&D-related keywords sourced from the Management's Discussion and Analysis section of the 10-K filing. The baseline regression model is estimated in subsamples based on board size, number of independent directors, female on board, busy directors and directors that do not attend meetings. The High/Low *Board Size* subsamples comprise observations as defined by the higher/lower tertiles of the number of board members. The *Percentage of Independent Directors* subsamples comprises observations where the independent directors on a board have the majority ($> 50\%$) or minority($\leq 50\%$). The *Number of Female Directors* subsamples comprise observations where the number of female directors is greater than one (> 1) or equal or less than one (≤ 1). The *Number of Busy Directors* subsamples comprise observations where the number of busy directors is either at least one (≥ 1) or zero ($= 0$). The *Number of Not Attended Directors* subsamples comprise observations where the number of directors who did not attend is either at least one (≥ 1) or zero ($= 0$). All explanatory variables are measured in fiscal year t. For variable definitions and details of their calculation, see Appendix A. The estimates include a constant and different fixed effects (as indicated at the bottom of the table) whose coefficients are suppressed. Industry fixed effects are defined based on the Fama–French 48-industry classification. All continuous variables are winsorized at the 1st and 99th percentile and are standardized to have a mean value of zero and variance of one. Robust standard errors clustered at the firm level are shown in parentheses. The symbols ***, **, and * denote two-tailed statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Board size		Percentage of independent directors		Number of female directors		Number of busy directors		Number of not attended directors	
	High	Low	$> 50\%$	$\leq 50\%$	> 1	≤ 1	≥ 1	$= 0$	≥ 1	$= 0$
Narrative FLS−MD&A	0.148***	0.093**	0.061***	0.285***	0.066***	0.080**	0.051***	0.185***	0.130**	0.061***
	(0.05)	(0.04)	(0.02)	(0.08)	(0.02)	(0.03)	(0.02)	(0.04)	(0.06)	(0.02)
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry
Number of observations	2,947	4,728	14,800	1,330	5,878	10,309	12,963	3,212	754	15,409
Pseudo Log-likelihood	-1,362.5	-2,343.2	-7,199.5	-576.3	-2,658.6	-5,135.5	-6,263.9	-1,529.5	-352.4	-7,441.7
Pseudo R-squared	0.046	0.033	0.023	0.101	0.031	0.026	0.022	0.056	0.096	0.024

Appendices

Appendix A. Variable definitions

In this Appendix, we provide definitions for the variables used in our empirical analysis. The specific time periods for measuring each variable are detailed in the captions of the tables. Variables sourced from Compustat are enclosed in parentheses (...), whilst those from CRSP are enclosed in square brackets [...].

Measures of stock price crash risk

CRASH is a binary variable set equal to one if firm j experiences at least one crash week during the fiscal year t, and zero otherwise. A "crash week" occurs when the idiosyncratic weekly return, $R_{j,w}$, is at least λ standard deviations, $\sigma_{j,t}$, below the average idiosyncratic weekly return, $\mu_{j,t}$, in the fiscal year. Specifically, a crash week is defined as $R_{j,w} < \mu_{j,t} - \lambda \times \sigma_{j,t}$, where the idiosyncratic return is calculated as $R_{j,w} = ln\,(1 + \varepsilon_{j,w})$. The residual, $\varepsilon_{j,w}$, is estimated from the expanded market and industry index model regression:

$$r_{j,w} = \alpha + \sum_{i=-2}^{i=+2} \beta_{i,j} r_{MKT,w+i} + \sum_{i=-2}^{i=+2} \gamma_{i,j} r_{IND,w+i} + \varepsilon_{j,w},$$

where $r_{j,w}$ denotes the weekly return of stock j on week w, $r_{MKT,w}$ denotes the weekly value-weighted market return and $r_{IND,w}$ denotes the weekly Fama and French (1997) value-weighted 48-industry return. Stock weekly returns are calculated using CRSP daily returns [*ret*], $r_{MKT,w}$ is calculated using the daily return on the CRSP value-weighted market return with dividends [*vwretd*], whilst $r_{IND,w}$ is calculated using the daily stock returns [*ret*] in the CRSP universe. For estimating the residuals, we require a minimum number of 26 weekly return observations.

PCRASH is a binary variable set equal to one if firm j experiences at least one crash week and not a jump week during the fiscal year t, and zero otherwise. A "jump week" is defined as $R_{j,w} \geq \mu_{j,t} + \lambda \times \sigma_{j,t}$. All quantities involved in the estimation of *PCRASH* are consistent with those outlined in the *CRASH* definition.

NCSKEW is the negative of the third moment of firm's j idiosyncratic weekly returns ($R_{j,w}$) divided by the standard deviation of idiosyncratic weekly returns raised to the third power, defined as:

$$NCSKEW_{j,t} = -\Big(n(n-1)^{3/2} \sum_{w=1}^{n} R_{j,w}^3\Big) / \Big((n-1)(n-2)(\sum_{w=1}^{n} R_{j,w}^2)^{3/2}\Big),$$

where n is the number of weekly returns during fiscal year t. All quantities involved in the estimation of *NCSKEW* are consistent with those outlined in the *CRASH* definition.

Measures of narrative disclosures

Narrative−x represents the percentage of sentences containing R&D-related keywords shown in Appendix B, where x designates the specific source of information used for estimation. Accordingly,

$x \in \{MD\&A,\ RF,\ 10K\}$, where $MD\&A$ indicates that the information is sourced from the 10-K's Management's Discussion and Analysis section, RF indicates that the information is sourced from the 10-K's risk factors section, and $10K$ indicates that information is sourced from the entire 10-K filing.

Narrative FLS$-x$ represents the percentage of sentences containing R&D-related keywords combined with forward-looking statements (FLS). The dictionary featuring the R&D-related keywords is shown in Appendix B, whilst FLS contains the word list of forward looking statements as per Li (2010): "*will*," "*could*," "*should*," "*expect*," "*anticipate*," "*plan*," "*hope*," "*believe*," "*can*," "*may*," "*might*," "*intend*," "*project*," "*forecast*," "*objective*" and "*goal*". The specific source of information used for estimation is designated by x. Accordingly, $x \in \{MD\&A,\ RF,\ 10K\}$, where $MD\&A$ indicates that the information is sourced from the 10-K's Management's Discussion and Analysis section, RF indicates that the information is sourced from the 10-K's risk factors section, and $10K$ indicates that information is sourced from the entire 10-K filing.

Baseline control variables

Sentiment$-x$ is the percentage of the difference between the positive words and the negative words (following the Loughran and McDonald, 2011 dictionary), where x designates the specific source of information used for estimation. Accordingly, $x \in \{MD\&A,\ RF,\ 10K\}$, where $MD\&A$ indicates that the information is sourced from the 10-K's Management's Discussion and Analysis section, RF indicates that the information is sourced from the 10-K's risk factors section, and $10K$ indicates that information is sourced from the entire 10-K filing.

Size is the natural logarithm of total assets (at).

Firm Age is the number of years that the firm is covered in the Compustat universe.

$Market$ *to Book* is the market value ($prcc\_f \times csho$) divided by the book value of equity (ceq).

Leverage is total liabilities (lt) divided by total assets (at).

Return on Assets is income before extraordinary items (ib) divided by total assets (at).

Return on Equity is income before extraordinary items (ib) divided by the book value of equity (ceq).

Stock Return is the average idiosyncratic weekly return during the fiscal year.

Detrended Turnover is the detrended average weekly stock trading volume [vol] during the fiscal year.

Ceo Depart is a binary variable set equal to one if there is a CEO departure in firm's CEO, during the fiscal year t, and zero otherwise.

Measures of innovation activity and efficiency

R&D Sale is research and development expense (xrd) divided by total sales ($sale$).

Patents Cites is the number of firm's patents granted weighted with their citations. To determine the U.S. patents associated with each firm, we utilize the matched data set introduced by Kogan, Papanikolaou, Seru, and Stoffman (2017).

Innovation Efficiency (*R&D-Capital*) is the number of patents granted scaled by $R\&D$ (xrd) capital, whereby $R\&D$ capital is the 5-year cumulative $R\&Dexpenditure$, following Hirshleifer et al. (2013). To determine the U.S. patents associated with each firm, we utilize the matched dataset introduced by Kogan et al. (2017).

Innovation Efficiency (*Cites-R&D-Capital*) is the number of patents granted weighted with their citations scaled by R&D ($R\&D$) capital, whereby R&D capital is the 5-year cumulative R&D expenditure, following Hirshleifer et al. (2013). To determine the U.S. patents associated with each firm, we utilize the matched dataset introduced by Kogan et al. (2017).

Measures of earnings management

Opacity is the three-year moving sum of the absolute value of discretionary accruals ($DACC$), following Hutton et al. (2009). $DACC$ is obtained from a modified Jones model as $DACC_t = TA_t/ASSETS_{t-1} - (a_0(1/ASSETS_{t-1}) + b_1(\Delta SALES_t - \Delta RECEIVABLES_t)/ASSETS_{t-1} + b_2(PPE_t/ASSETS_{t-1}))$, where total accruals ($TA$) is obtained from the following cross-sectional regression equation using the firms in each Fama and French 48 industries for each fiscal year as $TA_t/ASSETS_{t-1} = a_0(1/ASSETS_{t-1}) + b_1(\Delta SALES_t/ASSETS_{t-1}) + b_2(PPE_t/ASSETS_{t-1}) + e_t$, where TA is total accruals, $ASSETS$ is total assets (at), $\Delta SALES$ is change in sales ($sale$), $\Delta RECEIVABLES$ is change in receivables (rec) and PPE is property, plant, and equipment (ppe).

Depreciation is the depreciation expense (xdp) divided by sales ($sale$).

R&D Cut is a binary variable set equal to one if a firm experiences a negative change in research and development expenditure (xrd) relative to the prior year, and zero otherwise.

Measures of variables related to textual information

$Uncertainty - x$ is the percentage of words conveying uncertainty (following the Loughran and McDonald, 2011 dictionary), where x designates the specific source of information used for estimation. Accordingly, $x \in \{MD\&A,\ RF,\ 10\text{-}K\}$, where $MD\&A$ indicates that the information is sourced from the 10-K's Management's Discussion and Analysis section, RF indicates that the information is sourced from the 10-K's risk factors section, and 10-K indicates that information is sourced from the entire 10-K filing.

$Modal\ Weak - x$ is the percentage of the modal weak words (following theLoughran and McDonald, 2011 dictionary), where x designates the specific source of information used for estimation. Accordingly, $x \in \{MD\&A,\ RF,\ 10\text{-}K\}$, where $MD\&A$ indicates that the information is sourced from the 10-K's Management's Discussion and Analysis section, RF indicates that the information is sourced from the 10-K's risk factors section, and 10-K indicates that information is sourced from the entire 10-K filing.

$Litigious - x$ is the percentage of the words related to litigation (following the Loughran and McDonald, 2011 dictionary), where x designates the specific source of information used for estimation. Accordingly, $x \in \{MD\&A,\ RF,\ 10\text{-}K\}$, where $MD\&A$ indicates that the information is sourced from the 10-K's Management's Discussion and Analysis section, RF indicates that the information is sourced from the 10-K's risk factors section, and 10-K indicates that information is sourced from the entire 10-K filing.

Readability is the natural logarithm of the file size in megabytes of the SEC EDGAR "complete submission text file"for the 10-K filing.

Measures of CEO incentives

Stock Incentives is the CEO stock holdings incentives ratio estimated as in Bergstresser and Philippon (2006).

Option Incentives is the CEO option holdings incentives ratio estimated as in Bergstresser and Philippon (2006).

Measure of institutional ownership

Transient Inst. Ownership is the percentage of stock ownership in the firm by transient institutional investors, following Bushee (1998, 2001).

Measures of external corporate governance

Competitiveness is the industry adjusted price-cost margin estimated as firm operating profit divided by sales (*sale*). Firm operating profit is estimated by deducting from sales (*sale*), the cost of goods sold (*cogs*) and selling, general, and administrative expenses (*xsga*).

Gindex is the number of anti-takeover provision proposed by Gompers et al. (2003).

Analysts is the total number of analysts covering the firm.

Measures of variables related to board composition and characteristics

Board Size is total number of directors on the board.

Independent Directors is the number independent directors on the board.

Female Directors is the number of female directors on the board.

Busy Directors is the number of directors who are also members of other Major Company Boards.

Not Attended Directors is the number of directors who attended less than 75% of the board meetings.

Appendix B. R&D dictionary

This appendix provides the list of narrative R&D keywords and phrases used to classify a sentence as an R&D-related disclosure. We utilize Merkley (2014) dictionary with a slight modification, involving the addition of plural or singular forms of the lexical tokens present in the original version.

List of keywords and phrases
research and development, R&D, product development, research, development; research, engineering, and development; research and product development; announced a collaboration/s; application/s pending; applied for patent/s; breakthrough in; breakthrough innovation; claims in this/these patent/s; clinical candidate; clinical data; clinical development/s; clinical program/s; clinical study/ies; collaborative initiative/s; collaborative research; completion of key milestones; conduct research; continuing development of; develop technology/ies; developing new product/s; developing new technology/ies; development of new product/s; development of proprietary technology/ies; drug candidate; entering development; established a collaboration/s; evaluating the potential of; filed patent/s; granted a patent/s; important patent/s; issued a patent/s; joint research; joint venture to develop; key patent/s; new patent/s; new technology/ies; patent/s pending; patent/s was/were awarded; pilot study/ies; preclinical data; preclinical development; product candidate; product engineering; project/s in development; received a patent/s; research and evaluation project; research center/s; research collaboration/s; research collaborative/s; research development; research facility/ies; research initiative/s; research operation/s; research pipeline; research program/s; research project/s; research venture/s; safety study; technical development/s; technological breakthrough; technology breakthrough; technology development; technology milestone.

Appendix C. Managerial narratives and investor optimism

Table C1. Construct validity tests

This table reports OLS regression estimates for the relation between R&D managerial narrative disclosure and growth opportunities (*GO*). The main explanatory variable is *Narrative FLS−10K*, which measures the percentage of sentences containing forward-looking R&D-related keywords, sourced from the M&DA section of the 10-K filing. For variable definitions and details of their calculation, see Appendix A. The estimates include a constant and different fixed effects (as indicated at the bottom of the table) whose coefficients are suppressed. Industry fixed effects are defined based on the Fama–French 48-industry classification. All continuous variables are winsorized at the 1st and 99th percentile and are standardized to have a mean value of zero and variance of one. Robust standard errors clustered at the firm level are shown in parentheses. The symbols ***, **, and * denote two-tailed statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)
Narrative FLS−MD&A	0.082***		0.081***
	(0.03)		(0.03)
R&D Expenditure		0.035	0.029
		(0.03)	(0.03)
Sentiment−MD&A	-0.012	-0.014	-0.011
	(0.01)	(0.01)	(0.01)
Return on Assets	-0.285***	-0.285***	-0.287***
	(0.04)	(0.04)	(0.04)
Ln(Total Assets)	-0.007	-0.029	-0.022
	(0.02)	(0.02)	(0.02)
Ln(Firm Age)	0.019	0.015	0.019
	(0.02)	(0.02)	(0.02)
Market To Book	0.001	0.007	0.001
	(0.02)	(0.02)	(0.02)
Leverage	0.308***	0.305***	0.309***
	(0.02)	(0.02)	(0.02)
Return on Equity	-0.143***	-0.148***	-0.143***
	(0.02)	(0.02)	(0.02)
Stock Return	-0.098***	-0.103***	-0.098***
	(0.02)	(0.02)	(0.02)
Fixed effects	Year,	Year,	Year,

Continued on the next page

	Industry	Industry	Industry
Number of Observations	15,842	15,842	15,842
R-squared	0.266	0.261	0.266

Internet Appendix

Stock Price Crash Risk and the Managerial Rhetoric Mechanism: Evidence from R&D Disclosure in 10-K filings

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Table IA1-IA5 presents additional empirical results to examine the robustness of the results after different endogeneity tests. We show supplemental analysis conducted to test for unobserved heterogeneity (***Table IA1***). Additionally, we check the robustness of our inference when testing for reverse causality issues (***Table IA2***). ***Table IA3*** presents additional empirical results employed to test for measurements errors. Finally, ***Table IA4*** (***also Table 9 in the paper***) presents our inferences regarding the positive relation between the managerial rhetoric and crash risk by employing a difference-in-difference (DiD) analysis utilizing tariff cut as a quasi-natural experiment. ***Table IA5*** presents a selection of excerpts extracted from Item 7 of 10-K filings sourced directly from the Company Filings section of the EDGAR database.

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1 Endogeneity treatments

In this section, we utilize multiple approaches to show that our findings are robust to different endogeneity treatments and establish a causal relation between managerial rhetoric and stock price crash risk. Broadly speaking, endogeneity may arise from three different types of specification changes that can violate the assumption of having a strict exogenous error term (Roberts and Whited 2013). In this context, we conduct several alternative econometric approaches to address potential endogeneity concerns arising from these three sources, *i.e.*, unobserved heterogeneity, reverse causality, and measurement error. Furthermore, we circumvent endogeneity concerns by identifying an exogenous shock and comparing the change in rhetoric for different firms as a reaction to the shock.

1.1 Unobserved heterogeneity

In order to achieve a relatively more powerful approach towards time-invariant omitted variables we first include firm fixed effects in our baseline model. The firm-fixed effect framework permits a tighter identification in the analysis by using within-firm variation to identify coefficient estimates to investigate if the relation exists. This approach is beneficial for mitigating endogeneity concerns and preventing spurious relations. Thus, we re-run our baseline model with the inclusion of firm fixed effects, to address the issue of unobserved omitted variables, other than those included in the previous analysis. The results presented in Models (1) to (3) of Table IA1 confirm our previous inferences, by indicating that our results are not driven by any omitted fixed variables.

We add high dimensional fixed effects to account for unobserved firm heterogeneity and address any potential endogeneity and omitted variable bias (Gormley and Matsa (2014)). This firm heterogeneity (*i.e.*, unobserved firm-specific factors) may confound the estimation of the effect of our variables of interest. By including high dimensional fixed effects, which are interactions of firm quintiles (*i.e.*, grouping firms into quintiles based on their basic characteristics) and time dummies (*i.e.*, indicator variables for different time periods), we can capture some of this unobserved heterogeneity. Therefore, we adopt such a specification by including the interaction of dummies for *Size*, *Firm Age*, *Market to Book*, *Leverage*, *Return on Assets*, *Return on Equity*, *Return*, *Dturn* and *Ncskew*, with time dummies for each quintile. The results presented in Models (4) to (6) of Table IA1 remain unchanged, verifying the robustness of our findings to unobserved heterogeneity.

[Insert Table IA1, here]

1.2 Reverse causality

Our first approach toward mitigating reverse causality issues consists of the most commonly used method of relying on a lead-lagged relation, with stock price crash risk measured at $t+1$ and the managerial rhetoric at t. Moreover, we constantly include the Ncskew in the array of our main control variables to account for crash risk persistency as reported in earlier investigations. These approaches are in line with existing crash studies that attempted to propose an appropriate specification in this field (see *e.g.*, Callen and Fang, 2013, 2015; Kim, Wang, and Zhang, 2016; Andreou, Louca, and Petrou, 2017; An, Chen, Naiker, and Wang, 2020).

Besides these, swapping the two primary variables of the current study, the crash risk with the managerial rhetoric, is another approach to examine whether there is a reverse causality on their positive association. We perform several analyses by running six different model specifications, including various combinations of time, industry and firm fixed effects, to examine whether the current values of stock price crashes are related to future changes in managerial rhetoric. Overall, the results reported in Table IA2 indicate that there is no significant association between the stock price crash risk with the one year ahead managerial rhetoric.

[Insert Table IA2, here]

1.3 Measurement Error

We then move forward to examine another possible source of endogeneity which arises when there is a discrepancy between the actual variable of interest and the proxy used to quantify it. To do so, we re-run the baseline model after replacing our (continuous) explanatory variable (*i.e.*, managerial rhetoric) with a categorical variable featuring the deciles, quantiles and tertiles of that variable. The results reported in Table IA3 confirm that the crash risk forecasting power of managerial rhetoric is not driven by any measurement error as the results remain unaffected.

[Insert Table IA3, here]

1.4 Tariff cuts as an exogenous shock

Finally, in this section, we aim to strengthen our inferences regarding the positive relation between the managerial rhetoric and crash risk by conducting a difference-in-difference (DiD) analysis utilizing tariff cut as a quasi-natural experiment that causes an exogenous change of managerial rhetoric. The exogenous event of a tariff cut satisfies the requirements of representing an ideal framework to establish causality. Import tariffs, as per Bernard, Jensen, Redding, and Schott (2007) and Erdem and Tybout (2003), act as a significant barrier of entry for foreign competition and accordingly minimize pressure exerted from competitors. Additionally, according to Li and Zhan (2019), tariff cuts fulfil the exclusion condition because they are not associated with firm-specific stock price crash risk, while at the same time they enhance competition by encouraging imports. We assume that a tariff cut will affect managerial rhetoric through the competition increase. This unexpected event should cause an anticipated increase on our variable of interest, as a response to the recent competitive pressure. Therefore, to further alleviate endogeneity issues, we examine how a tariff cut, an exogenous event, alters managers' narratological concepts employed, in terms of their proclivity to shape and/or retain investors' expectations through their disclosures.

We obtain annual product-level U.S. import data from the publicly available U.S. International Trade Commission (USITC) DataWeb. This data is then aggregated by district, year, and industry, as defined by NAIC number. Each observation is classified into its respective state based on the district. Following the methodology outlined by Li and Zhan (2019), we identify a tariff reduction within a specific industry-year when a change results in at least a 3 times increase in imports compared to the median change. Subsequently, we employ a DiD framework based on this exogenous event. To accomplish this, we restrict our sample to U.S. states that have undergone a tariff cut and apply the before-after model, as suggested by Duchin, Ozbas, and Sensoy (2010). Accordingly, we construct the binary indicator variable *After*, which takes a value of one if an industry has experienced a tariff cut over the last 3 years. This variable, along with its interaction with managerial rhetoric, has been integrated into our baseline models. The DiD setting enable us to estimate the causal effect of the tariff cut on the relation between R&D narrative disclosure and stock price crash risk. This DiD estimator (*After*Narrative FLS−MD&A*) captures the average differential change in stock price crash risk in post-tariff cut period and provides an estimate of the causal effect on the outcome of our interest. The results reported in Table IA4 show a significant positive interaction term, implying that the significant variance in trade barriers (through the exogenous tariff cut) does not eliminate the documented causal relation between managerial rhetoric and the following period's incidence of stock price crashes.

[Insert Table IA4, here]

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Tables

Table IA1. Endogeneity tests: Inclusion of firm-fixed effects and high dimensional fixed effects
This table reports logistic regression estimates for the relation between narrative with one-year ahead stock price crashes. The explanatory variables consist of two narrative proxies derived from textual analysis of MD&A, denoted as *Narrative FLS−MD&A* and *Narrative MD&A*. The dependent variable, *PCRASH*, is measured in fiscal year $t+1$, whereby all independent variables are measured in fiscal year t. Detailed variable definitions are provided in the Appendix A. The estimates in Models (1) and (2) include firm-fixed effects and year-fixed effects to control for time-invariant unobserved firm heterogeneity and year characteristics, while Models (3) to (4) include high dimensional fixed effects and industry-fixed effects to further control for unobserved firm heterogeneity and for unobserved time-invariant effects pertaining to industry. The estimates reported are obtained using the full sample with sufficient data to estimate the main control variables. All models include a constant and baseline control variables. The standard errors are clustered at the firm level and provided in parentheses. All continuous variables are winsorized at the 1st and 99th percentiles and are standardized to have a mean value of zero and variance of one. The symbols ***, **, and * denote two-tailed statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(4)	(5)
Narrative FLS−MD&A	0.116***		0.085***	
	(0.03)		(0.02)	
Narrative MD&A		0.110***		0.074***
		(0.03)		(0.02)
Sentiment−MD&A	0.117***	0.116***	0.091***	0.090***
	(0.04)	(0.04)	(0.02)	(0.02)
Ln(Total Assets)	0.547***	0.547***		
	(0.10)	(0.10)		
Ln(Firm Age)	-0.143	-0.135		
	(0.11)	(0.11)		
Market to Book	0.121***	0.120***		
	(0.03)	(0.03)		
Leverage	-0.072	-0.070		
	(0.04)	(0.04)		
Return on Assets	-0.073*	-0.073*		
	(0.04)	(0.04)		
Return on Equity	0.013	0.013		
	(0.03)	(0.03)		
Stock Return	0.130***	0.130***		

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	(0.04)	(0.04)		
Dturn	0.066**	0.066**		
	(0.03)	(0.03)		
Ncskew	-0.129***	-0.129***		
	(0.02)	(0.02)		
CEO Depart 3Y Before	-0.082	-0.083	0.040	0.039
	(0.10)	(0.10)	(0.09)	(0.09)
CEO Depart 2Y Before	0.159*	0.158*	0.230***	0.228***
	(0.09)	(0.09)	(0.08)	(0.08)
CEO Depart 1Y Before	0.255***	0.255***	0.295***	0.293***
	(0.09)	(0.09)	(0.07)	(0.07)
CEO Depart	0.015	0.016	0.052	0.051
	(0.09)	(0.09)	(0.07)	(0.07)
CEO Depart 1Y After	-0.127	-0.125	-0.095	-0.094
	(0.09)	(0.09)	(0.08)	(0.08)
Fixed effects	Year, Firm	Year, Firm	Industry, High dimensional	Industry, High dimensional
Number of observations	13,529	13,529	16,196	16,196
Pseudo Log-likelihood	-6,554.0	-6,555.2	-7,310.6	-7,312.6
Pseudo R-squared	0.101	0.101	0.089	0.089

Table IA2. Endogeneity tests: Reverse Causality

This table reports OLS regression estimates for the relation between *PCRASH* with one-year ahead narrative. The main depended variables consist of two narrative proxies derived from textual analysis of MD&A, denoted as *Narrative FLS−MD&A* and *Narrative MD&A*. The estimates reported are obtained using the full sample with sufficient data to estimate the main control variables, which consists of 16,202 firm-year observations. The dependent variables are measured in fiscal year $t+1$, whereby the independent variable (*PCRASH*) is measured in fiscal year t. Detailed variable definitions are provided in the Appendix A. The fixed effects included are displayed in each model separately. All models include a constant and baseline control variables. The standard errors are clustered at the firm level and provided in parentheses. All continuous variables are winsorized at the 1st and 99th percentiles and are standardized to have a mean value of zero and variance of one. The symbols ***, **, and * denote two-tailed statistical significance at the 1%, 5%, and 10% level, respectively.

	Narrative FLS−MD&A	Narrative MD&A	Narrative FLS−MD&A	Narrative MD&A
	(1)	(2)	(3)	(4)
PCRASH	0.032	0.027	0.019	0.015
	(0.03)	(0.02)	(0.03)	(0.02)
Sentiment−MD&A	-0.038***	-0.030***	-0.029***	-0.018*
	(0.010)	(0.011)	(0.009)	(0.010)
Ln(Total Assets)	-0.021	-0.032**	-0.018	-0.006
	(0.015)	(0.015)	(0.028)	(0.026)
Ln(Firm Age)	-0.096***	-0.113***	-0.280**	-0.441***
	(0.025)	(0.029)	(0.116)	(0.131)
Market to Book	0.078***	0.084***	0.015*	0.020**
	(0.027)	(0.026)	(0.008)	(0.009)
Leverage	-0.034*	-0.059***	0.005	-0.018
	(0.018)	(0.019)	(0.026)	(0.023)
Return on Assets	0.036**	0.049***	-0.013	-0.007
	(0.015)	(0.016)	(0.010)	(0.010)
Return on Equity	-0.069**	-0.072***	-0.007	-0.009
	(0.028)	(0.026)	(0.011)	(0.009)
Stock Return	-0.076***	-0.096***	-0.013	-0.027*
	(0.016)	(0.016)	(0.018)	(0.016)
Dturn	-0.002	-0.006	0.015	0.014
	(0.013)	(0.011)	(0.019)	(0.014)

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Ncskew	-0.003	-0.000	-0.011*	-0.006
	(0.006)	(0.006)	(0.006)	(0.006)
CEO Depart 3Y Before	0.007	0.010	-0.008	-0.005
	(0.032)	(0.031)	(0.027)	(0.025)
CEO Depart 2Y Before	-0.019	-0.002	-0.024	-0.010
	(0.026)	(0.026)	(0.027)	(0.025)
CEO Depart 1Y Before	-0.041*	-0.041*	-0.039	-0.038
	(0.025)	(0.024)	(0.031)	(0.026)
CEO Depart	-0.039*	-0.032	-0.040	-0.036
	(0.023)	(0.023)	(0.028)	(0.025)
CEO Depart 1Y After	-0.043**	-0.050**	-0.027	-0.026
	(0.021)	(0.020)	(0.026)	(0.022)
Fixed effects	Year, Industry	Year, Industry	Year, Firm	Year, Firm
Number of observations	16,202	16,202	16,202	16,202
R-squared	0.158	0.258	0.393	0.561

Table IA3. Endogeneity tests: Measurement Error

This table reports logistic regression estimates for the relation between narrative with one-year ahead stock price crashes. The main explanatory variables consist of three alternative categorical variables derived from ranking the narrative proxy *Narrative FLS−MD&A*, in 10, 5 and 3 groups, respectively. The estimates reported are obtained using the full sample with sufficient data to estimate the main control variables, which consists of 16,202 firm-year observations. The dependent variable, *PCRASH*, is measured in fiscal year $t+1$, whereby all independent variables are measured in fiscal year t. Detailed variable definitions are provided in the Appendix A. The estimates include industry-fixed effects and year-fixed effects to control for unobserved time-invariant effects pertaining to industry and year characteristics, respectively. All models include a constant and baseline control variables. The standard errors are clustered at the firm level and provided in parentheses. All continuous variables are winsorized at the 1st and 99th percentiles and are standardized to have a mean value of zero and variance of one. The symbols ***, **, and * denote two-tailed statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)
Narrative FLS−MD&A-10groups	0.026***		
	(0.01)		
Narrative FLS−MD&A-5groups		0.053***	
		(0.02)	
Narrative FLS−MD&A-3groups			0.084***
			(0.03)
Sentiment−MD&A	0.092***	0.090***	0.092***
	(0.02)	(0.02)	(0.02)
Ln(Total Assets)	-0.036**	-0.037**	-0.036**
	(0.02)	(0.02)	(0.02)
Ln(Firm Age)	-0.125***	-0.126***	-0.125***
	(0.05)	(0.05)	(0.05)
Market to Book	0.061***	0.062***	0.062***
	(0.02)	(0.02)	(0.02)
Leverage	0.009	0.007	0.008
	(0.02)	(0.02)	(0.02)
Return on Assets	-0.091***	-0.090***	-0.091***
	(0.02)	(0.02)	(0.02)
Return on Equity	0.043*	0.042*	0.043*
	(0.02)	(0.02)	(0.02)
Stock Return	0.054**	0.053*	0.054**
	(0.03)	(0.03)	(0.03)

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Dturn	0.037*	0.037*	0.037*
	(0.02)	(0.02)	(0.02)
Ncskew	0.034*	0.034*	0.034*
	(0.02)	(0.02)	(0.02)
CEO Depart 3Y Before	0.017	0.017	0.016
	(0.08)	(0.08)	(0.08)
CEO Depart 2Y Before	0.236***	0.235***	0.235***
	(0.07)	(0.07)	(0.07)
CEO Depart 1Y Before	0.302***	0.302***	0.301***
	(0.07)	(0.07)	(0.07)
CEO Depart	0.049	0.049	0.048
	(0.07)	(0.07)	(0.07)
CEO Depart 1Y After	-0.106	-0.105	-0.106
	(0.07)	(0.07)	(0.07)
Fixed effects	Year, Industry	Year, Industry	Year, Industry
Number of observations	16,202	16,202	16,202
Pseudo Log-likelihood	-7,839.2	-7,840.5	-7,839.4
Pseudo R-squared	0.024	0.023	0.024

Table IA4. Endogeneity tests: Setting for hyping investors' expectations (before and after the tariff cut):
This table reports logistic regression estimates for the relation between narrative with one-year ahead stock price crashes. The main explanatory variable consists of the narrative proxy derived from textual analysis of MD&A, denoted as *Narrative FLS−MD&A*. The dependent variable, *PCRASH*, is measured in fiscal year $t+1$, whereby all independent variables are measured in fiscal year t. The estimates in Models (1) to (3) include industry-fixed effects and year-fixed effects to control for unobserved time-invariant effects pertaining to industry and year characteristics, while Models (4) to (6) include firm-fixed effects and year-fixed effects to control for time-invariant unobserved firm heterogeneity and year characteristics, respectively. All models include a constant and baseline control variables. Detailed variable definitions are provided in the Appendix A. The standard errors are clustered at the firm level and provided in parentheses. All continuous variables are winsorized at the 1st and 99th percentiles and are standardized to have a mean value of zero and variance of one. The symbols ***, **, and * denote two-tailed statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
After	-0.115	-0.125	-0.121	-0.177*	-0.181*	-0.175
	(0.08)	(0.08)	(0.08)	(0.10)	(0.11)	(0.11)
After*Narrative FLS−MD&A	0.114**	0.125**	0.134**	0.149*	0.152*	0.159*
	(0.06)	(0.06)	(0.06)	(0.08)	(0.08)	(0.09)
Sentiment−MD&A			0.014			-0.022
			(0.07)			(0.10)
Ln(Total Assets)		-0.034	-0.038		0.411**	0.390*
		(0.04)	(0.04)		(0.20)	(0.20)
Ln(Firm Age)		-0.033	-0.034		0.182	0.178
		(0.04)	(0.04)		(0.24)	(0.23)
Market to Book		0.011	0.012		0.041	0.042
		(0.04)	(0.04)		(0.06)	(0.06)
Leverage		-0.006	-0.008		-0.097	-0.098
		(0.04)	(0.04)		(0.09)	(0.09)
Return on Assets		-0.069*	-0.063*		-0.021	-0.017
		(0.04)	(0.04)		(0.05)	(0.05)
Return on Equity		0.099***	0.100***		0.092*	0.094*
		(0.04)	(0.04)		(0.05)	(0.05)
Stock Return		0.086**	0.086**		0.201***	0.203***
		(0.04)	(0.04)		(0.07)	(0.07)
Dturn		0.031	0.030		0.075*	0.076*

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		(0.03)	(0.03)		(0.04)	(0.04)
Ncskew		0.037	0.035		-0.107***	-0.109***
		(0.03)	(0.03)		(0.04)	(0.04)
CEO Depart 3Y Before			0.067			0.050
			(0.12)			(0.15)
CEO Depart 2Y Before			0.193*			0.171
			(0.11)			(0.15)
CEO Depart 1Y Before			0.311***			0.319**
			(0.11)			(0.14)
CEO Depart			0.036			0.108
			(0.11)			(0.14)
CEO Depart 1Y After			-0.084			-0.047
			(0.12)			(0.15)
Fixed effects	Year, Industry	Year, Industry	Year, Industry	Year, Firm	Year, Firm	Year, Firm
Number of observations	5,889	5,874	5,874	4,903	4,889	4,889
Pseudo Log-likelihood	-3,097.1	-3,080.3	-3,074.7	-2,546.4	-2,519.1	-2,515.5
Pseudo R-squared	0.026	0.029	0.031	0.107	0.115	0.116

Table IA5. Excerpts from 10-Ks (Item 7)
Source: EDGAR — Company Filings

Company Name	Filing Date	Period of Report	Extract from Item 7	ChatGPT Interpretation
Agouron Pharmaceuticals Inc	1996-09-19	1996-06-30	The Company believes that its current capital resources, existing contractual commitments and the proceeds from a secondary public offering in July 1996 (see Note 9) are sufficient to maintain its current and planned operations through fiscal 1998. This belief is based on current research and clinical development plans, anticipated working capital requirements associated with the planned commercial launch of VIRACEPT during fiscal 1997, the current regulatory environment, historical industry experience in the development of therapeutic drugs and general economic conditions.	1. Based on the provided statements, it suggests that the company has positive future prospects. The company believes that it has enough capital resources, contractual commitments, and proceeds from a public offering to sustain its operations through fiscal 1998. This indicates a level of financial stability and confidence in the company's ability to meet its planned objectives. 2. These statements create positive expectations. The company's belief is supported by current research and clinical development plans, anticipated working capital requirements, regulatory environment, historical industry experience, and general economic conditions. By considering these factors, the company is expressing optimism about its ability to navigate the market successfully and achieve its goals. 3. These statements are likely to fuel investor optimism. The company's confidence in its capital resources, contractual commitments, and planned operations through fiscal 1998

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				suggests a positive outlook. The mention of a planned commercial launch of VIRACEPT during fiscal 1997 further indicates a potential revenue-generating opportunity. This combination of financial stability, planned operations, and anticipated market success can generate optimism among investors who may see the company as having strong growth potential.
Allen Telecom Inc	1997-03-27	1996-12-31	In the past few years, the Company has significantly increased its research and development and new product engineering costs in order to keep pace with the technological advances in the industry. The Company anticipates that this trend will continue as PCS and cellular systems are implemented and expanded and the Company strives to develop ancillary products, including software products, for the wireless telephony industry.	1. Based on the provided statements, the company has positive future prospects. The company has been investing significantly in research and development and new product engineering costs to keep up with technological advances in the industry. This suggests that the company is actively innovating and adapting to the changing market, which can enhance its competitiveness and growth potential. 2. These statements create positive expectations. The mention of the company's anticipation for the trend of increased investment in research and development and new product engineering costs implies that the company is proactive in addressing industry advancements and expanding its product offerings. This indicates a focus on staying relevant and meeting the evolving needs of the wireless telephony industry, which can be

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				seen as positive by stakeholders. 3. These statements are likely to fuel investor optimism. The company's commitment to investing in research and development and new product engineering costs indicates a forward-thinking approach. Investors may view this as a sign that the company is positioning itself for future success and growth. The emphasis on developing ancillary products, including software products, for the wireless telephony industry further indicates a proactive stance towards capturing market opportunities. Collectively, these factors can generate optimism among investors regarding the company's potential for future success and profitability.
Amazon Inc	1999-12-31	2000-09-08	We intend to continue to expand our operations by promoting new or complementary products or sales formats and by expanding the breadth and depth of our product and service offerings. In addition to ongoing investments in our Web stores and infrastructure, we intend to increase investments in products, services and international expansion.	1. Based on the provided statements, the company has positive future prospects. The company states its intention to expand its operations by promoting new or complementary products, sales formats, and expanding the breadth and depth of its product and service offerings. This indicates a growth-oriented approach and suggests that the company is actively working to enhance its market presence and meet evolving customer needs. 2. These statements create positive expectations. The company's intention to expand operations and invest in product, service, and

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				international expansion signifies a proactive strategy for growth. By emphasizing ongoing investments in web stores and infrastructure, as well as increased investments in various areas, the statements demonstrate a commitment to strengthening the company's capabilities and reaching a wider customer base. These factors generate positive expectations for the company's future prospects. 3. These statements are likely to fuel investor optimism. The company's focus on expanding operations, investing in various aspects of the business, and broadening its product and service offerings can be viewed positively by investors. It indicates a proactive approach to capturing market opportunities and staying ahead of the competition. Investors generally seek companies with growth potential and a strategic outlook, which can fuel optimism about the company's future performance and attract investment.
Apple Inc	2015-09-26	2015-10-28	The Company continues to believe that focused investments in R&D are critical to its future growth and competitive position in the marketplace and are directly related to timely development of new and updated products that are central to the Company's core business strategy.	1. Based on the provided statements, the company has positive future prospects. The statement emphasizes the company's belief in the significance of focused investments in research and development (R&D) for its future growth and competitive position in the marketplace. This suggests that the company recognizes the importance of innovation and

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				product development to drive its success. 2. These statements create positive expectations. The statement underscores the company's belief that focused investments in R&D are critical to its future growth. It highlights the direct relationship between R&D investments and the timely development of new and updated products that align with the company's core business strategy. This indicates a proactive approach to staying competitive and meeting market demands, which generates positive expectations for the company's ability to innovate and remain relevant. 3. These statements are likely to fuel investor optimism. The company's belief in the criticality of R&D investments for future growth and competitive positioning can instill confidence in investors. The emphasis on the direct link between R&D investments and the development of central products reinforces the company's commitment to strategic innovation. Investors generally value companies that prioritize research and development as it can lead to new revenue streams, market expansion, and long-term success.
Bio-Techne Corp	1997-09-26	1997-06-30	Also included in research and development in fiscal 1997 and 1996 is $400,000 per year related to a Research and Development Agree-	1. Based on the provided statements, it suggests that the company has positive future prospects. The mention of research and

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ment with Cistron Biotechnology, Inc. Management of the Company believes that R&D Systems will continue to develop new products.

development (R&D) expenses, including the Research and Development Agreement with Cistron Biotechnology, Inc., indicates a commitment to innovation and product development. The management's belief in the company's ability to develop new products further supports positive future prospects.

2. These statements create positive expectations. The inclusion of R&D expenses, particularly the specific mention of the Research and Development Agreement, signifies an active investment in innovation. This indicates that the company is actively working on advancing its product portfolio. The management's belief in the company's ability to develop new products reinforces the positive expectations for the company's future prospects.

3. These statements may fuel investor optimism. The company's inclusion of R&D expenses and the Research and Development Agreement can be viewed as positive signs by investors. It demonstrates the company's commitment to research and innovation, which are often seen as drivers of future growth and competitiveness. The management's belief in the company's ability to develop new products further adds to investor optimism, as it suggests confidence in the company's prospects for continued success

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				and product innovation.
Ebay	2006-02-24	2005-12-31	We anticipate that we will continue to devote significant resources to product development in the future as we add new features and functionality to the Marketplaces, Payments and Communications businesses. The headcount growth was focused on hiring new employees for various platform development initiatives at eBay and PayPal in addition to our international expansion of both platforms.	1. Based on the provided statements, the company has positive future prospects. The anticipation of devoting significant resources to product development indicates a commitment to innovation and enhancing the company's offerings in the Marketplaces, Payments, and Communications businesses. This suggests a focus on growth and staying competitive in the market. 2. These statements create positive expectations. The company's intention to devote significant resources to product development and add new features and functionality to its businesses indicates a proactive approach to meet evolving customer needs and enhance user experiences. This implies a commitment to innovation and improvement, which generates positive expectations for the company's future prospects. 3. These statements are likely to fuel investor optimism. The company's focus on product development, including the addition of new features and functionality, demonstrates a commitment to staying at the forefront of the market. Investors often value companies that prioritize innovation and invest in enhancing their offerings. Additionally, the mention of headcount growth for platform development

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				initiatives and international expansion further reinforces the company's commitment to growth and market reach. These factors are likely to fuel investor optimism about the company's potential for future success and profitability.
Exelixis Inc	2007-02-27	2006-12-29	Utilizing our library of more than four million compounds, we integrate high-throughput processes, medicinal chemistry, bioinformatics, structural biology, and early in vivo testing in parallel to characterize thousands of compounds, a process that is designed to enable us to move with speed in research and development. We have established collaborations with major pharmaceutical and biotechnology companies based on the strength of our expertise in biology, drug discovery and development that allow us to retain economic participation in compounds and support additional development of our proprietary products. Through these collaborations, we obtain license fees, research funding, a share of the profits and the opportunity to receive milestone payments and royalties from research results and subsequent product development activities.	1. Based on the provided statements, the company has positive future prospects. The statements highlight the company's utilization of a vast library of compounds and integration of various processes, such as high-throughput processes, medicinal chemistry, bioinformatics, structural biology, and early in vivo testing. This indicates a strong focus on research and development and suggests a commitment to advancing their pipeline of proprietary products. 2. These statements create positive expectations. The company's emphasis on utilizing a range of scientific processes in parallel to characterize thousands of compounds showcases an efficient and comprehensive approach to research and development. The establishment of collaborations with major pharmaceutical and biotechnology companies further indicates recognition of the company's expertise in biology, drug discovery, and development. These factors contribute to positive expectations regarding the

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				company's ability to generate novel compounds and achieve success in the market. 3. These statements are likely to fuel investor optimism. The company's collaborations with major industry players and the associated benefits, such as license fees, research funding, profit sharing, milestone payments, and royalties, are positive indicators. Investors typically value strong collaborations, as they can provide financial stability, validate the company's expertise, and offer potential revenue streams. These statements suggest a favorable business environment for the company and may foster optimism among investors.
Incyte Corp	2003-03-28	2002-12-31	The restructuring programs will have little impact on our therapeutic discovery and development programs as we intend to continue to invest in research and development for our therapeutic discovery and development efforts.	1. Based on the provided statements, the company has positive future prospects. The statement indicates that the restructuring programs will have little impact on the company's therapeutic discovery and development programs. This suggests that the company intends to maintain its investment in research and development for these efforts, indicating a commitment to innovation and growth in the therapeutic sector. 2. These statements create positive expectations. The company's intention to continue investing in research and development for therapeutic discovery and development

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				efforts despite undergoing restructuring programs indicates a prioritization of these activities. This suggests a proactive approach to innovation and product development, generating positive expectations for the company's future prospects. 3. These statements may fuel investor optimism. The company's commitment to maintaining investment in research and development for therapeutic discovery and can be viewed positively by investors. Investors typically value companies that prioritize innovation and recognize its importance in driving growth and success. The statement's emphasis on the company's intention to continue investing in these areas can generate optimism among investors about the company's future performance and potential for developing successful therapies.
Innoviva Inc	2010-02-26	2009-12-31	In October 2009, GSK and Theravance announced that the first patient had commenced treatment in the Phase 3 program to develop a next-generation combination treatment for patients with chronic obstructive pulmonary disease (COPD).	1. Based on the provided statement, the company has positive future prospects. The announcement of the initiation of a Phase 3 program for the development of a next-generation combination treatment for patients with chronic obstructive pulmonary disease (COPD) suggests the company is actively working on advancing its pipeline and addressing a significant medical need. This indicates a positive outlook for the company's

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				future prospects. 2. These statements create positive expectations. The mention of the Phase 3 program demonstrates that the company has progressed to an advanced stage of clinical development. This indicates a potential confidence in the efficacy and safety of the treatment being developed. The focus on a next-generation combination treatment further suggests innovation and a commitment to improving therapeutic options, generating positive expectations for the company's future performance. 3. These statements may fuel investor optimism. The announcement of the Phase 3 program and the development of a next-generation combination treatment for COPD can be viewed positively by investors. Investors often value companies that are actively engaged in advanced stages of clinical development, as it indicates progress towards potential market approval. The focus on addressing a significant medical need and developing an innovative treatment can generate optimism about the company's potential for future success and profitability.
Intel Corp	2010-02-22	2009-12-26	With the launch of our 32nm products and fourth quarter record shipments of microprocessor units, we are entering 2010 in a strong	1. Based on the provided statements, the company has positive future prospects. The statements highlight the launch of 32nm

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competitive position as we continue delivering improvements in our product offerings through the “tick-tock” manufacturing process technology and product development cadence. We are also focusing on the development of a new highly scalable, many-core architecture aimed at parallel processing, the simultaneous use of multiple cores to execute a computing task. This architecture will initially be used as a software development platform for graphics and throughput computing (the need for large amounts of computing performance consistently over a long period of time). Over time, this architecture may be utilized in the development of products for scientific and professional workstations as well as high-performance computing applications.	products, record shipments of microprocessor units, and improvements in product offerings through the ”tick-tock” manufacturing process technology and product development cadence. This indicates a strong competitive position and a focus on delivering advancements in their product lineup. 2. These statements create positive expectations. The mention of the launch of new products, record shipments, and a focus on continuous improvements through manufacturing process technology and product development cadence indicates a commitment to innovation and staying competitive in the market. The company’s focus on developing a highly scalable, many-core architecture for parallel processing further reinforces its dedication to advancing its technology offerings. These factors generate positive expectations for the company’s future performance. 3. These statements are likely to fuel investor optimism. The company’s achievements, such as the launch of new products, record shipments, and a commitment to continuous improvements, are positive indicators for investors. Investors generally value companies that demonstrate a strong competitive position, innovation, and a focus on staying ahead of market trends. The mention of the

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				development of a highly scalable, many-core architecture for parallel processing expands the potential market reach, which can further fuel investor optimism about the company's growth potential and market opportunities.
National Service Industries Inc	1997-11-20	1997-08-31	Sales growth of continuing businesses is expected to exceed 5.0 percent, given the continued strength in the lighting equipment market and growth initiatives in the chemical and envelope segments.	1. Based on the provided statement, the company has positive future prospects. The expectation of sales growth exceeding 5.0 percent indicates an optimistic outlook for the company's continuing businesses. The statement also mentions the continued strength in the lighting equipment market and growth initiatives in the chemical and envelope segments, suggesting favorable market conditions and strategic efforts to drive growth. 2. These statements create positive expectations. The expectation of sales growth exceeding 5.0 percent, along with the mention of continued strength in the lighting equipment market and growth initiatives in specific segments, indicate a positive outlook for the company. These factors suggest that the company is well-positioned to benefit from favorable market conditions and its own growth initiatives. 3. These statements are likely to fuel investor optimism. The expectation of sales growth exceeding 5.0 percent, coupled with the mention of favorable market conditions and

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				growth initiatives, can instill confidence in investors. Investors generally value companies that demonstrate the potential for revenue growth and capitalize on market opportunities. These statements suggest a positive trajectory for the company's future performance, which can fuel investor optimism.
Nektar Therapeutics	2011-03-01	2010-12-31	In addition to advancing our proprietary programs that are currently in clinical development, we are committed to continuing to make significant investments to advance new opportunities from our earlier stage research discovery pipeline. We expect research and development expense will substantially increase over the next several years. We plan to continue to advance our most promising early research drug candidates into preclinical development with the objective to advance these early stage research programs to human clinical studies over the next several years.	1. Based on the provided statements, the company has positive future prospects. The statements indicate a commitment to advancing both proprietary programs in clinical development and new opportunities from earlier stage research discovery. This suggests a focus on innovation, pipeline expansion, and potential future growth. 2. These statements create positive expectations. The company's commitment to advancing both existing and new programs indicates a proactive approach to research and development. The mention of substantial investments to advance opportunities from the research discovery pipeline and the expectation of a substantial increase in research and development expenses further reinforces the company's dedication to innovation and product development. These factors generate positive expectations for the company's future prospects. 3. These statements are likely to fuel investor

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				optimism. The company's commitment to advancing promising early-stage research drug candidates and the objective of advancing these programs to human clinical studies over the next several years can be viewed positively by investors. Investors generally value companies that demonstrate a strong research pipeline and a strategic approach to drug development. These statements indicate a proactive and growth-oriented strategy, which can fuel investor optimism about the company's potential for future success and value creation.
Novellus Systems Inc	2005-03-15	2004-12-31	We continue to work closely with our customers and make substantial investments in research and development in order to continue delivering innovative products which enhance productivity for our customers and utilize the latest technology. We believe these investments have positioned us for future growth. Our significant investments in R&D over the past several years reflect our strong commitment to the continuous improvement of our current product lines and the development of new products and technologies. We continue to believe that significant investment in R&D is required to remain competitive, and we plan to continue to invest in new products	1. Based on the provided statements, the company has positive future prospects. The statements highlight the company's commitment to working closely with customers, making substantial investments in research and development, delivering innovative products, and utilizing the latest technology. This indicates a focus on continuous improvement, staying competitive, and positioning the company for future growth. 2. These statements create positive expectations. The company's emphasis on working closely with customers, investing in research and development, and delivering innovative products suggests a proactive approach to meeting customer needs and market

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			and enhancement of our current product lines. We devote a significant portion of our personnel and financial resources to research and development programs, and we seek to maintain close relationships with our customers in order to remain responsive to their product needs. Our success will depend on our ability to accurately predict evolving industry standards, to develop innovative solutions and improve existing technologies, to win market acceptance of our new and advanced technologies and to manufacture our products in a timely and cost-effective manner and in a manner that addresses changing customer needs. To ensure the functionality and reliability of our future product introductions or product improvements, we incur substantial research and development costs early in development cycles, before we can confirm the technical feasibility or commercial viability of a product or product improvement.	demands. The commitment to continuous improvement and development of new products and technologies generates positive expectations for the company's future performance. 3. These statements are likely to fuel investor optimism. The company's focus on maintaining close relationships with customers, investing in research and development, and addressing evolving industry standards indicates a commitment to staying ahead of the competition and meeting customer demands. Investors generally value companies that prioritize innovation, market responsiveness, and the ability to adapt to changing customer needs. These statements demonstrate the company's efforts in these areas and are likely to fuel investor optimism about the company's potential for future success and market acceptance.
Oracle Corp	2017-06-27	2017-05-31	We focus our development efforts on improving the performance, security, operation and integration of these differing technologies to make them more cost-effective and easier to deploy, manage and maintain for our customers and to improve their computing	1. Based on the provided statements, the company has positive future prospects. The statements indicate a focus on improving the performance, security, operation, and integration of technologies to enhance customer experience and computing performance

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performance relative to our competitors. After the initial purchase of Oracle products and services, our customers can continue to benefit from our research and development efforts and deep IT expertise by purchasing and renewing Oracle support offerings for their on-premise deployments, which may include product enhancements that we periodically deliver to our products, and/or by renewing their SaaS, PaaS and IaaS contracts with us.

On a constant currency basis, we expect that our total cloud and on-premise software revenues generally will continue to increase due to:

- expected growth in our cloud SaaS, PaaS and IaaS offerings;
- continued demand for our on-premise software products and software license updates and product support offerings, including the high percentage of customers that renew their software license updates and product support contracts; and
- contributions from our acquisitions.

We believe all of these factors should contribute to growing our cloud and on-premise software revenues, which should enable us to continue to make investments in research and development.

relative to competitors. This suggests a commitment to innovation and addressing customer needs, which bodes well for future prospects.

2. These statements create positive expectations. The emphasis on improving technologies, making them more cost-effective, easier to deploy, manage, and maintain, indicates a proactive approach to product development and customer satisfaction. The mention of product enhancements periodically delivered and the option to renew support offerings and contracts further reinforces the company's commitment to ongoing improvements and customer value. These factors generate positive expectations for the company's future performance.

3. These statements are likely to fuel investor optimism. The company's focus on continuous development efforts, deep IT expertise, and customer support offerings can be viewed positively by investors. Investors generally value companies that prioritize innovation, customer satisfaction, and the ability to adapt to changing technological needs. The statements highlight the company's commitment to these aspects, which can fuel investor optimism about the company's growth potential and its ability to retain and expand its customer base.

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Orchestra Therapeutics Inc	1999-03-30	1998-12-31	The Company may receive as much as $77 million as a result of this agreement, including license and milestone payments of $45 million, payments to support research and development of $18 million and $14 million to purchase the Company's common stock, priced at a premium to the market, subject to certain rights of termination by Agouron. The Company also expects research and development costs to increase as it continues clinical trials related to a potential rheumatoid arthritis therapy. Research and development expenses should also continue to rise in the foreseeable future due to expanding preclinical and clinical testing of the Company's proposed gene therapy and cancer treatments.	1. Based on the provided statements, the company has positive future prospects. The statements mention potential payments from an agreement, including license and milestone payments, as well as investments to support research and development. The expectations of increasing research and development costs and expanding preclinical and clinical testing indicate a commitment to innovation and the development of potential therapies. These factors suggest positive future prospects for the company. 2. These statements create positive expectations. The mention of potential payments, investments in research and development, and the expansion of preclinical and clinical testing signifies a proactive approach to advancing the company's therapies and product pipeline. These statements indicate a commitment to growth and innovation, which generates positive expectations for the company's future performance. 3. These statements are likely to fuel investor optimism. The potential payments from the agreement, along with the commitment to research and development and expanding testing, indicate a strong focus on product development and growth opportunities. Investors generally value companies that actively invest in research and development and have

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				potential milestones and partnerships in place. These statements are likely to fuel investor optimism about the company's potential for future success and profitability.
PDL BioPharma Inc	1997-02-13	1996-12-31	The Company's revenues to date have consisted, and for the near future are expected to consist, principally of research and development funding, licensing and signing fees and milestone payments from pharmaceutical companies under collaborative research and development and licensing agreements.	1. Based on the provided statements, the company has positive future prospects. The statements indicate that the company's revenues have consisted mainly of research and development funding, licensing and signing fees, and milestone payments from pharmaceutical companies. This suggests that the company has established collaborative research and development agreements and licensing deals, which can be indicative of potential future product advancements and revenue streams. 2. These statements create positive expectations. The mention of research and development funding, licensing and signing fees, and milestone payments implies that the company is actively engaged in partnerships and collaborations with pharmaceutical companies. This suggests that the company's technologies or products are of interest to industry players, which can create positive expectations for potential future revenue generation and product development. 3. These statements may fuel investor optimism. The company's reliance on research

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				and development funding, licensing and signing fees, and milestone payments from pharmaceutical companies indicates an established presence in the industry and a potential for future growth. Investors often value companies that have secured collaborative agreements and partnerships, as these can provide revenue stability and opportunities for further development. These statements can fuel investor optimism about the company's ability to attract funding and generate positive outcomes from its collaborative efforts.
Precision Castparts Corp	1998-06-26	1998-03-29	Sales to the general industrial, energy and automotive markets are expected to grow at rates higher than the underlying economic growth of those markets as we plan to focus significant attention on additional market penetration and continued development of new products.	1. Based on the provided statements, the company has positive future prospects. The statements indicate an expectation of sales growth in the general industrial, energy, and automotive markets at rates higher than the underlying economic growth. This suggests that the company has strategic plans in place to focus on market penetration and new product development, indicating a positive outlook for future growth. 2. These statements create positive expectations. The expectation of sales growth at rates higher than the underlying economic growth, combined with the company's focus on additional market penetration and new product development, suggests a proactive

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				approach to expanding its market presence. These statements indicate a belief in the company's ability to outperform the broader market and generate growth, creating positive expectations for its future performance. 3. These statements may fuel investor optimism. The expectation of sales growth at rates higher than the underlying economic growth and the focus on market penetration and new product development are likely to be viewed positively by investors. Investors generally value companies that demonstrate the potential for market outperformance and have clear strategies for growth. These statements can fuel investor optimism about the company's future prospects, as they suggest a commitment to expanding market share and developing innovative products.
Enanta Pharmaceuticals Inc	2018-11-29	2018-09-30	At any given time, we typically have several active early stage research and drug discovery projects. We expect that our research and development expenses will continue to increase in the future as we advance our RSV, NASH, PBC, and HBV programs. We also have a program to discover and develop new chemical entities for the treatment of HBV.	1. Based on the provided statements, the company has positive future prospects. The statements indicate that the company has several active early stage research and drug discovery projects, suggesting a robust pipeline of potential therapies. The expectation of increasing research and development expenses to advance programs targeting RSV, NASH, PBC, and HBV further reinforces the company's commitment to innovation and addressing significant medical needs.

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2. These statements create positive expectations. The mention of active early stage research and drug discovery projects indicates ongoing efforts to expand the company's product pipeline. The expectation of increasing research and development expenses to advance specific programs targeting various diseases suggests a proactive approach to therapeutic development. These statements generate positive expectations for the company's future prospects in terms of pipeline growth and potential breakthroughs in addressing diseases.

3. These statements are likely to fuel investor optimism. The presence of several active early stage research and drug discovery projects demonstrates the company's dedication to innovation and developing novel therapies. The expectation of increasing research and development expenses indicates a commitment to advancing the targeted programs. Investors generally value companies with strong pipelines and a focus on research and development. These statements can fuel investor optimism about the company's potential for future success, market growth, and the possibility of bringing new treatments to market.

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Tenneco Inc	1999-03-10	1998-12-31	On July 21, 1998, Tenneco announced that its Board of Directors had authorized management to develop a broad range of strategic alternatives designed to better realize the long-term value of its businesses for its shareowners. This, other new product introductions, acquisitions including Richter Manufacturing, and the higher growth rate of Specialty Packaging's market segments should lead to volume increases.	1. Based on the provided statements, the company has positive future prospects. The statements indicate that the company is actively exploring strategic alternatives to enhance long-term value for its shareholders. This suggests a proactive approach to improving the company's performance and indicates a positive outlook for future prospects. 2. These statements create positive expectations. The mention of new product introductions, acquisitions, and the expected volume increases in Specialty Packaging's market segments implies growth opportunities for the company. The focus on diversifying research and development activities and entering collaborative agreements indicates a proactive approach to innovation and potential revenue generation. These statements generate positive expectations for the company's future performance. 3. These statements may fuel investor optimism. The company's efforts to explore strategic alternatives, engage in new product introductions, acquisitions, and diversify research and development activities can be viewed positively by investors. Investors generally value companies that actively seek opportunities for growth and revenue diversification. The mention of ongoing discussions

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				with pharmaceutical companies regarding strategic research and product development agreements further reinforces potential revenue and cash flow opportunities. These statements are likely to fuel investor optimism about the company's potential for future success and value creation.
Vertex Pharmaceuticals Inc	2004-03-15	2003-12-31	We have elected to diversify our research and development activities across a relatively broad array of investment opportunities, due in part to the high risks associated with the biotechnology and pharmaceutical business. We focus our efforts both on programs which we expect to control throughout the development and commercialization process, and programs which we expect will be conducted in the development and commercial phase principally by a collaborative partner. Based on the value that we believe we have built through research and development investments in certain of our drug discovery and development programs and our perception of the level of interest in certain of our programs among some potential collaborators, we believe that we could enter into additional collaborative agreements in 2004 which could be material to our business. In addition, we are currently in discussions with pharmaceutical companies regarding	1. Based on the provided statements, the company has positive future prospects. The statements indicate that the company has chosen to diversify its research and development activities to mitigate the high risks associated with the biotechnology and pharmaceutical business. This suggests a proactive approach to managing risk and pursuing multiple investment opportunities, which can enhance the company's future prospects. 2. These statements create positive expectations. The focus on diversifying research and development activities and entering into collaborative agreements implies a strategic approach to innovation and revenue generation. The mention of building value through research and development investments and the perception of interest from potential collaborators further reinforces the positive outlook. These statements generate positive expectations for the company's future performance. 3. These statements may fuel investor

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			strategic research and product development agreements, and the successful conclusion of such discussions may result in additional revenue and cash flow in 2004.	optimism. The company's ongoing discussions with pharmaceutical companies regarding strategic research and product development agreements indicate potential opportunities for additional revenue and cash flow. Investors generally value companies that actively seek collaborations and partnerships to drive growth and diversify their revenue streams. These statements can fuel investor optimism about the company's potential for future success, market expansion, and value creation.
Comverse Technology Inc	1998-03-30	1997-12-31	The Company believes that opportunities for large installations will continue to grow in both its commercial and government markets, and intends to continue to expand its research and development, manufacturing, sales and marketing and product support capabilities in anticipation of such growth. The increase in research and development expenditures reflects the Company's concentration on enhancing the range of features and capabilities of its existing product lines and developing new generations of its products. The Company believes that these efforts are essential for the continuing competitiveness of its product offerings and for positioning itself to participate in future growth opportunities in both the commercial and	1. Based on the provided statements, the company has positive future prospects. The statements indicate that the company believes opportunities for large installations will continue to grow in both commercial and government markets, and it plans to expand various capabilities in anticipation of such growth. This suggests a positive outlook for the company's future prospects and its ability to capture market opportunities. 2. These statements create positive expectations. The focus on expanding research and development, manufacturing, sales and marketing, and product support capabilities indicates a commitment to enhancing existing product lines and developing new generations of products. This suggests a proactive

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	government sectors.	approach to innovation, product improvement, and market expansion. These statements generate positive expectations for the company's future performance. 3. These statements may fuel investor optimism. The company's belief in the growth potential of large installations in both commercial and government markets, along with its intentions to expand capabilities, positions the company for future opportunities. Investors generally value companies that proactively invest in research and development, enhance product offerings, and position themselves for market growth. These statements are likely to fuel investor optimism about the company's potential for future success, market expansion, and increased competitiveness.