Three Essays in Corporate Finance

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Abstract

This thesis examines three important topics in corporate finance: the relation between the dividend-paying status of a firm and its investment and operating performance following a seasoned equity offering (SEO), the market's view on one-dollar CEO salary announcements, and the value of corporate social responsibility (CSR) in the event of a data breach. First, I provide an in-depth analysis of the connection between dividend payouts and corporate investment of SEO firms. Empirical studies have documented the decline in post-issue operating performance of SEO firms, and the potential overinvestment of SEO proceeds seems to be a critical factor. Studies on dividend payouts argue that the agency cost of overinvestment could be lowered when dividends are paid to reduce free cash flows held by managers. To examine the connection, I utilize two post-issue dividend policies, paying consecutive dividends or nothing, to separate my sample of SEO firms and compare the two groups' post-issue investment and operating performance. I find that non-dividend-paying SEO firms overinvest more, leading to the deterioration of asset turnover and worse post-issue operating performance compared with dividend-paying ones. The results suggest a beneficial effect of consistent dividend payouts on post-SEO business operations. Second, I examine the market reaction to the public announcement of a $1 CEO salary decision using explicit reasons for the decision and mechanisms for dealing with the base salary to disentangle possible explanations for the reaction. It shows that the market does not favour the so-called personal sacrifice when CEOs eliminate their salary to counter a downturn or crisis. When a firm is in a predicament or has poor performance, the market sees its CEO's decision to give up the salary as a signal that the outlook for the firm is bleak and the CEO is attempting to save their position. However, when newly hired CEOs start with a $1 salary, the market reacts positively. The results ascertain that a $1 salary is not seen purely as a vehicle for interest alignment. Third, I investigate whether public firms' CSR activities pay off when they suffer a data breach that potentially harms their reputation and hurts firm value. I use a sample of US data breaches and two sources of environmental, social, and corporate governance (ESG) ratings to investigate whether CSR engagement by public firms mitigates the negative stock market reactions to their data breach announcements. I utilize pre-breach ESG scores to separate my sample of breached firms into high and low CSR groups. Using event study methodology, I find that the market reacts significantly negatively to only the low CSR group's announcements. Consistent with previous studies on how firms benefit from CSR activities when they face adversity and lose public trust, the results suggest that social performance protects firms against information leakage incidents. However, the extent to which the market assesses the ratings from different providers is still divergent, which is a concern for practitioners.

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Contents

List of Figures

List of Tables

Declaration of Authorship

I, Wei-Ju Liao, declare that this thesis titled, "Three Essays in Corporate Finance" and the work presented in it are my own. This thesis consists of five chapters in total and is presented in the format of a sandwich thesis. The thesis includes a general introduction, three empirical chapters, and a general conclusion.

I am the primary author of all five chapters. I conducted the empirical research in consultation with Dr. Anna Danielova for Chapters 2 and 3 and with Dr. Trevor Chamberlain and Dr. Rahman Khokhar for Chapter 4. For Chapters 2 and 3, I was the primary individual responsible for collecting data, analyzing the data, and writing the article. For Chapter 4, using the ESG data provided by Dr. Rahman Khokhar, I was responsible for collecting other necessary data, analyzing the data and writing the article.

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Chapter 1

Introduction

This thesis examines three important topics in corporate finance: the relation between the dividend-paying status of a firm and its investment and operating performance following a seasoned equity offering (SEO), the market's view on one-dollar CEO salary announcements, and the value of corporate social responsibility (CSR) activities in the event of a data breach. These topics concern academics, financial professionals, policymakers, and individual investors. First, SEO firms underperform their non-issuing counterparts in the long run due to the potential overinvestment of new funds. Investigating dividend payouts that are assumed to reduce the agency cost of overinvestment can help explain the subpar performance of SEO firms. Second, executive compensation has been an often discussed subject in academic research on corporate governance. As a specific case of CEO compensation that minimizes the fixed salary, a $1 salary echoes the common question of whether equity-based compensation is an effective incentive mechanism encouraging managers to accomplish the goal of firm value maximization. Last, the impact of CSR activities on firm performance and the reliability of CSR ratings have been of interest to the public. An adverse event of information leakage from which public firms suffer can be utilized to reexamine these issues empirically. My research on these topics has policy implications about the makings of dividend policies, CEO compensation designs, and firm CSR engagement.

The first essay, *Corporate Operating Performance Following Seasoned Equity Offerings: It Pays to Pay Dividends*, investigates the connection between dividend payouts and investments of SEO firms. This topic matters because the deterioration in SEO firms' post-issue operating performance has been observed, and the overinvestment of SEO proceeds is considered a critical factor (Fu, 2010; Lee, 1997; Loughran and Ritter, 1997). Regarding the agency problem, research on dividend-payout has investigated its role in reducing free cash flows. Yet, few have attempted to establish a direct relationship between it and post-SEO performance (Booth and Chang, 2011)[1]. This essay examines whether SEO firms' operating performance benefits from their dividend policy. I focus on the following questions: When an SEO firm decides not to pay dividends, does it overinvest more severely than its counterpart that pays dividends consistently? What is the impact of dividend payouts on post-SEO operating performance? What is the channel through which dividend payouts mitigate the deterioration in post-SEO operating performance?

Following Fu (2010), I measure the post-issue overinvestment and operating-income-to-assets ratio (Operating ROA) of SEO firms. To measure the effect of dividend payouts, I compare two groups of SEO firms that adopt two different

[1]Booth and Chang (2011) documented a less negative market reaction to SEO announcements of dividend-paying firms than non-dividend-paying counterparts due to less information asymmetry.

dividend-paying policies—paying consistent dividends or nothing. I find SEO firms that pay nothing statistically overinvest more, which deteriorates their operating asset productivity following SEOs. The results suggest that dividend payouts affect post-SEO operating performance despite being relatively smaller than SEO proceeds and contemporaneous investments.

The second essay, *The Curious Case of One-Dollar CEO Salaries: Evidence from Market Reaction to Salary Decision Announcements*, examines how the market reacts to the public announcement of a $1 CEO salary decision. Beyond a literal dollar coin, a $1 salary involves a shift in CEO compensation components. Companies and CEOs can use the decision as either a signal of a promising future or a response to the current predicament. In terms of the method used to adjust the fixed base salary of CEOs, it could be either cutting it entirely or shifting it to variable pay. The methods can result in an early level difference in total CEO compensation. Following Hamm, Jung, and Wang (2015) and Loureiro, Makhija, and Zhang (2020), I use two main reason categories: *Alignment* and *Downturn*. Additionally, I investigate the methods, *Salary Cuts* and *Exchange*, and manually collect $1 salary announcement dates. The abnormal returns in the event window using event study methodology should reflect the information in the announcement, including reasons and mechanisms. I find a significantly negative price reaction to the *Downturn* reason and the *Salary Cuts* approach. If a firm performs poorly and its CEO cuts their salary to $1, the salary decision is seen as indicative of either a response to revenue losses or the CEO's intention of escaping dismissal. However, the market favours the decision if the firm hires a new CEO and provides $1 salary compensation from the outset. The mixed findings of abnormal returns in this study suggest that a $1 salary is not viewed purely as a vehicle for aligning interests between CEOs and shareholders.

The third essay, *The Role of Corporate Social Responsibility: Evidence from Market Reaction to Data Breach Announcements*, examines the impact of CSR on firm value. I investigate whether CSR activities pay off for public firms when they suffer a data breach that potentially harms their reputation and hurts firm value. A data breach announcement typically discloses the cause and affected populations, bringing a bad market reaction. Previous studies on data breach announcements find that the market reacts negatively to the disclosure, while the reactions to different breach types and affected industries are mixed (Arcuri, Brogi, and Gandolfi, 2017; Cavusoglu, Mishra, and Raghunathan, 2004). As for CSR, previous studies have mixed opinions about its effect on firm performance and firm value (Deng, Kang, and Low, 2013; Gillan, Koch, and Starks, 2021). This essay links the literature on CSR with data breaches. Consistent with previous studies on how CSR activities benefit firms when firms face adversity and lose public trust, my empirical analysis suggests that social performance insures companies against the information leakage problem; however, it also shows the extent to which the market assesses the ratings by different providers is still divergent, which is a concern for practitioners.

My dissertation research makes the following primary contributions. The results of operating asset turnover in the first essay show the impact of consistent dividend payouts on post-SEO business operations. The essay confirms the connection between corporate dividends and investments following SEOs, supporting the viewpoint in the previous dividend literature. The second essay contributes to the executive compensation literature by using manually collected data on $1 CEO salary decisions to empirically examine the market reaction to their public announcements, attempting to fill the gap in the recent studies on this topic. The third essay supplements the literature on CSR by investigating the impact of CSR activities on firm value using adverse data breach events. Overall, my dissertation results support and expand previous research arguments in each research field: (1) paying dividends mitigates the overinvestment problem; (2) the market can distinguish the reasons and mechanisms for $1 salary decisions; (3) CSR activities pay off during a crisis.

The rest of the thesis proceeds as follows. Chapter 2 studies the level of overinvestment following SEOs and its consequences for firm performance and examines whether dividend payouts mitigate the deterioration in post-issue operating performance. Chapter 3 investigates the reasons and mechanisms for adopting a $1 CEO salary and examines the market reaction to its public announcement. Chapter 4 focuses on the impact of CSR activities using data breach events. Chapter 5 summarizes and concludes.

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Chapter 2

Corporate Operating Performance Following Seasoned Equity Offerings: It Pays to Pay Dividends

2.1 Introduction

Numerous studies on seasoned equity offerings (SEOs) have documented the subpar market reaction to SEO announcements and subsequent deteriorating operating performance. Theories developed to explain the decline in operating performance following SEOs include Myers and Majluf's (1984) adverse selection model and Jensen's (1986) free cash flow hypothesis. Myers and Majluf (1984) emphasize the private information advantage of managers and claim that a firm issues new equity when the stock is overvalued. On the other hand, Jensen (1986) highlights the conflicting interests between managers and shareholders, potentially leading to overinvestment of new funds in negative net-present-value (NPV) projects.

The research on dividend policy provided two key implications. Agency cost theory suggests that dividend payouts decrease free cash flow available to managers and prevent managers from investing in negative NPV projects when conditions are not favorable (Al-Malkawi, Rafferty, and Pillai, 2010; Easterbrook, 1984; Jensen, 1986; La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 2000; Lang and Litzenberger, 1989). According to La Porta, Lopez-de-Silanes, Shleifer, and Vishny (2000), "by paying dividends, insiders return corporate earnings to investors and hence are no longer capable of using these earnings to benefit themselves... the payment of dividends exposes companies to the possible need to come to the capital markets in the future to raise external funds, and hence gives outside investors an opportunity to exercise some control over the insiders at that time (Easterbrook (1984))" (p. 4). The signaling theory of dividends posits that dividend payouts send a positive signal of future profitability. With the information gap between managers and shareholders, managers can use dividend announcements as a vehicle to communicate information to the financial market about a firm's future earnings and growth (Al-Malkawi, Rafferty, and Pillai, 2010).

While both SEOs and dividend policy provide guidance as to how managers deploy available funds, there have been no attempts to establish a direct relationship between dividend policy and SEO firm performance. Loderer and Mauer (1992) and Booth and Chang (2011) examined SEO announcement-day returns and the role of dividend payouts in reducing information asymmetry before SEOs. Booth and Chang (2011) found that the market reacts to the SEO announcements made by dividend-paying firms less negatively than to those made by non-dividend-paying firms, due to less information asymmetry. On the other hand, Fu (2010) attributes the poor operating performance post-issue to the overinvestment of new proceeds and indirectly challenges the existing argument that dividend payouts bring benefits by reducing free cash flows and forcing managers to raise funds in capital markets.[1] Thus, whether dividend payouts affect the investment and operating performance of SEO firms needs to be examined. This study aims to fill this gap and address the question of whether the operating performance of SEO firms benefits from dividend payouts.

To examine the potential effect of dividend payouts on firms' investment policy and operating performance, I compare two samples of firms with SEOs. Firms in the first sample include firms that did not pay dividends for three years after the SEO. The second sample includes firms that had been paying dividends during a three-year window after the SEO. For firms in both samples, I compare investments and operating performances before and after the SEOs using a control sample of non-SEO firms, matched on the dividend policy. I find that matched to non-SEO control firms, non-dividend-paying firms invest more after SEOs than do dividend-paying firms.[2] Examining the overinvestment pattern and its impact on the operating performance of SEO firms, I also find that when SEO firms over-invest, non-dividend-paying firms have poorer post-issue operating performance

[1] Fu (2010) notes that "...the desirable monitoring of capital markets described by Easterbrook (1984) does not apply to a typical SEO firm."

[2] The abnormal investment is calculated as the difference in the investment between SEO firms and matched non-SEO control firms. In this study, "overinvestment" represents positive abnormal investment. Non-dividend-paying firms also have more negative abnormal investment than dividend-paying firms. The matching criteria and the results are explained in Section 2.4.

than do dividend payers. Furthermore, non-dividend-paying firms have more negative changes in asset turnover, the proxy for operating asset productivity, than do dividend payers for the highest levels of overinvestment in a quintile analysis. Controlling for firm characteristics and past performance, the multivariate regression results confirm a positive relationship between dividend payouts and post-issue firm operating performance. Finally, I find that the post-issue asset turnover is smaller for non-dividend-paying firms that overinvested. The results suggest that dividend payout affects post-SEO operating performance, despite dividends being relatively smaller than SEO proceeds and contemporaneous investments.

The remainder of this paper is divided into four sections. In the next section, I review the previous literature on SEOs, corporate investments, and dividend payouts, and develop my hypotheses. Data collection and variable construction are described in Section 2.3. Section 2.4 presents the descriptive statistics for investment and operating performance, a quintile analysis of abnormal investment, and the regression results of the operating performance for the SEO sample, as well as robustness tests. Section 2.5 concludes.

2.2 Literature review and research hypotheses

2.2.1 SEO firm performance and investment

There is abundant empirical research on the market reaction to SEO announcements and subsequent corporate performance (Hansen and Crutchley, 1990; Jegadeesh, 2000; Lee, 1997a; Lee, 1997b; Loughran and Ritter, 1995, 1997, 2000; Spiess and Affleck-Graves, 1995; Teoh, Welch, and Wong, 1998). The literature referred to Myers and Majluf's (1984) information asymmetry theory and Jensen's (1986) free cash flow theory to explain the negative reaction to SEO announcements. Information asymmetry theory emphasizes the advantage of private information possessed by managers (Kim and Weisbach, 2008; Myers and Majluf, 1984). On the other hand, the free cash flow theory highlights the conflict of interests discrepancy between managers and shareholders. When the conflict of interests exists, managers may be inclined to use corporate free cash flows to invest in negative net present value (NPV) projects (Jensen, 1986; Pawlina and Renneboog, 2005). Examining SEO firms' free cash flows and their post-issue operating performance, McLaughlin, Safieddine, and Vasudevan (1996) document that the operating performance improves before SEOs and then drops dramatically following SEOs, with a greater decline for firms with higher free cash flow levels before SEOs. Loughran and Ritter (1997) obtain similar results for operating performance, which peaks at the time of the offerings and deteriorates afterward. They claim that the issuers are overoptimistic about future profitability and continue to invest heavily. Lee (1997a) looks at the effects growth opportunities have on the post-issue earnings performance of SEO firms and suggests that the free cash flow problem following equity issuance worsens the operating performance of firms.[3]

While seasoned equity offerings are most often used to raise investment capital for R&D and capital expenditures (Kim and Weisbach, 2008)[4], several papers have

[3]Bayless and Jay (2011) argue that operating performance drops prior to an SEO.

[4]The authors also argue that managers may purposely use equity offerings to take advantage of mispricing when market conditions are favourable. Using the market-to-book ratio to reflect equity value, they show that firms with higher market-to-book ratios not only have a higher fraction of secondary shares in their offerings, but also keep more new proceeds as cash.

documented investment distortions, such as rejecting good investment opportunities and spending higher than expected amounts on R&D, before and after SEOs.[5] Examining the impact of overinvestment after SEOs, Fu (2010) claims that managers squander the free cash flows generated by SEOs, and poor firm performance following SEOs is attributable to overinvestment.

2.2.2 Dividend payouts

Several studies on dividends have investigated the role of dividend payouts in lowering agency costs. As dividend payouts reduce the free cash flows controlled by managers, managers will have less cash on hand to misuse. Being forced to visit capital markets more frequently for investment capital, firms will be more closely monitored by capital markets (Easterbrook, 1984; Jensen, 1986; La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 2000; Lang and Litzenberger, 1989; Officer, 2011). Lang and Litzenberger (1989) utilize Tobin's Q as an indicator of overinvestment and argue that the reaction to a sizable dividend change announcement is significant for overinvestment firms, which supports the free cash flow hypothesis. Officer (2011) argues that higher dividend announcement returns reflect the reduction of agency costs of overinvestment for firms with poorer investment opportunities.[6]

[5]Stein (1988, 1989, 2003) and Qian, Zhong, and Zhong (2012) examine the pre-issue investment of SEO firms, while Fu (2010) explores the post-issue investment of SEO firms.

[6]On the other hand, the signaling hypothesis suggests that dividend changes can deliver some updated information about future profitability (Denis, Denis, and Sarin, 1994; Woolridge, 1983; Yoon and Starks, 1995). These competing, but not exclusive, hypotheses are also applied to studies in which the market reaction to dividend change announcements and post-announcement performance has been investigated. For example, Akhigbe and Madura (1996) analyze the relation between long-term share performance and dividend initiations and omissions. Lie (2005) investigates the operating performance after dividend decreases and omissions to emphasize the information role of dividends. Kale, Kini, and Payne (2012) argue that information signaling can explain the dividend initiation decision, while not excluding other explanations of dividend policy.

Several empirical studies have shed light on the relationship between dividend payouts before SEOs and the stock market reaction to the SEO, based on the signaling hypothesis. Firms issue new stocks to finance new investments. Ambarish, John, and Williams (1987) argue that firms can convey private information through the combination of dividends and announced investments. Loderer and Mauer (1992) examine whether dividend payments alleviate valuation uncertainty to mitigate negative SEO announcement day returns but find no significant evidence. Booth and Chang (2011), emphasizing the role of dividend payouts in reducing information asymmetry before SEOs, show that the market reaction to SEO announcements will be less negative if firms pay dividends prior to SEOs.[7] Dasilas and Leventis (2013) report similar results, focusing on the Greek market.

2.2.3 Research hypotheses

Building upon the findings of dividends, seasoned equity issues, and investment literature, this study examines whether dividend payouts mitigate the deterioration in the operating performance of SEO firms due to overinvestment. The inverted operating performance U curve surrounding SEOs has been identified in previous literature (Loughran and Ritter, 1997; McLaughlin, Safieddine, and Vasudevan, 1996). The SEO literature suggests that overinvestment potentially happening after SEOs hurts post-issue operating performance. The dividend literature argues that dividend payouts decrease free cash flows, and the positive reaction to dividend initiation announcements reflects the reduction of the agency cost of overinvestment. If dividend payouts decrease free cash flows held by managers

[7] Booth and Chang (2011) also investigate the impact of dividend changes on SEO announcement day returns.

(forcing managers to return to capital markets to gather necessary capital), managers would be forced to use the funds more cautiously (due to ongoing monitoring by capital markets (Easterbrook, 1984)). Thus, for dividend-paying firms, the level of overinvestment should be lower, and the post-issue performance deterioration resulting from overinvestment should be less severe. Therefore, I conjecture that firms which pay no dividends are more likely to overinvest after SEOs.

More severe overinvestment problem should lead to inferior operating performance. Officer (2011) argues that higher dividend initiation announcement returns reflect the reduction of agency costs of overinvestment at firms with poor investment opportunities. When firms with poor investment opportunities initiate dividend payouts, the decrease in free cash flows held by managers prevents them from wasting funds. On the other hand, non-dividend-paying firms with poor investment opportunities are more likely to overinvest new proceeds from SEOs, leading to poorer operating performance. The misuse of funds after SEOs causes a reduction in asset productivity and a deterioration in operating performance (Fu, 2010). Therefore, the post-issue operating performance of non-dividend-paying firms should deteriorate even more when they have poorer investment opportunities. I formulate the following hypotheses:

H1 Firms that pay dividends contemporaneously following SEOs experience less deterioration in operating performance from overinvestment following SEOs than firms that do not pay dividends.

H2 Firms that pay dividends contemporaneously following SEOs experience less deterioration in asset productivity than firms that do not pay dividends.

2.3 Sample selection and methodology

2.3.1 Sample

The data include primary and combined seasoned equity offers between 1982 and 2018, reported in the Security Data Corporation electronic database.[8] I impose several filters on the original data set:

1. The stocks trade on the NYSE, AMEX, or NASDAQ.

2. I exclude firms with the SIC codes 4910-4949 (utilities) and 6000-6999 (financial institutions).

3. The sample firms must have the necessary accounting items in the Compustat database.

4. If the offering is a combined one, the percentage of primary shares offered needs to be higher than fifty percent of total shares offered.[9]

5. For the firms with multiple SEOs in the sample period, I calculate the gap between two consecutive SEOs. I exclude both SEOs if the gap between them is less than three years. Only the preceding one is excluded if the gap is between three and five years. This criterion excludes the overlap of necessary data between two consecutive SEOs by a firm.[10]

[8] A combined offering includes primary shares issued by a firm and secondary shares sold by its existing shareholders. To measure the SEO proceeds that go to the issuing firm, the data on primary shares are used. Following Fu (2010), I set the percentage requirement of primary shares in a combined offering in the fourth filter.

[9] Final sample consists of 70.73% primary offerings and 29.27% combined offerings with the percentage of primary shares equal to 75.72%/77.35% (mean/median).

[10] In this study, the difference in variables between pre-SEO and post-SEO periods are calculated. The overlap of data between two consecutive SEOs of a firm may cause statistical bias.

The procedure produces a sample of 1,804 SEOs. The number of SEOs in each year and percentages in a total sample are reported in Table 2.1. Compared to other decades, the 1990s saw more SEOs, accounting for forty percent of the sample. After 2000, the number of SEOs per year has relatively decreased and stabilized.

The filing year of each SEO is defined as year 0. Consistent with the previous literature, I examine corporate performance during a three-year window before the SEO and over the five-year horizon after the SEO. Since the consecutive nine-year data are needed for pre- and post-issue investment and operating performance, the SEOs between 1985 and 2013 are used in the empirical analysis. To gauge the effect of dividend payouts on a firm's operating performance and asset quality, I divide the sample into two groups based on the choice of dividend payments following SEOs. I split the sample into the "DIVIDEND" and the "NODIVIDEND" groups based on whether a firm pays consecutive dividends during a three-year period following the SEO.[11] Table 2.2 provides a comprehensive list of variables used in this study and their definitions.

To prevent using the pre-SEO data for an SEO of a firm as the post-SEO data for the preceding SEO of the same firm, this criterion is utilized for each firm. Section 2.4.4 shows the analysis for the sub-sample of firms without multiple SEOs. Results are generally consistent with those in the main part of the paper.

[11]Booth and Chang (2011) separate their sample based on whether firms pay dividends in the year prior to SEOs. I choose three-year consecutive dividends after SEOs to ensure that the firms have a consistent dividend policy.

2.3.2 Investments, dividend payouts, and operating performance

Table 2.3 reports the descriptive statistics for the sample of firms as well as SEOs. Following previous studies, the investment is calculated as the sum of capital expenditures, acquisition expenses, and increases in investment. As the primary reason for issuing new capital, the investment is expected to increase following SEOs. Panel A shows that both the volume and the annual investment-to-asset ratio increase from year −1 to year 0. The median of investments increases from around $11 million in year −1 to around $19 million in year 0, and the median of the annual investment-to-asset ratio increases from 8.07% in year −1 to 9.42% in year 0. Scaled by the market value of assets, the median investment ratio (Investments/MV) increases from 4.11% in year −1 to 5.01% in year 0. Following Lee (1997a) and Officer (2011), I use Tobin's Q to measure a firm's growth opportunities. The greater-than-unity median Tobin's Q, 1.88 in year −1, indicates SEO firms are those with potential growth opportunities.[12]

To examine the operating performance of SEO firms, I adopt the primary measure used in Fu (2010), the operating-income-to-assets ratio (OPROA). The operating-income-to-assets ratio is calculated as operating income before depreciation divided by the average of the beginning and ending period cash-adjusted assets (total assets minus cash and marketable securities). The operating-income-to-assets ratio can be decomposed into two components, asset turnover and operating

[12] According to Fu (2010), "However, it is still possible that the huge amount of cash proceeds exceed the issuer's optimal investment needs" (p. 252).

margin on sales. Asset turnover is measured as net sales divided by average cash-adjusted assets, and operating margin on sales is measured as operating income before depreciation divided by net sales. Asset turnover measures the productivity of operating assets, and operating margin on sales measures the operating income generated by each dollar of sales. According to Fu (2010), inspecting two components separately helps to examine the direct impact of overinvestment on operating performance. In addition to OPROA, return on assets (ROA) and return on equity (ROE) are also calculated. Panel A of Table 2.3 shows that the medians of OPROA, ROA, and ROE all increase from year -1 to year 0.

Panel B reports the deal statistics, including SEO proceeds and the ratio of investments to SEO proceeds. It shows that in year 0, investment accounts for half the SEO proceeds (49.66%) for a median firm. An average sample firm invested more than it raised with the SEO, suggesting that investments were the primary reason for issuing new equity capital. Splitting the sample into dividend and non-dividend payers, dividend payers raise more and have a higher ratio of investments to proceeds than an average/median non-dividend-paying firm. Dividend-paying firms also invest more than they raise with SEOs.

Panel C reports the markets where the SEOs are issued. It shows that around two-thirds of the sample firms are listed on the NASDAQ. Looking at sub-samples, I find that over half of the dividend-paying firms are listed on the New York Stock Exchange, whereas 77% of non-dividend paying corporations are listed on NASDAQ.

Panel D provides additional information on other SEO-firm-related ratios. The ratio of new shares to existing shares (NS/OS) is measured as new shares offered divided by existing shares. For an average company, the new shares issued comprise close to 22% of the outstanding shares before its offering. The proceeds-to-asset ratio (P/MV) is measured as the SEO proceeds divided by the market value of assets in the year -1. On average, the equity increases by 20% post SEOs. The mean (median) ratio of the book-to-market value of equity (BE/ME) in year -1, 0.43 (0.34), suggests that firms are possibly overvalued before an offering.

One of the main arguments of the paper is that paying out dividends would limit the amount of cash available for investment, thus forcing managers to be more selective with their investment choices. Share buybacks potentially could accomplish the same effect. In Table 2.4, I examine the relative magnitude of dividend payouts and share buybacks. Panel E shows that a median sample firm paid out more than three times as much in dividends relative to its total pre-SEO market (book) value of assets as it did in share buybacks. This strengthens the argument for dividend payouts being the primary source of cash disbursements. Another way to assess how important dividend disbursements are for companies is to look at the ratio of dividends to investments and to SEO proceeds. In panel A, the mean (median) firm pays out dividends equal to 22% (9%) of their year 0 investments. Alternatively, an average (median) firm pays out 23% (9%) of the SEO proceeds in dividends. Further analysis that accounts for share repurchases is provided in Section 2.4.4.

2.4 Empirical results

2.4.1 Pre- and post-issue operating performance and investment of SEO firms

Previous literature documented that the operating performance of SEO firms improves gradually before an SEO and deteriorates abruptly afterward (Loughran and Ritter, 1997; McLaughlin, Safieddine, and Vasudevan, 1996). I begin my analysis by replicating the operating performance surrounding SEO issues. Table 2.5 presents the operating-income-to-assets ratio (OPROA) of SEO firms for nine consecutive years from year −3 to +5. In addition to looking at the whole sample, I conduct the same analysis for two groups: "DIVIDEND" and "NODIVIDEND." The "DIVIDEND" group includes SEO firms that pay dividends from year 0 to year +2, while the "NODIVIDEND" group includes SEO firms that pay no dividends in the same period. In Table 2.5, 365 out of 1,411 SEO firms pay dividends consecutively and 467 firms pay no dividends in years 0, +1 and +2.[13] Consistent with the findings of the previous literature, the operating performance of a median firm improves before an SEO, peaks in year 0, and drops after an SEO, starting with year +1. The inverted U curve of operating performance holds for both "DIVIDEND" and "NODIVIDEND" groups. The test statistics show the "DIVIDEND" group outperforms the "NODIVIDEND" group after SEOs yearly. Figure 2.1 displays this downward trend in the post-issue operating performance of the whole sample and for each group separately.

[13]Some firms change their dividend policies "entirely" following SEOs. Eight firms pay dividends in year 0 while they pay no dividends in both years +1 and +2; 281 firms begin to pay dividends in years +1 and +2 after paying no dividends in year 0. These firms are excluded from the study because I require that dividend-paying and no-dividend-paying policies be consistent.

I further split the "DIVIDEND" group into two: top 50% and bottom 50% (based on D(0)/TA(−1)) to check if I can observe any significant differences in operating performance between those two groups. The decrease in free cash flows held by managers in the higher dividend paying sub-sample should in theory prevent them from wasting funds more in comparison to the bottom half of the dividend-paying sample. This is exactly what I observe. Dividend-paying firms in the top half exhibit better operating performance than the dividend-paying firms in the bottom half for the median firms (the numbers after year +1 are statistically significant). The operating performance of the firms both in the top and bottom dividend sub-samples significantly outperforms non-dividend firms.[14]

Generally, investment soars with SEOs, which supports the view that firms issue new shares to raise investment capital. Table 2.6 reports summary statistics of the raw investment of SEO firms for nine consecutive years from year −3 to +5. The numbers in Table 2.6 show an upward trend in the raw investment for both groups regardless of the SEO firms' dividend policy.[15]

Taken together, the results in Tables 2.5 and 2.6 indicate that while firms increased their investment expenditures with new SEO proceeds, the operating performance deteriorated, suggesting the potential for suboptimal investment, including overinvestment.

[14] I also check if difference in operating performance could be associated with being listed at different exchanges. I split DIVIDEND and NODIVIDEND samples into three groups each, based on stocks listed on American, New York, or NASDAQ exchange. Dividend paying stocks consistently outperform their non dividend paying counterparts while being listed on the same exchange. The table is available upon request.

[15] I also calculate the ratio of annual raw investment to total assets one year before, from year −2 to year +5, and the ratio of investment in year 0 to total assets in year −1 is the highest, regardless of the group.

2.4.2 Overinvestment and quintile analysis

To measure overinvestment, I calculate the abnormal investment ratio for each SEO firm. Following Fu (2010), the abnormal investment ratio is measured as the difference in the post-issue investment ratio between an SEO firm and its matched non-SEO firm. The post-issue investment ratio (I/A) is measured as the median investment from year 0 to year +2 divided by the book value of total assets in year -1.[16] Five-year post-issue period (from year 0 to year +4) and six-year post-issue period (from year 0 to year +5) are also used to capture longer-term post-issue investments. A matched non-SEO firm is selected based on the two-digit SIC industry code, the market-to-book ratio of assets, the interest coverage ratio, and the dividend policy. Following Fu (2010), the market-to-book ratio of assets is used for matching firms on investment opportunities, and the interest coverage ratio is used for matching firms on financial slack. I require control firms to have an interest coverage ratio greater than three and above the first quartile in its industry to exclude potentially financially constrained firms from the matching pool. The matched non-SEO firm needs to have the same dividend policy, either paying consecutive dividends or paying no dividend, as the SEO firm.[17]

Table 2.7 reports the abnormal investment statistics for the whole sample and the "DIVIDEND" and "NODIVIDEND" groups.[18] I utilize two investment ratios in this paper. The first one is investment scaled by the book value of total assets.

[16] I use the mean investment as an alternative when measuring the post-issue investment ratio. The results for the following empirical analysis are consistent with the main results in Sections 2.4.2 and 2.4.3. The tables are attached in the appendices.

[17] For each SEO firm, the final matched firm is the one with the closest match on the market-to-book ratio of assets from the matching pool of control firms.

[18] Due to the matching requirements for non-SEO control firms and for using the abnormal investment ratio, the benchmark-adjusted I/A, the numbers in the two groups drop from 365 (467) in Table 2.5 to 325 (442) in Table 2.7.

The second ratio is investment scaled by the market value of total assets. Panel A of Table 2.7 shows that SEO firms invest more than their control firms on average. The mean abnormal investment is 27.73% (27.79% and 26.40%), and the median abnormal investment is 4.75% (4.10% and 4.23%). I also check if there is a noticeable difference between pre- and post-SEO investment. I employ the investment growth ratio (ΔI/I), measured as the difference between the pre- and post-issue investment divided by the pre-issue investment. Panel A reports that compared to the control firm, a median SEO firm has 48.36% more investment growth.

Panel B reports the results of abnormal investment for the “DIVIDEND” and “NODIVIDEND” groups. The statistics in panel B indicate that both “DIVIDEND” and “NODIVIDEND” groups have positive abnormal investment after SEOs on average. The median abnormal investment is 3.60% (3.28% and 3.12%) for dividend-paying firms and 7.07% (5.59% and 6.27%) for non-dividend-paying firms. The median investment change (ΔI/I) for non-dividend-paying firms is 82.98%, which is much higher than that for dividend-paying firms, 15.50%. Panel B also shows that the difference in the post-issue abnormal investment between the two groups is significant. Consistent with the notion that dividend payouts diminish cash available for investments, panel B shows that the “NODIVIDEND” group has significantly higher abnormal investment and changes in investment than the “DIVIDEND” group after an SEO.

Panels C and D report the median abnormal investment in five quintiles based on the ranking of the abnormal investment ratio. Firms in the first (fifth) quintile have the lowest (highest) abnormal investment ratio. Looking at the results by abnormal investment quintiles in panel C, I can see that the median abnormal investment in the first two quintiles is negative, −16.38% and −1.07%, which means that some SEO firms invest less than their matched non-SEO firms, and some SEO firms invest considerably more than their matched non-SEO firms (quintiles four and five). Figure 2.2 illustrates the results of the abnormal investment by quintile. Interesting observations emerge. Non-dividend paying firms have higher abnormal investments than their dividend paying counterparts in quintiles four and five. On the other hand, non-dividend firms have a lower negative abnormal investment in the first two quintiles. Both results are significant statistically using the Wilcoxon test, shown in panel D. For completeness of analysis, in panel E, I look at the "DIVIDEND" group, splitting firms into the top 50% and bottom 50% based on the average of the dividends in years 0, +1, and +2. I observe a similar pattern: bottom 50% dividend-paying firms exhibit higher levels of abnormal investment than dividend-paying firms in the top 50% in quintiles three to five (while still having lower abnormal investment than non-dividend-paying firms). Overall, Table 2.7 suggests that after SEOs, non-dividend-paying firms overinvest more than dividend-paying firms.

To examine the relationship between the extent of overinvestment and the operating performance of SEO firms, I focus on the constituents of the operating ROA. The results for the five-quintile analysis of post-issue operating performance are reported in Table 2.8. Panel A shows the results for the whole sample and panels B and C show the results for the "DIVIDEND" group and the "NODIVIDEND" group, respectively. To measure the operating performance, I calculate the medians of post-issue OPROA in year +1 and the change in OPROA between pre-issue years (year −2 to year 0) and post-issue years (year +1 to year +3), respectively. To better gauge the negative impact of overinvestment, I measure both the medians of post-issue asset turnover and operating margin on sales in year +1 and the change in these two components between pre- and post-issue years. I used median values to calculate differences between pre- and post-issue years. The results for the whole SEO sample are consistent with Fu's (2010) findings that asset turnover deteriorates when overinvestment soars, which causes a decline in operating performance. The asset turnover in year +1 (Asset Turnover +1) drops in the fifth quintile. The median changes in OPROA (Δ Operating ROA) and asset turnover (Δ Asset Turnover) between pre- and post-issue years become more negative when the abnormal investment ratio gets higher. These numbers indicate that it is the overinvestment post SEOs that negatively affects the operating performance. Turning to subgroups, in panels B and C, I find that while asset turnover gets progressively worse in both the "DIVIDEND" and "NODIVIDEND" samples, it deteriorates more for non-dividend paying firms in the third, fourth, and fifth quintiles.

Table 2.9 provides results of a similar analysis, but with an alternative measure of post-issue operating performance, the median OPROA from year +3 to year +5. This is done to account for the fact that it might take longer to earn a return from the investment expenditure. The results for post-issue operating performance and asset turnover in Table 2.9 are consistent with the findings in Table 2.8. Figure 2.3 displays the downward trend of the median change in asset turnover. In quintiles three to five, the change in asset turnover of the "NODIVIDEND" group is negative and lower than that of the "DIVIDEND" group. The results above imply that overinvestment decreases operating performance by reducing asset turnover, and operating asset productivity deteriorates more in the "NODIVIDEND" group.

2.4.3 Regression analysis

Next, I examine the relationship between the dividend payouts, investments, and the operating performance of SEO firms in a multivariable setting. The dependent variable in the regressions is the post-issue median operating performance (Post-issue MOPROA), measured as the median of three-year post-issue OPROA. The regressions include a dummy variable controlling for the dividend payout, which is equal to one for the "NODIVIDEND" group and zero for the "DIVIDEND" group. I conjecture that the coefficient for the non-dividend dummy is negative. Other independent variables include pre-issue OPROA (LAG(OPROA)), firm size (LN(TA)), firm growth opportunities (TQ), and firm investment (I/A). Table 2.10 reports the correlations between variables. The correlation matrix does not find potential multi-collinearity for independent variables.

Table 2.11 reports the regression results of the post-issue operating performance.[19] The regressions utilize the abnormal investment ratio [I(0-2)/A(−1)], measured as the difference in the median of the investments in years 0, +1, and +2, divided by the book value of total assets in year −1, between SEO firms and their matched non-SEO control firms. The results show that the coefficients for the non-dividend dummy are significantly negative in both columns, supporting my conjecture that dividend policies relate to post-issue operating performance. The

[19] Though not shown in the tables, variance inflation factors (VIFs) are calculated for each independent variable in the regressions to detect the degree of multicollinearity. Observing lower than 10 VIF values, I find no significant multicollinearity issues.

results of the coefficients for the abnormal investment ratio [I(0-2)/A(−1)] and its square are consistent with the findings in Table 2.8 on the nonlinearity of the relationship between OPROA +1 and abnormal I/A. Besides, the coefficients for pre-issue OPROA (LAG(OPROA)) and firm size (LN(TA)) are positive and statistically significant. The coefficients for Tobin's Q are significantly negative, which is consistent with the view in Lee (1997b) that managers take advantage of investors' over-optimism. The statistically negative coefficients for the non-dividend dummy in the regressions in Table 2.11 support my hypothesis that contemporaneous dividend payouts have a positive impact on post-issue operating performance when overinvestment happens after an SEO.[20]

In Table 2.12, I use the post-issue asset turnover as the dependent variable to examine whether the productivity of operating assets deteriorates due to overinvestment. An investment opportunity dummy (D_TQ) is added, equal to one if Tobin's Q in year 0 is higher than its median and zero if Tobin's Q is lower than its median. I also include an interaction term: the product of the abnormal investment-to-asset ratio [I(0-2)/A(−1)] and the investment opportunity dummy (D_TQ). In columns (a) and (b), the coefficients for the abnormal investment-to-asset ratio are significantly negative, suggesting the possibility of subpar investments. Post-SEO asset turnover is worse for firms that do not have consistent dividend payouts. The non-dividend dummy coefficient is −0.173 (−0.171) and significant at 5%. Furthermore, I use the annual investment-to-asset ratio in panel

[20]To address the possibility of a selection bias on dividend payer status, Booth and Chang (2011) choose the percentage of dividend payers in a two-digit SIC industry in a year and the average of dividend-to-asset ratios in an industry as the instrumental variables in their self-selection models. I acknowledge the same issue for my non-dividend dummy and the challenge finding appropriate instrumental variables, considering my non-dividend dummy is determined by a firm's consecutive three-year data.

B and then separate the sample based on the abnormal investment. Not surprisingly, for the subsample of firms with negative abnormal investment (firms that invest less than their matched peers), neither the interaction term nor the non-dividend dummy is significant. On the other hand, in the overinvestment subsample, the investment opportunities interaction term and the non-dividend dummy are significant in column (f). The result indicates that firms with higher investment opportunities have more productive operating assets when they invest after an SEO. The negative effect of not paying dividends is more pronounced for the subset of firms that overinvest relative to their peers. The coefficient for the non-dividend paying dummy is -0.191 (-0.196) and significant at the five percent level. These results support my second hypothesis regarding the deterioration in asset productivity. The negative coefficients for the post-issue investment ratio and the non-dividend dummy in Table 2.12 indicate that overinvestment following SEOs leads to the deterioration in operating asset productivity, which can be worse when firms overinvest, have lower investment opportunities, and pay no dividends.

2.4.4 Further empirical analysis

Multiple SEOs issued by a firm

This section excludes all firms with more than one SEO in the sample period between 1982 and 2018. Tables 2.13 to 2.15 report the operating performance and abnormal investment statistics, and Tables 2.16 to 2.19 show the quintile analysis and regression results.[21] The abnormal investment and quintile analysis results are the same as above, especially when the abnormal investment reaches the highest

[21] These Tables correspond with Tables 2.5, 2.6, 2.7, 2.8, 2.9, 2.11, and 2.12.

level. Panel D of Table 2.15 shows that dividend-paying firms have lower abnormal investment ratios in each quintile, and Table 2.16 indicates that there are more negative asset turnover changes for non-dividend-paying firms than dividend payers when abnormal investment climbs high. For operating asset productivity, Table 2.19 reports the regression results like Table 2.12 indicating that non-dividend-paying firms experience more deterioration in their operating asset productivity than dividend-paying firms after SEOs, especially when abnormal investment is positive in columns (e) and (f) of panel B. The coefficients for the non-dividend-paying dummy are significantly negative at the five percent level. The results suggest that paying consistent dividends enhances the operating performance of firms that raise funds after a prolonged absence from equity markets.

Stock repurchases

Table 2.4 shows that some SEO firms also conduct share repurchases in year 0. The median ratio of share buyback to SEO proceeds for firms that pay dividends in the same year is small—a 2.66% versus 11.75% dividend payments to SEO proceeds ratio. Overall, dividends comprise 9.35% of SEO proceeds versus 2.32% for share repurchases. Booth and Chang (2011) control for stock repurchase when examining the effect of dividend payouts on SEO announcement-day return. Therefore, for robustness, I include another dummy variable (B_dummy) to control for buybacks. The dummy is equal to one if SEO firms repurchase stocks in year 0 and zero if they do not. Tables 2.20 and 2.21 show the regression results. In Table 2.21, the coefficients for the stock repurchase dummy are significantly positive, suggesting that regarded as an alternative type of payout, stock repurchases have a similar effect on the post-issue asset productivity of firms conducting SEOs to that of consistent dividend payouts. The rest of the results are consistent with Tables 2.11 and 2.12.

Change in the number of business segments

It is possible that the change in operating performance and asset productivity is associated with the changes in conglomerate firms' composition. Companies could divest or acquire segments around the time they have SEOs, thus affecting the operating performance and asset productivity. I checked if changes in the number of segments could be contributing to the documented findings. Ninety percent of the sample firms did not experience any changes in the number of segments from the SEO year to the next. Close to 2% of firms reduced the number of segments and about 8% increased. Eighty-five percent of the firms stayed the same from the year preceding SEOs to the year after SEOs. The detailed information is provided in Table 2.22. Given that the vast majority of the firms in my sample did not make any changes to the composition of the conglomerate, it is unlikely that documented deterioration in the operating performance and asset productivity is driven by the composition of the firms.

2.5 Conclusion

To investigate the connection between dividend payouts and investments of SEO firms, I analyze issuers' operating performance for potential overinvestment problems post SEOs. In general, the operating performance of SEO firms deteriorates substantially after offerings. Prior research argues that the poor post-issue operating performance is attributed to the overinvestment of new proceeds, accompanied by the deterioration in operating asset productivity (Fu, 2010). Addressing the free cash flow problem, the agency cost literature posits that paying dividends reduces cash held by managers to prevent or mitigate investments into subpar NPV projects. This paper adds to this literature by examining how dividend payouts relate to post-issue investment and operating performance. Based on the pattern of contemporaneous dividend payments after SEOs, this study splits the SEO sample into dividend-paying and non-dividend-paying groups. To inspect the post-issue investment, I measure overinvestment as the abnormal investment of SEO firms compared with the investment of matched non-SEO control firms. The results suggest that overinvestment generally happens after SEOs. Accordingly, the post-issue operating performance of SEO firms, measured as the operating income-to-asset ratio, decreases post SEOs over several years. Furthermore, the operating asset productivity of SEO firms, captured by asset turnover, deteriorates more for firms with higher positive abnormal investment after SEOs. The quintile analysis shows that non-dividend-paying firms overinvest more, leading to deterioration in post-issue asset turnover, affecting post-issue operating performance. The regression analysis shows that dividend payers have less deterioration in post-issue operating performance. The findings support my conjecture that dividend payments mitigate the overinvestment problem that hurts post-issue operating performance. I also investigate the effect of stock repurchases around SEOs. Interestingly, while there does not seem to be a significant relationship between stock repurchases and post SEO operation performance, stock repurchases do have a direct positive effect on asset turnover, similar to dividend payments. In conclusion, to supplement the research in equity offering and dividend fields, this study addresses the question of whether the operating performance of SEO firms benefits from dividend payouts.

This paper suggests that the impact of consistent dividend payouts on post SEO business operations is important.

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Table 2.1: This table reports the numbers and the percentages of seasoned equity offerings (SEOs) between 1982 and 2018.

Year	Number of SEOs	Percentage of sample
1982	3	0.17%
1983	121	6.71%
1984	15	0.83%
1985	48	2.66%
1986	55	3.05%
1987	42	2.33%
1988	12	0.67%
1989	38	2.11%
1990	17	0.94%
1991	68	3.77%
1992	57	3.16%
1993	73	4.05%
1994	46	2.55%
1995	87	4.82%
1996	109	6.04%
1997	80	4.43%
1998	54	2.99%
1999	52	2.88%
2000	53	2.94%
2001	40	2.22%
2002	45	2.49%
2003	46	2.55%
2004	45	2.49%
2005	33	1.83%
2006	30	1.66%
2007	39	2.16%
2008	26	1.44%
2009	82	4.55%
2010	29	1.61%
2011	23	1.27%
2012	38	2.11%
2013	44	2.44%
2014	42	2.33%
2015	44	2.44%
2016	35	1.94%
2017	66	3.66%
2018	67	3.71%
Total	1,804	100.00%

Table 2.2: This table lists the definition of variables used in this essay, including firm characteristics and deal characteristics.

Variable	Definition
Firm characteristics	
TA(A)	Total assets (Millions of dollars)
MV(V)	Market value of assets
ROA	Return on assets (Net income divided by book value of total assets)
ROE	Return on equity (Net income divided by market value of equity)
OPROA	Operating-income-to-assets ratio (Operating income before depreciation divided by average cash-adjusted assets)
MOPROA	Median operating-income-to-assets ratio in pre- or post-issue years
INV	Investment (CAPEX + Acquisitions + Increase in investment)
INV/TA	Investment divided by book value of total assets
INV/MV	Investment divided by market value of assets
BE/ME	Book value of equity divided by market value of equity
Tobin's Q (TQ)	Market value of assets divided by book value of total assets (V/A)
BB	Share buyback (Purchase of common and preferred stock)
I(0-2)/A(−1)	The median of the investments in years 0, +1, and +2, divided by the book value of total assets in year −1
[I(0-2)/A(−1)]	Abnormal investment calculated as the difference in the I(0-2)/A(−1) ratio between SEO firms and their matched non-SEO control firms
LAG(OPROA)	The ratio of OPROA in year −1
Deal characteristics	
NS	New shares outstanding
OS	Existing shares outstanding
PROCEED	SEO proceeds (The product of new shares offered and offer price)
INV/PROCEED	Investment divided by SEO proceeds
PROCEED/TA	SEO proceeds divided by total assets

Table 2.3: This table provides descriptive statistics of SEO sample firms. Panel A reports the statistics for firm characteristics in the filing year (year 0) and the year before the filing year (year −1) respectively. Panel B reports the statistics for deal characteristics in year 0. Panel C reports the exchange distribution of SEOs. Panel D reports the statistics of SEO related ratios. NS/OS is the ratio of new shares to existing shares outstanding. P is the SEO proceeds acquired from the SDC database. A and MV are the book value and market value of assets. BE and ME are the book value and market value of equity. All data are winsorized at the 2.5 and 97.5 percentiles prior to calculations. The number 0 (−1) in the parentheses represents the filing year (the pre-issue year).

Panel A: Firm Characteristics

	Year −1			Year 0		
Firm characteristic	Mean	Median	Number	Mean	Median	Number
OPROA (%)	−28.89	13.01	1,796	−21.13	13.78	1,796
ROA (%)	−5.50	2.94	1,801	−4.24	3.39	1,803
ROE (%)	−2.55	2.39	1,801	−2.35	2.57	1,801
Total assets	775.05	125.75	1,804	946.72	192.46	1,803
Investments	93.01	10.54	1,644	140.20	19.24	1,660
Investments/TA (%)	13.22	8.07	1,644	15.26	9.42	1,660
Investments/MV (%)	7.06	4.11	1,644	8.47	5.01	1,660
Tobin's Q	2.66	1.88	1,804	2.38	1.79	1,801

Panel B: Deal Characteristics (Year 0)

	Deal characteristic	Mean	Median	Number
Full sample	Proceeds (Million dollars)	93.12	46.60	1,804
	Investments/Proceeds (%)	113.44	49.66	1,660
Dividend in Year 0	Proceeds (Million dollars)	140.56	59.00	534
	Investments/Proceeds (%)	198.54	114.67	473
No Dividend in Year 0	Proceeds (Million dollars)	73.14	42.00	1,270
	Investments/Proceeds (%)	80.50	34.57	1,187

Table 2.3 (continued)

Panel C: Deal Exchange

	Deal exchange	Number	Percentage
Full sample	American	103	5.71%
	Nasdaq	1,177	65.24%
	New York	524	29.05%
	Total	1,804	100.00%
Dividend in Year 0	American	44	8.24%
	Nasdaq	195	36.52%
	New York	295	55.24%
	Total	534	100.00%
No Dividend in Year 0	American	59	4.65%
	Nasdaq	982	77.32%
	New York	229	18.03%
	Total	1,270	100.00%

Panel D: SEO Related Ratios

Variable	Mean	Median	Q_1	Q_3	Number
NS/OS	0.22	0.18	0.11	0.28	1,708
P(0)/MV(−1)	0.20	0.15	0.08	0.27	1,804
P(0)/A(−1)	0.56	0.32	0.13	0.73	1,804
V(−1)/A(−1)	2.66	1.88	1.28	3.15	1,804
BE(−1)/ME(−1)	0.43	0.34	0.18	0.59	1,804

TABLE 2.4: This table reports statistics for SEO firms that paid out dividends and had share buybacks in the filing year (year 0). Panel A includes firms that paid dividends in year 0 regardless of share buybacks. Panel B consists of firms that bought back shares in year 0 regardless of dividend payouts. Firms in panel C paid dividends but did not buy back shares in year 0. Panel D has firms that bought back shares but did not pay dividends in year 0. Panel E reports firms that both paid dividends and had share repurchases in year 0. D is total dividends. V is market value of assets. A is book value of assets. PROC is SEO proceeds. I is investment. BB is total share buybacks. All data are winsorized at the 2.5 and 97.5 percentiles prior to calculations. The number 0 (−1) in the parentheses represents the filing year (the pre-issue year). The statistics are displayed as percentages.

Panel A: Statistics for Dividends

Variable	Mean	Median	Q_1	Q_3	Number
D(0)/V(−1)	1.46	0.91	0.40	1.86	534
D(0)/A(−1)	2.48	1.50	0.67	2.81	534
D(0)/PROC	23.23	9.35	3.41	29.44	534
D(0)/I(0)	22.07	9.20	3.41	23.41	473

Panel B: Statistics for Share Buybacks

Variable	Mean	Median	Q_1	Q_3	Number
BB(0)/V(−1)	1.48	0.29	0.06	1.43	404
BB(0)/A(−1)	3.19	0.55	0.11	2.67	404
BB(0)/PROC	14.81	2.32	0.63	12.04	404
BB(0)/I(0)	36.67	4.25	0.68	19.93	367

Panel C: Statistics for Dividends (Dividends only, no buybacks)

Variable	Mean	Median	Q_1	Q_3	Number
D(0)/V(−1)	1.50	0.89	0.40	1.86	317
D(0)/A(−1)	2.49	1.38	0.62	2.64	317
D(0)/PROC	20.56	8.63	3.49	25.61	317
D(0)/I(0)	21.07	9.24	3.21	22.75	283

Panel D: Statistics for Share Buybacks (Buybacks only, no dividends)

Variable	Mean	Median	Q_1	Q_3	Number
BB(0)/V(−1)	1.39	0.29	0.05	1.60	243
BB(0)/A(−1)	3.42	0.61	0.11	3.21	243
BB(0)/PROC	9.45	1.87	0.46	9.79	243
BB(0)/I(0)	45.72	5.78	0.88	26.02	227

Table 2.4 (continued)

Panel E: Statistics for Both Dividends and Share Buybacks

Variable	Mean	Median	Q_1	Q_3	Number
D(0)/V(−1)	1.46	0.96	0.42	1.90	217
D(0)/A(−1)	2.49	1.74	0.74	3.16	217
D(0)/PROC	26.86	11.75	3.36	32.12	217
D(0)/I(0)	25.96	9.08	3.46	24.04	190
BB(0)/V(−1)	1.61	0.31	0.07	1.36	161
BB(0)/A(−1)	2.73	0.45	0.10	2.15	161
BB(0)/PROC	29.85	2.66	0.96	21.40	161
BB(0)/I(0)	23.03	3.17	0.51	11.43	140

TABLE 2.5: This table reports the statistics for the operating performance of SEO firms from year −3 to year +5. The operating-income-to-assets ratio (OPROA) is calculated as operating income before depreciation divided by the average of the beginning and ending period cash-adjusted assets (total assets minus cash and marketable securities). The "DIVIDEND" group includes firms that pay dividends in years 0, +1, and +2, while the "NODIVIDEND" group includes firms that pay no dividend in the same time period. The "DIVIDEND" group is divided into the "Top 50%" and "Bottom 50%" sub-groups based on D(0)/TA(−1), the ratio of dividends in year 0 to total assets in year −1. The statistics are displayed as percentages. ***, **, and * indicate significance level at 1%, 5%, and 10%, respectively.

					Mean of OPROA					
Mean	N	−3	−2	−1	0	+1	+2	+3	+4	+5
ALL	1,411	−23.41	−31.25	−31.70	−10.08	−6.82	−3.05	2.39	3.64	6.49
DIVIDEND	365	0.22	0.18	1.27	5.24	7.72	9.97	10.60	13.41	12.92
Top 50%		−0.80	−2.29	−1.25	2.57	8.18	11.83	11.75	15.22	15.90
Bottom 50%		3.82	5.45	6.96	9.07	7.29	8.27	9.54	11.72	10.13
Difference		−4.61	−7.74	−8.22	−6.50	0.88	3.56	2.22	3.50**	5.77*
Top − NO		41.48**	58.79**	64.49*	17.71**	24.15***	26.54***	17.21***	19.29***	14.54***
Bottom − NO		46.10***	66.54**	72.71**	24.21***	23.26***	22.98***	14.99***	15.79**	8.76*
NODIVIDEND	467	−42.28	−61.09	−65.74	−15.14	−15.97	−14.71	−5.45	−4.06	1.36
T-test		42.50***	61.27**	67.01*	20.37***	23.70***	24.69***	16.06***	17.48**	11.56***
					Median of OPROA					
Median	N	−3	−2	−1	0	+1	+2	+3	+4	+5
ALL	1,411	13.16	12.93	14.53	15.36	13.43	12.45	12.67	12.71	12.88
DIVIDEND	365	15.42	15.09	15.22	15.27	14.28	14.07	13.95	13.70	13.93
Top 50%		17.72	17.08	16.63	16.01	15.44	15.72	14.61	14.99	14.38
Bottom 50%		13.17	13.42	13.53	13.90	13.56	12.02	13.40	12.47	13.02
Wilcoxon		3.13***	2.95***	1.98**	−0.89	1.53	3.00***	2.25**	2.37**	3.16***
Top − NO		4.39***	3.78***	1.64	0.03	2.69***	4.54***	3.46***	3.52***	3.52***
Bottom − NO		1.99**	1.95*	0.43	−0.50	1.59	2.09**	1.53	1.38	1.23
NODIVIDEND	467	12.22	11.60	14.14	15.93	11.88	10.97	11.41	11.26	11.54
Wilcoxon stat		3.94***	3.51***	1.12	−0.35	2.68***	4.15***	3.10***	3.03***	2.92***

TABLE 2.6: This table reports the statistics for the raw investment of SEO firms from year −3 to year +5. The "DIV" group includes SEO firms that pay dividends in years 0, +1, and +2, while the "NODIV" group includes SEO firms that pay no dividend in the same time period. ***, **, and * indicate significance level at 1%, 5%, and 10%, respectively.

Mean of Raw Investment										
Mean	N	INVEST −3	INVEST −2	INVEST −1	INVEST 0	INVEST +1	INVEST +2	INVEST +3	INVEST +4	INVEST +5
ALL	1,411	94.82	100.53	105.74	142.40	138.83	159.66	163.77	195.21	215.01
DIV	365	209.67	241.26	295.89	354.48	299.55	346.83	311.21	374.28	390.50
NODIV	467	43.02	43.15	36.48	69.31	75.89	83.13	84.10	95.26	117.39
T-test		166.60***	197.10***	259.40***	285.20***	223.70***	263.70***	227.10***	279.00***	273.10***
Median of Raw Investment										
Median	N	INVEST −3	INVEST −2	INVEST −1	INVEST 0	INVEST +1	INVEST +2	INVEST +3	INVEST +4	INVEST +5
ALL	1,411	7.18	6.80	9.82	19.58	23.49	24.64	22.69	26.63	27.69
DIV	365	20.81	26.84	39.79	59.72	57.54	59.16	58.45	58.82	73.93
NODIV	467	3.33	3.26	5.42	13.64	14.91	15.81	14.63	16.31	18.33
Wilcoxon		9.99***	11.26***	11.41***	10.54***	8.74***	7.85***	7.61***	7.21***	7.28***

Table 2.7: This table reports the statistics of the post-issue abnormal investment of SEO firms. Abnormal investment, the benchmark-adjusted I/A, is calculated as the difference in the I/A ratio between SEO firms and their matched non-SEO control firms. I/A represents the ratio of the median of the investments in years 0, +1, and +2 (years 0, +1, +2, +3, +4, and +5) to the book value of total assets in year −1. I/V represents the ratio of the median of the investments in years 0, +1, and +2 (years 0, +1, +2, +3, +4, and +5) to the market value of total assets in year −1. ΔI/I is the ratio of the investment change, calculated as the difference between the three-year pre-issue mean investment and the five-year post-issue mean investment divided by the three-year pre-issue mean investment. Panel A reports the statistics of the abnormal investment of the matched SEO sample. Panel B reports the statistics of the abnormal investment of the dividend-paying firms and non-dividend-paying firms respectively. Panel C reports the median abnormal investment in five quintiles based on the ranking of the abnormal investment. Panel D reports the comparison of the abnormal investment between dividend-paying firms and non-dividend-paying firms. Panel E reports the comparison of the abnormal investment between the top 50% and bottom 50% of dividend-paying firms. The dividend-paying firms are divided into the "Top 50%" and "Bottom 50%" sub-groups based on the average of the dividends in year 0, +1, and +2 respectively. The statistics are displayed as percentages.

Panel A: Abnormal Investment

Variable	Number	Mean	Median
[I(0-2)/A(−1)]	767	27.73	4.75
[I(0-2)/V(−1)]	767	8.68	2.21
[I(0-4)/A(−1)]	769	27.79	4.10
[I(0-4)/V(−1)]	769	7.95	2.12
[I(0-5)/A(−1)]	769	26.40	4.23
[I(0-5)/V(−1)]	769	7.36	2.03
[ΔI/I]	692	668.78	48.36

Panel B: Abnormal Investment (DIVIDEND vs. NODIVIDEND)

	Dividend			No dividend				
Variable	Mean	Median	N	Mean	Median	N	Difference	Wilcoxon
[I(0-2)/A(−1)]	13.59	3.60	325	38.13	7.07	442	24.53***	−2.37**
[I(0-2)/V(−1)]	4.21	2.08	325	11.96	2.42	442	7.75***	−1.48
[I(0-4)/A(−1)]	13.01	3.28	327	38.73	5.59	442	25.72***	−2.36**
[I(0-4)/V(−1)]	3.64	1.92	327	11.15	2.48	442	7.51***	−1.93*
[I(0-5)/A(−1)]	12.41	3.12	327	36.75	6.27	442	24.34***	−2.61***
[I(0-5)/V(−1)]	3.25	1.66	327	10.40	2.40	442	7.15***	−1.97**
[ΔI/I]	−17.08	15.50	268	1,102.30	82.98	424	1,119.38	−3.37***

Table 2.7 (continued)

Panel C: Abnormal Investment by Quintile

Abnormal Investment	Median	Number
Quintile 1	−16.38	153
Quintile 2	−1.07	154
Quintile 3	4.75	153
Quintile 4	17.31	154
Quintile 5	68.77	153

Panel D: Abnormal Investment by Quintile (DIVIDEND vs. NODIVIDEND)

	Dividend		No dividend		
Abnormal Investment	Median	N	Median	N	Wilcoxon
Quintile 1	−12.65	65	−19.05	88	2.83***
Quintile 2	−0.99	65	−1.23	89	1.18
Quintile 3	3.60	65	7.07	88	−5.57***
Quintile 4	11.75	65	23.04	89	−8.66***
Quintile 5	33.51	65	109.08	88	−8.22***

Panel E: Abnormal Investment by Quintile (Dividend: Top 50% vs. Bottom 50%)

	Top 50%		Bottom 50%		
Abnormal Investment	Median	N	Median	N	Wilcoxon
Quintile 1	−10.68	31	−16.77	33	0.62
Quintile 2	−1.73	32	−0.04	33	−3.31***
Quintile 3	2.85	32	4.29	34	−4.28***
Quintile 4	10.74	32	13.27	33	−2.28**
Quintile 5	25.11	31	39.53	33	−3.12***

TABLE 2.8: This table reports the post-issue operating performance and the change surrounding SEOs. The operating-income-to-assets ratio (OPROA) is calculated as operating income before depreciation divided by the average of the beginning and ending period cash-adjusted assets (total assets minus cash and marketable securities). Asset turnover is measured as net sales divided by average cash-adjusted assets, and operating margin on sales is measured as operating income before depreciation divided by net sales. As for the change, for each firm, the medians of variables in the pre-issue years (year −2 to year 0) and in the post-issue years (year +1 to year +3) are computed respectively, and then the difference between pre- and post-issue are computed. Quintile partitions are based on the abnormal investment, calculated as the benchmark-adjusted ratio of the three-year (years 0, +1, and +2) median of the investment to the book value of assets in year −1. The reported numbers are the medians. ***, **, and * indicate significance level at 1%, 5%, and 10%, respectively.

Investment Quintiles (By abnormal I/A)	OPROA +1	Asset Turnover +1	Operating Margin on Sales +1	Δ Operating ROA	Δ Asset Turnover	Δ Operating Margin on Sales	N
Panel A: ALL							
1 (low) <= −5.01%	0.086	1.115	0.076	−0.009	−0.044*	−0.007	153
2 [−4.91%, 1.50%]	0.118	1.365	0.100	0.002	0.031	0.004	154
3 [1.60%, 9.48%]	0.149	1.380	0.116	−0.009*	−0.095***	0.001	153
4 [9.54%, 28.81%]	0.155	1.249	0.122	−0.027***	−0.162***	−0.003	154
5 (high) >= 29.65%	0.136	1.096	0.121	−0.032*	−0.326***	0.004	153
Panel B: DIVIDEND (Pay consecutive dividends in years 0, +1, and +2)							
1 (low) <= −4.04%	0.112	0.998	0.117	−0.008	0.017	−0.001	65
2 [−3.73%, 1.39%]	0.126	1.014	0.117	−0.003	0.006	0.0003	65
3 [1.50%, 6.82%]	0.152	1.324	0.115	−0.012**	−0.095***	−0.0001	65
4 [6.85%, 19.93%]	0.164	1.129	0.159	−0.006	−0.089***	0.002	65
5 (high) >= 20.20%	0.145	1.067	0.126	−0.034***	−0.211***	−0.009*	65
Panel C: NODIVIDEND (Pay no dividend in years 0, +1, and +2)							
1 (low) <= −6.66%	0.064	1.276	0.036	−0.003	−0.113**	−0.016	88
2 [−6.55%, 1.60%]	0.105	1.478	0.072	0.004	0.042	0.004	89
3 [1.72%, 12.76%]	0.128	1.400	0.092	−0.007	−0.153***	0.0001	88
4 [12.91%, 44.16%]	0.156	1.301	0.120	−0.037**	−0.236***	−0.002	89
5 (high) >= 44.45%	0.144	1.096	0.139	−0.025	−0.499***	0.009	88

TABLE 2.9: This table reports the post-issue operating performance and the change surrounding SEOs. The operating-income-to-assets ratio (OPROA) is calculated as operating income before depreciation divided by the average of the beginning and ending period cash-adjusted assets (total assets minus cash and marketable securities). Asset turnover is measured as net sales divided by average cash-adjusted assets, and operating margin on sales is measured as operating income before depreciation divided by net sales. As for the change, for each firm, the medians of variables in the pre-issue years (year −3 to year −1) and in the post-issue years (year +3 to year +5) are computed respectively, and then the difference between pre- and post-issue are computed. Quintile partitions are based on the abnormal investment, calculated as the benchmark-adjusted ratio of the three-year (years 0, +1, and +2) median of the investment to the book value of assets in year −1. The reported numbers are the medians. ***, **, and * indicate significance level at 1%, 5%, and 10%, respectively.

Investment Quintiles (By abnormal I/A)	OPROA +1	Asset Turnover +1	Operating Margin on Sales +1	Δ Operating ROA	Δ Asset Turnover	Δ Operating Margin on Sales	N
Panel A: ALL (Year +3 to Year +5 for Post-issue Operating Performance)							
1 (low) <= −5.01%	0.086	1.115	0.076	−0.020	0.001	−0.009	153
2 [−4.91%, 1.50%]	0.118	1.365	0.100	−0.009	−0.064	−0.001	154
3 [1.60%, 9.48%]	0.149	1.380	0.116	−0.019**	−0.183***	0.0004	153
4 [9.54%, 28.81%]	0.155	1.249	0.122	−0.033***	−0.160***	−0.004	154
5 (high) >= 29.65%	0.136	1.096	0.121	−0.061*	−0.358***	0.018*	153
Panel B: DIVIDEND (Year +3 to Year +5 for Post-issue Operating Performance)							
1 (low) <= −4.04%	0.112	0.998	0.117	−0.013	0.003	−0.003	65
2 [−3.73%, 1.39%]	0.126	1.014	0.117	−0.013	−0.098	−0.001	65
3 [1.50%, 6.82%]	0.152	1.324	0.115	−0.022***	−0.195***	0.002	65
4 [6.85%, 19.93%]	0.164	1.129	0.159	−0.018	−0.103***	0.009	65
5 (high) >= 20.20%	0.145	1.067	0.126	−0.054***	−0.206***	−0.015	65
Panel C: NODIVIDEND (Year +3 to Year +5 for Post-issue Operating Performance)							
1 (low) <= −6.66%	0.064	1.276	0.036	−0.020	−0.006	−0.020	88
2 [−6.55%, 1.60%]	0.105	1.478	0.072	−0.006	0.011	0.0001	89
3 [1.72%, 12.76%]	0.128	1.400	0.092	−0.015	−0.223***	−0.002	88
4 [12.91%, 44.16%]	0.156	1.301	0.120	−0.061**	−0.201***	−0.006	89
5 (high) >= 44.45%	0.144	1.096	0.139	−0.062	−0.477***	0.031**	88

Table 2.10: This table reports the correlations between key variables used in this paper. In each row, the upper number reports the Pearson correlation coefficients. PMOPROA is the median of post-issue three-year OPROA. ΔMOPROA is the difference between the median of three-year post-issue OPROA and the median of three-year pre-issue OPROA. I/A is the ratio of the three-year (years 0, +1, and +2) median of investment to the assets in year −1. INV/PROC is the ratio of the investment to the SEO proceeds in year 0. TQ is Tobin's Q. LAG(OPROA) is the OPROA in year −1. TA is the book value of total assets in year 0.

	PMOPROA	ΔMOPROA	OPROA +1	I/A	INV/PROC	TQ	LAG(OPROA)	TA
PMOPROA	1	-0.13^{***}	0.91^{***}	0.03	0.09^{**}	-0.20^{***}	0.27^{***}	0.07^{*}
		0.0004	< 0.0001	0.3821	0.0127	< 0.0001	< 0.0001	0.0558
ΔMOPROA		1	-0.09^{**}	0.02	0.01	0.11^{***}	-0.99^{***}	-0.02
			0.0112	0.6652	0.8415	0.0022	< 0.0001	0.5789
OPROA +1			1	0.04	0.09^{**}	-0.17^{***}	0.21^{***}	0.06^{*}
				0.2922	0.0148	< 0.0001	< 0.0001	0.0932
I/A				1	0.06	0.08^{**}	-0.03	-0.06
					0.1337	0.0351	0.3501	0.1019
INV/PROC					1	-0.13^{***}	0.05	0.33^{***}
						0.0004	0.2108	< 0.0001
TQ						1	-0.13^{***}	-0.14^{***}
							0.0003	0.0001
LAG(OPROA)							1	0.03
								0.4172
TA								1

Table 2.11: This table presents the results of the regression analysis. The dependent variable is the median of three-year post-issue OPROA (Post-issue MOPROA). The variable [I(0-2)/A(−1)] is the post-issue abnormal investment ratio, measured as the difference in the median of the investments in years 0, +1, and +2, divided by the book value of total assets in year −1, between SEO firms and their matched control firms. The variable LAG(OPROA) is the OPROA in year −1. The dividend dummy (D_Dummy) is equal to one if a firm pays no dividend in years 0, +1, and +2, and is equal to zero if a firm pays consecutive dividends in the same period. ***, **, and * indicate significance level at 1%, 5%, and 10%, respectively.

	Dependent Variable: Post-Issue MOPROA (+1 to +3)	
	(a)	(b)
[I(0-2)/A(−1)]	0.081***	0.213***
	(2.87)	(3.75)
[I(0-2)/A(−1)]-Square		−0.017***
		(−2.67)
TQ	−0.048***	−0.051***
	(−2.99)	(−3.18)
LAG(OPROA)	0.027***	0.028***
	(5.90)	(6.01)
LN(TA)	0.074***	0.073***
	(3.77)	(3.71)
D_Dummy	−0.111*	−0.118*
	(−1.65)	(−1.77)
INTERCEPT	−0.346	−0.351
	(−0.73)	(−0.75)
Industry FE	Yes	Yes
F Value	13.73***	13.40***
R-Square	0.210	0.218
Number	739	739

TABLE 2.12: This table presents the results of the regression analysis. The dependent variable is the median of three-year post-issue asset turnover. In panel A, the variable [I(0-2)/A(−1)] is the post-issue abnormal investment ratio, measured as the difference in the median of the investments in years 0, +1, and +2, divided by the book value of total assets in year −1, between SEO firms and their matched control firms. The dividend dummy (D_Dummy) is equal to one if a firm pays no dividend in years 0, +1, and +2, and is equal to zero if a firm pays consecutive dividends in the same period. The investment opportunity dummy (D_TQ) is equal to one if a firm's Tobin's Q is higher than the median and is equal to zero if it is less than the median. In panel B, the variable I(0-2)/A(−1) is the post-issue investment ratio, measured as the median of the investments in years 0, +1, and +2, divided by the book value of total assets in year −1. The sample is separated into two groups based on the post-issue abnormal investment. The "Negative abnormal investment" group includes the firms that have negative abnormal investment, and the "Overinvestment" group includes the firms that have positive abnormal investment. ***, **, and * indicate significance level at 1%, 5%, and 10%, respectively.

Panel A: Post-issue Asset Turnover

	Dependent Variable: Post-Issue Asset Turnover (+1 to +3)	
	(a)	(b)
[I(0-2)/A(−1)]	−0.147**	−0.181**
	(−2.36)	(−2.36)
[I/A]-Square		0.006
		(0.75)
[I/A]*D_TQ	0.087	0.074
	(1.22)	(1.01)
TQ	−0.001	0.0004
	(−0.06)	(0.02)
LN(TA)	−0.102***	−0.102***
	(−4.58)	(−4.54)
D_Dummy	−0.173**	−0.171**
	(−2.28)	(−2.24)
INTERCEPT	3.346***	3.346***
	(6.21)	(6.21)
Industry FE	Yes	Yes
F Value	13.29***	12.44***
R-Square	0.203	0.204
Number	746	746

TABLE 2.12 (CONTINUED)

Panel B: Post-issue Asset Turnover

	Dependent Variable: Post-Issue Asset Turnover (+1 to +3)					
	All		Negative abnormal investment		Overinvestment	
	(a)	(b)	(c)	(d)	(e)	(f)
I(0-2)/A(−1)	−0.093***	−0.180***	−0.924	−0.252	−0.090***	−0.178***
	(−2.93)	(−2.92)	(−1.37)	(−0.26)	(−3.03)	(−3.23)
I/A*D_TQ		0.114		−1.109		0.116*
		(1.64)		(−1.00)		(1.89)
TQ	0.002	−0.005	0.059	0.081	−0.014	−0.023
	(0.09)	(−0.28)	(1.32)	(1.62)	(−0.78)	(−1.22)
LN(TA)	−0.105***	−0.107***	−0.071*	−0.071*	−0.121***	−0.123***
	(−4.83)	(−4.90)	(−1.75)	(−1.75)	(−4.78)	(−4.87)
D_Dummy	−0.155**	−0.159**	−0.132	−0.127	−0.191**	−0.196**
	(−2.09)	(−2.14)	(−0.87)	(−0.84)	(−2.36)	(−2.43)
INTERCEPT	3.342***	3.369***	1.662***	1.596***	3.494***	3.529***
	(6.27)	(6.32)	(2.96)	(2.82)	(7.23)	(7.32)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
F Value	14.79***	13.96***	4.92***	4.62***	14.32***	13.57***
R-Square	0.203	0.206	0.186	0.189	0.262	0.268
Number	767	767	271	271	496	496

TABLE 2.13: This table reports the statistics for the operating performance of SEO firms from year −3 to year +5. The operating-income-to-assets ratio (OPROA) is calculated as operating income before depreciation divided by the average of the beginning and ending period cash-adjusted assets (total assets minus cash and marketable securities). The "DIVIDEND" group includes firms that pay dividends in years 0, +1, and +2, while the "NODIVIDEND" group includes firms that pay no dividend in the same time period. The "DIVIDEND" group is divided into the "Top 50%" and "Bottom 50%" sub-groups based on D(0)/TA(−1), the ratio of dividends in year 0 to total assets in year −1. The statistics are displayed as percentages. ***, **, and * indicate significance level at 1%, 5%, and 10%, respectively.

				Mean of OPROA						
Mean	N	−3	−2	−1	0	+1	+2	+3	+4	+5
ALL	1,077	−25.11	−34.76	−35.70	−8.09	−2.28	−0.95	5.33	6.71	8.29
DIVIDEND	277	0.13	1.15	3.10	7.66	9.31	12.38	12.62	14.14	14.74
Top 50%		−3.74	−3.72	−0.49	6.19	11.72	14.91	13.56	15.31	15.88
Bottom 50%		3.78	7.68	7.92	9.15	7.01	10.03	11.72	13.01	13.58
Difference		−7.52	−11.39	−8.41	−2.96	4.71	4.88**	1.84	2.30	2.30*
Top – NO		42.29**	66.52*	74.21	18.53**	22.10***	27.51***	14.65***	12.84***	12.65***
Bottom – NO		49.81***	77.92**	82.61*	21.50**	17.38**	22.63***	12.80***	10.55***	10.35**
NODIVIDEND	360	−46.03	−70.24	−74.70	−12.34	−10.38	−12.59	−1.09	2.47	3.23
T-test		46.16**	71.39**	77.79	20.01**	19.68***	24.97***	13.70***	11.68***	11.51***

				Median of OPROA						
Median	N	−3	−2	−1	0	+1	+2	+3	+4	+5
ALL	1,077	13.74	13.99	16.07	16.48	13.96	12.75	12.98	13.05	13.36
DIVIDEND	277	16.11	15.88	16.36	15.76	14.78	14.64	14.04	14.55	14.06
Top 50%		18.08	17.95	17.55	16.82	15.80	16.06	14.74	15.49	14.72
Bottom 50%		13.29	13.98	13.72	15.31	14.03	11.83	12.56	12.71	13.02
Wilcoxon		2.59***	2.62***	1.81*	−0.82	1.54	2.93***	2.31**	1.78*	−2.51**
Top – NO		3.59***	3.14***	0.76	−0.01	2.73***	4.63***	3.23***	2.82***	2.91***
Bottom – NO		1.80*	1.59	−0.39	−0.59	1.46	2.09**	1.15	1.02	1.18
NODIVIDEND	360	12.01	12.02	16.21	16.80	12.14	10.83	11.70	11.90	12.19
Wilcoxon stat		3.36***	2.89***	0.16	−0.37	2.63***	4.22***	2.72***	2.38**	2.55**

Table 2.14: This table reports the statistics for the raw investment of SEO firms from year −3 to year +5. The "DIV" group includes SEO firms that pay dividends in years 0, +1, and +2, while the "NODIV" group includes SEO firms that pay no dividend in the same time period. ***, **, and * indicate significance level at 1%, 5%, and 10%, respectively.

Mean of Raw Investment										
Mean	N	INVEST −3	INVEST −2	INVEST −1	INVEST 0	INVEST +1	INVEST +2	INVEST +3	INVEST +4	INVEST +5
ALL	1,077	63.27	67.14	81.41	108.78	111.00	112.78	112.67	130.79	146.26
DIV	277	127.18	147.67	225.93	279.95	247.62	241.00	225.20	261.34	271.18
NODIV	360	27.63	30.71	30.53	60.90	65.92	63.58	63.00	70.60	99.30
T-test		99.50***	117.00***	195.40***	219.10***	181.70***	177.40***	162.20***	190.70***	171.90***
Median of Raw Investment										
Median	N	INVEST −3	INVEST −2	INVEST −1	INVEST 0	INVEST +1	INVEST +2	INVEST +3	INVEST +4	INVEST +5
ALL	1,077	5.16	4.95	8.04	16.35	19.14	20.02	19.82	22.30	22.13
DIV	277	17.49	21.25	33.32	49.66	47.50	44.16	48.16	43.12	56.33
NODIV	360	2.33	2.85	4.88	11.68	14.07	14.59	13.71	14.02	16.97
Wilcoxon		9.25***	10.04***	10.10***	9.05***	7.04***	6.45***	6.21***	5.95***	6.36***

Table 2.15: This table reports statistics of the post-issue abnormal investment of SEO firms. Abnormal investment, the benchmark-adjusted I/A, is calculated as the difference in the I/A ratio between SEO firms and their matched non-SEO control firms. I/A represents the ratio of the median of the investments in years 0, +1, and +2 (years 0, +1, +2, +3, +4, and +5) to the book value of total assets in year −1. I/V represents the ratio of the median of the investments in years 0, +1, and +2 (years 0, +1, +2, +3, +4, and +5) to the market value of total assets in year −1. ΔI/I is the ratio of the investment change, calculated as the difference between the three-year pre-issue mean investment and the five-year post-issue mean investment divided by the three-year pre-issue mean investment. Panel A reports the statistics of the abnormal investment of the matched SEO sample. Panel B reports the statistics of the abnormal investment of the dividend-paying firms and non-dividend-paying firms respectively. Panel C reports the median abnormal investment in five quintiles based on the ranking of the abnormal investment. Panel D reports the comparison of the abnormal investment between dividend-paying firms and non-dividend-paying firms. Panel E reports the comparison of the abnormal investment between the top 50% and bottom 50% of dividend-paying firms. The dividend-paying firms are divided into the "Top 50%" and "Bottom 50%" sub-groups based on the average of the dividends in year 0, +1, and +2 respectively. The statistics are displayed as percentages.

Panel A: Abnormal Investment

Variable	Number	Mean	Median
[I(0-2)/A(−1)]	587	31.41	4.90
[I(0-2)/V(−1)]	587	9.05	2.23
[I(0-4)/A(−1)]	589	30.69	4.17
[I(0-4)/V(−1)]	589	7.44	2.12
[I(0-5)/A(−1)]	589	28.47	4.48
[I(0-5)/V(−1)]	589	6.43	2.10
[ΔI/I]	525	1,068.94	48.28

Panel B: Abnormal Investment (DIVIDEND vs. NODIVIDEND)

	Dividend			No dividend				
Variable	Mean	Median	N	Mean	Median	N	Difference	Wilcoxon
[I(0-2)/A(−1)]	15.90	3.55	245	42.52	8.14	342	26.61**	−2.06**
[I(0-2)/V(−1)]	4.37	2.16	245	12.40	2.53	342	8.03***	−0.89
[I(0-4)/A(−1)]	13.64	3.64	247	43.00	6.38	342	29.36**	−1.86*
[I(0-4)/V(−1)]	2.47	2.12	247	11.02	2.17	342	8.56***	−1.15
[I(0-5)/A(−1)]	12.41	3.39	247	40.07	6.90	342	27.66**	−2.30**
[I(0-5)/V(−1)]	1.68	1.74	247	9.87	2.37	342	8.19***	−1.38
[ΔI/I]	−86.96	2.37	200	1,780.26	101.79	325	1,867.22	−4.29***

Table 2.15 (continued)

Panel C: Abnormal Investment by Quintile

Abnormal Investment	Median	Number
Quintile 1	−17.34	117
Quintile 2	−0.93	118
Quintile 3	4.90	117
Quintile 4	17.39	118
Quintile 5	75.44	117

Panel D: Abnormal Investment by Quintile (DIVIDEND vs. NODIVIDEND)

	Dividend		No dividend		
Abnormal Investment	Median	N	Median	N	Wilcoxon
Quintile 1	−12.65	49	−20.20	68	3.36***
Quintile 2	−0.31	49	−1.66	69	2.35**
Quintile 3	3.55	49	8.15	68	−5.89***
Quintile 4	12.65	49	23.69	69	−7.57***
Quintile 5	33.51	49	117.76	68	−7.33***

Panel E: Abnormal Investment by Quintile (Dividend: Top 50% vs. Bottom 50%)

	Top 50%		Bottom 50%		
Abnormal Investment	Median	N	Median	N	Wilcoxon
Quintile 1	−9.81	24	−16.41	24	−1.35
Quintile 2	−0.32	24	−1.06	25	0.61
Quintile 3	3.10	25	4.14	25	2.37**
Quintile 4	13.39	24	11.60	25	0.29
Quintile 5	27.17	24	35.05	25	−1.61

Table 2.16: This table reports the post-issue operating performance and the change surrounding SEOs. The operating-income-to-assets ratio (OPROA) is calculated as operating income before depreciation divided by the average of the beginning and ending period cash-adjusted assets (total assets minus cash and marketable securities). Asset turnover is measured as net sales divided by average cash-adjusted assets, and operating margin on sales is measured as operating income before depreciation divided by net sales. As for the change, for each firm, the medians of variables in the pre-issue years (year −2 to year 0) and in the post-issue years (year +1 to year +3) are computed respectively, and then the difference between pre- and post-issue are computed. Quintile partitions are based on the abnormal investment, calculated as the benchmark-adjusted ratio of the three-year (years 0, +1, and +2) median of the investment to the book value of assets in year −1. The reported numbers are the medians. ***, **, and * indicate significance level at 1%, 5%, and 10%, respectively.

Investment Quintiles (By abnormal I/A)	OPROA +1	Asset Turnover +1	Operating Margin on Sales +1	Δ Operating ROA	Δ Asset Turnover	Δ Operating Margin on Sales	N
Panel A: ALL							
1 (low) <= −5.85%	0.089	1.298	0.080	−0.016	−0.155***	−0.012	117
2 [−5.82%, 1.77%]	0.118	1.326	0.098	−0.001	−0.043	0.004	118
3 [1.78%, 9.97%]	0.160	1.380	0.125	−0.018***	−0.142***	−0.004	117
4 [10.03%, 31.38%]	0.152	1.281	0.119	−0.032***	−0.174***	−0.004	118
5 (high) >= 31.60%	0.117	1.148	0.120	−0.037	−0.343***	−0.004	117
Panel B: DIVIDEND (Pay consecutive dividends in years 0, +1, and +2)							
1 (low) <= −4.04%	0.112	0.998	0.123	−0.008	−0.004	−0.001	49
2 [−3.61%, 1.72%]	0.149	1.064	0.120	−0.014	−0.094**	0.004	49
3 [1.77%, 6.85%]	0.172	1.472	0.115	−0.015**	−0.086***	−0.001	49
4 [6.95%, 19.93%]	0.170	1.242	0.134	−0.022*	−0.102**	0.001	49
5 (high) >= 20.20%	0.135	1.079	0.121	−0.053***	−0.247***	−0.020***	49
Panel C: NODIVIDEND (Pay no dividend in years 0, +1, and +2)							
1 (low) <= −7.12%	0.075	1.451	0.045	−0.037	−0.241***	−0.016	68
2 [−7.11%, 1.90%]	0.094	1.402	0.052	−0.011	−0.043	0.000 02	69
3 [2.09%, 13.27%]	0.138	1.382	0.111	−0.033**	−0.230***	−0.004	68
4 [13.37%, 48.05%]	0.158	1.301	0.121	−0.037*	−0.212***	−0.001	69
5 (high) >= 49.18%	0.115	1.112	0.105	−0.025	−0.566***	0.009	68

Table 2.17: This table reports the post-issue operating performance and the change surrounding SEOs. The operating-income-to-assets ratio (OPROA) is calculated as operating income before depreciation divided by the average of the beginning and ending period cash-adjusted assets (total assets minus cash and marketable securities). Asset turnover is measured as net sales divided by average cash-adjusted assets, and operating margin on sales is measured as operating income before depreciation divided by net sales. As for the change, for each firm, the medians of variables in the pre-issue years (year −3 to year −1) and in the post-issue years (year +3 to year +5) are computed respectively, and then the difference between pre- and post-issue are computed. Quintile partitions are based on the abnormal investment, calculated as the benchmark-adjusted ratio of the three-year (years 0, +1, and +2) median of the investment to the book value of assets in year −1. The reported numbers are the medians. ***, **, and * indicate significance level at 1%, 5%, and 10%, respectively.

Investment Quintiles (By abnormal I/A)	OPROA +1	Asset Turnover +1	Operating Margin on Sales +1	Δ Operating ROA	Δ Asset Turnover	Δ Operating Margin on Sales	N
Panel A: ALL (Year +3 to Year +5 for Post-issue Operating Performance)							
1 (low) <= −5.85%	0.089	1.298	0.080	−0.029	−0.014	−0.012	117
2 [−5.82%, 1.77%]	0.118	1.326	0.098	−0.004	−0.111**	0.008	118
3 [1.78%, 9.97%]	0.160	1.380	0.125	−0.025***	−0.287***	−0.007	117
4 [10.03%, 31.38%]	0.152	1.281	0.119	−0.057***	−0.177***	−0.011	118
5 (high) >= 31.60%	0.117	1.148	0.120	−0.062	−0.417***	0.019	117
Panel B: DIVIDEND (Year +3 to Year +5 for Post-issue Operating Performance)							
1 (low) <= −4.04%	0.112	0.998	0.123	−0.012	0.059	−0.008	49
2 [−3.61%, 1.72%]	0.149	1.064	0.120	−0.022	−0.216***	0.006	49
3 [1.77%, 6.85%]	0.172	1.472	0.115	−0.021**	−0.200***	0.0004	49
4 [6.95%, 19.93%]	0.170	1.242	0.134	−0.022**	−0.169**	−0.003	49
5 (high) >= 20.20%	0.135	1.079	0.121	−0.072***	−0.232***	−0.016	49
Panel C: NODIVIDEND (Year +3 to Year +5 for Post-issue Operating Performance)							
1 (low) <= −7.12%	0.075	1.451	0.045	−0.024	−0.013	−0.011	68
2 [−7.11%, 1.90%]	0.094	1.402	0.052	−0.001	−0.091	0.0001	69
3 [2.09%, 13.27%]	0.138	1.382	0.111	−0.081**	−0.346***	−0.021*	68
4 [13.37%, 48.05%]	0.158	1.301	0.121	−0.061	−0.187***	−0.008	69
5 (high) >= 49.18%	0.115	1.112	0.105	−0.044	−0.553***	0.027	68

Table 2.18: This table presents the results of the regression analysis. The dependent variable is the median of three-year post-issue OPROA (Post-issue MOPROA). The variable [I(0-2)/A(−1)] is the post-issue abnormal investment ratio, measured as the difference in the median of the investments in years 0, +1, and +2, divided by the book value of total assets in year −1, between SEO firms and their matched control firms. The variable LAG(OPROA) is the OPROA in year −1. The dividend dummy (D_Dummy) is equal to one if a firm pays no dividend in years 0, +1, and +2, and is equal to zero if a firm pays consecutive dividends in the same period. ***, **, and * indicate significance level at 1%, 5%, and 10%, respectively.

	Dependent Variable: Post-Issue MOPROA (+1 to +3)	
	(a)	(b)
[I(0-2)/A(−1)]	0.069**	0.187***
	(2.57)	(3.40)
[I(0-2)/A(−1)]-Square		−0.015**
		(−2.46)
TQ	−0.050***	−0.052***
	(−2.75)	(−2.88)
LAG(OPROA)	0.022***	0.023***
	(5.21)	(5.33)
LN(TA)	0.073***	0.071***
	(3.31)	(3.25)
D_Dummy	−0.113	−0.119
	(−1.55)	(−1.64)
INTERCEPT	−0.334	−0.338
	(−0.75)	(−0.76)
Industry FE	Yes	Yes
F Value	10.05***	9.85***
R-Square	0.193	0.201
Number	562	562

Table 2.19: This table presents the results of the regression analysis. The dependent variable is the median of three-year post-issue asset turnover. In panel A, the variable [I(0-2)/A(−1)] is the post-issue abnormal investment ratio, measured as the difference in the median of the investments in years 0, +1, and +2, divided by the book value of total assets in year −1, between SEO firms and their matched control firms. The dividend dummy (D_Dummy) is equal to one if a firm pays no dividend in years 0, +1, and +2, and is equal to zero if a firm pays consecutive dividends in the same period. The investment opportunity dummy (D_TQ) is equal to one if a firm's Tobin's Q is higher than the median and is equal to zero if it is less than the median. In panel B, the variable I(0-2)/A(−1) is the post-issue investment ratio, measured as the median of the investments in years 0, +1, and +2, divided by the book value of total assets in year −1. The sample is separated into two groups based on the post-issue abnormal investment. The "Negative abnormal investment" group includes the firms that have negative abnormal investment, and the "Overinvestment" group includes the firms that have positive abnormal investment. ***, **, and * indicate significance level at 1%, 5%, and 10%, respectively.

Panel A: Post-issue Asset Turnover

	Dependent Variable: Post-Issue Asset Turnover (+1 to +3)	
	(a)	(b)
[I(0-2)/A(−1)]	−0.145**	−0.187**
	(−2.45)	(−2.55)
[I/A]-Square		0.007
		(0.97)
[I/A]*D_TQ	0.103	0.085
	(1.51)	(1.20)
TQ	0.002	0.004
	(0.11)	(0.20)
LN(TA)	−0.108***	−0.107***
	(−4.23)	(−4.18)
D_Dummy	−0.205**	−0.203**
	(−2.45)	(−2.42)
INTERCEPT	3.400***	3.398***
	(6.59)	(6.59)
Industry FE	Yes	Yes
F Value	13.91***	12.98***
R-Square	0.246	0.247
Number	569	569

TABLE 2.19 (CONTINUED)

Panel B: Post-issue Asset Turnover

	Dependent Variable: Post-Issue Asset Turnover (+1 to +3)					
	All		Negative abnormal investment		Overinvestment	
	(a)	(b)	(c)	(d)	(e)	(f)
I(0-2)/A(−1)	−0.080***	−0.161***	−0.538	0.076	−0.067**	−0.156***
	(−2.59)	(−2.76)	(−1.36)	(0.13)	(−2.26)	(−2.86)
I/A*D_TQ		0.108		−1.120		0.119*
		(1.64)		(−1.53)		(1.94)
TQ	0.007	−0.002	0.044	0.073	−0.004	−0.016
	(0.32)	(−0.09)	(0.95)	(1.46)	(−0.17)	(−0.70)
LN(TA)	−0.107***	−0.109***	−0.102**	−0.093**	−0.100***	−0.102***
	(−4.32)	(−4.39)	(−2.18)	(−1.99)	(−3.42)	(−3.50)
D_Dummy	−0.184**	−0.187**	−0.137	−0.120	−0.225**	−0.228**
	(−2.25)	(−2.29)	(−0.84)	(−0.73)	(−2.45)	(−2.49)
INTERCEPT	3.369***	3.400***	1.912***	1.593***	3.387***	3.427***
	(6.59)	(6.66)	(3.53)	(2.75)	(6.98)	(7.08)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
F Value	15.39***	14.45***	5.10***	4.90***	12.69***	12.09***
R-Square	0.244	0.248	0.226	0.235	0.293	0.300
Number	585	585	204	204	381	381

Table 2.20: This table presents the results of the regression analysis. The dependent variable is the median of three-year post-issue OPROA (Post-issue MOPROA). The variable [I(0-2)/A(−1)] is the post-issue abnormal investment ratio, measured as the difference in the median of the investments in years 0, +1, and +2, divided by the book value of total assets in year −1, between SEO firms and their matched control firms. The variable LAG(OPROA) is the OPROA in year −1. The dividend dummy (D_Dummy) is equal to one if a firm pays no dividend in years 0, +1, and +2, and is equal to zero if a firm pays consecutive dividends in the same period. The stock repurchase dummy (B_Dummy) is equal to one if a firm repurchases stocks in year 0, and is equal to zero if a firm has no stock repurchase in year 0. ***, **, and * indicate significance level at 1%, 5%, and 10%, respectively.

	Dependent Variable: Post-Issue MOPROA (+1 to +3)	
	(a)	(b)
[I(0-2)/A(−1)]	0.082***	0.216***
	(2.88)	(3.80)
[I(0-2)/A(−1)]-Square		−0.017***
		(−2.72)
TQ	−0.049***	−0.052***
	(−2.99)	(−3.19)
LAG(OPROA)	0.027***	0.028***
	(5.87)	(5.98)
LN(TA)	0.073***	0.071***
	(3.70)	(3.63)
D_Dummy	−0.113*	−0.120*
	(−1.68)	(−1.80)
B_Dummy	0.052	0.060
	(0.87)	(1.03)
INTERCEPT	−0.354	−0.361
	(−0.75)	(−0.77)
Industry FE	Yes	Yes
F Value	12.86***	12.63***
R-Square	0.211	0.219
Number	739	739

Table 2.21: This table presents the results of the regression analysis. The dependent variable is the median of three-year post-issue asset turnover. The variable [I(0-2)/A(−1)] is the post-issue abnormal investment ratio, measured as the difference in the median of the investments in years 0, +1, and +2, divided by the book value of total assets in year −1, between SEO firms and their matched control firms. The dividend dummy (D_Dummy) is equal to one if a firm pays no dividend in years 0, +1, and +2, and is equal to zero if a firm pays consecutive dividends in the same period. The stock repurchase dummy (B_Dummy) is equal to one if a firm repurchases stocks in year 0, and zero if a firm has no stock repurchase in year 0. The investment opportunity dummy (D_TQ) is equal to one if a firm's Tobin's Q is higher than the median, and zero if it is less than the median. ***, **, and * indicate significance level at 1%, 5%, and 10%, respectively.

	Dependent Variable: Post-Issue Asset Turnover (+1 to +3)	
	(a)	(b)
[I(0-2)/A(−1)]	-0.139^{**}	-0.170^{**}
	(−2.23)	(−2.21)
[I(0-2)/A(−1)]-Square		0.005
		(0.68)
[I(0-2)/A(−1)]*D_TQ	0.079	0.067
	(1.10)	(0.91)
TQ	−0.001	0.0003
	(−0.06)	(0.02)
LN(TA)	-0.105^{***}	-0.105^{***}
	(−4.70)	(−4.67)
D_Dummy	-0.178^{**}	-0.176^{**}
	(−2.34)	(−2.31)
B_Dummy	0.129^{*}	0.127^{*}
	(1.92)	(1.89)
INTERCEPT	3.324^{***}	3.323^{***}
	(6.18)	(6.18)
Industry FE	Yes	Yes
F Value	12.70^{***}	11.93^{***}
R-Square	0.207	0.207
Number	746	746

Table 2.22: This table reports the change in the number of business segments of SEO firms after SEOs. The segment information from the Compustat database is used. The available data years include 1989-2001, 2012 and 2013. The segment number change from year −1 to year +1 and the segment number change from year 0 to year +1 are calculated respectively. The frequency and the percentage are reported.

From Year −1 to Year +1			From Year 0 to Year +1		
Change	Frequency	Percent	Change	Frequency	Percent
−3	1	0.15	−3	1	0.14
−2	3	0.46	−2	2	0.28
−1	16	2.47	−1	13	1.82
0	553	85.34	0	643	89.93
1	48	7.41	1	36	5.03
2	16	2.47	2	14	1.96
3	7	1.08	3	5	0.70
4	3	0.46	4	1	0.14
5	0	0.00	5	0	0.00
6	1	0.15	6	0	0.00

FIGURE 2.1: This figure displays the median of operating-income-to-assets ratio (OPROA) of SEO firms from three years before SEOs (year −3) to five years after SEOs (year +5).

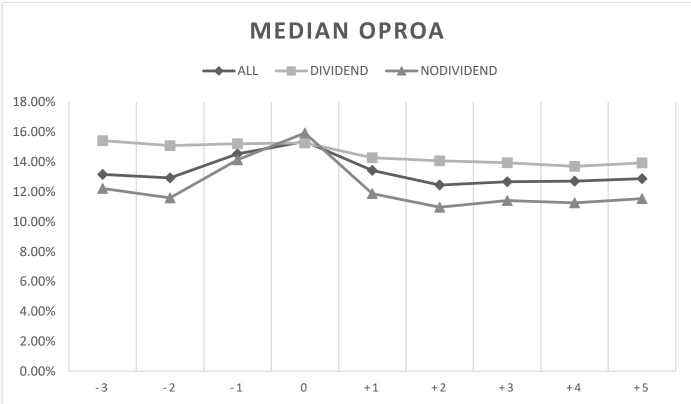


Figure 2.2: This figure displays the median of the abnormal investment in five quintiles based on the level of the abnormal investment in Table 2.7. The numbers are displayed as percentages.

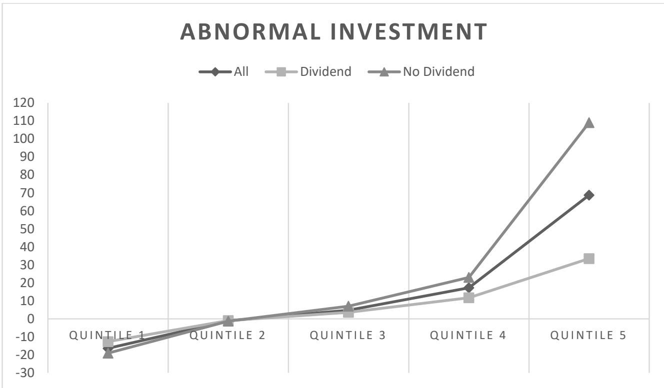
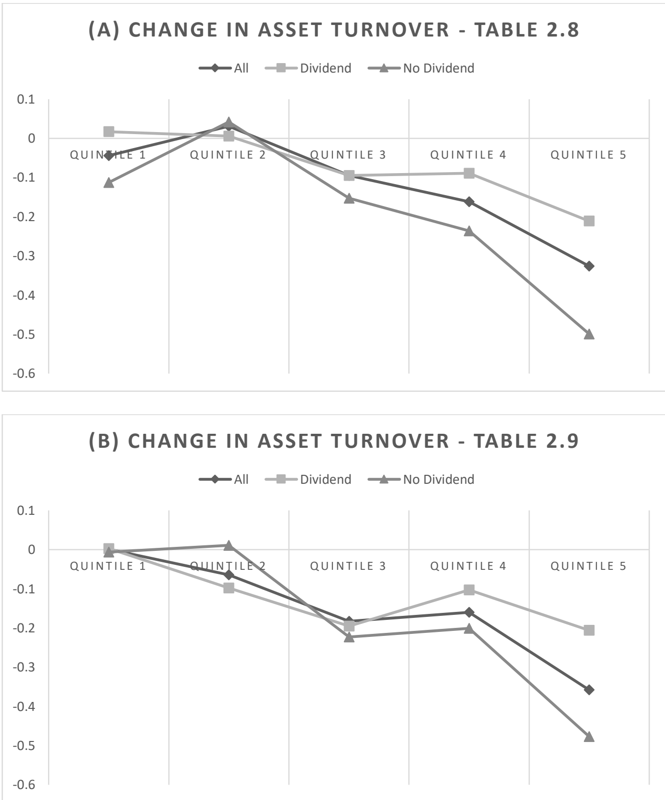


FIGURE 2.3: The figure displays the median change in asset turnover in quintile analysis. Part (A) shows the results for the change in asset turnover between pre- and post-issue years in Table 2.8. Part (B) shows the results in Table 2.9.



Appendix

2.A Supplementary results

For robustness checks, I utilize the three-year (years 0, +1, and +2) mean of the investment to the book value of assets in year −1 to calculate abnormal investment in the following three tables for comparison with Tables 2.8, 2.11, and 2.12, respectively.

TABLE 2.A1: This table reports the post-issue operating performance and the change surrounding SEOs. The operating-income-to-assets ratio (OPROA) is calculated as operating income before depreciation divided by the average of the beginning and ending period cash-adjusted assets (total assets minus cash and marketable securities). Asset turnover is measured as net sales divided by average cash-adjusted assets, and operating margin on sales is measured as operating income before depreciation divided by net sales. As for the change, for each firm, the medians of variables in the pre-issue years (year −2 to year 0) and in the post-issue years (year +1 to year +3) are computed respectively, and then the difference between pre- and post-issue are computed. Quintile partitions are based on the abnormal investment, calculated as the benchmark-adjusted ratio of the three-year (years 0, +1, and +2) mean of the investment to the book value of assets in year −1. The reported numbers are the medians. ***, **, and * indicate significance level at 1%, 5%, and 10%, respectively.

Investment Quintiles (By abnormal I/A)	OPROA +1	Asset Turnover +1	Operating Margin on Sales +1	Δ Operating ROA	Δ Asset Turnover	Δ Operating Margin on Sales	N
Panel A: ALL							
1 (low) <= −6.02%	0.092	1.182	0.067	−0.003	−0.042*	−0.001	153
2 [−5.88%, 2.36%]	0.123	1.320	0.096	0.003	0.032	0.004	154
3 [2.50%, 12.57%]	0.148	1.351	0.115	−0.015***	−0.095***	−0.004	153
4 [12.77%, 33.80%]	0.149	1.254	0.126	−0.028***	−0.191***	−0.004	154
5 (high) >= 34.13%	0.155	1.025	0.140	−0.037*	−0.354***	0.005	153
Panel B: DIVIDEND (Pay consecutive dividends in years 0, +1, and +2)							
1 (low) <= −4.55%	0.112	1.051	0.101	−0.003	0.018	0.007	65
2 [−4.45%, 2.27%]	0.135	1.053	0.109	−0.002	0.004	0.0003	65
3 [2.28%, 8.00%]	0.158	1.330	0.127	−0.022***	−0.086***	−0.008**	65
4 [8.58%, 23.99%]	0.163	1.216	0.162	−0.004	−0.088**	0.003	65
5 (high) >= 24.47%	0.135	0.918	0.131	−0.056***	−0.247***	−0.010	65
Panel C: NODIVIDEND (Pay no dividend in years 0, +1, and +2)							
1 (low) <= −8.50%	0.063	1.286	0.036	−0.002	−0.113**	−0.009	88
2 [−8.07%, 2.86%]	0.105	1.402	0.072	0.004	0.033	0.004	89
3 [3.08%, 15.40%]	0.143	1.429	0.096	−0.017	−0.160***	−0.001	88
4 [15.51%, 49.61%]	0.149	1.219	0.121	−0.040**	−0.285***	−0.006	89
5 (high) >= 49.70%	0.145	1.115	0.141	−0.013	−0.500***	0.010	88

Table 2.A2: This table presents the results of the regression analysis. The dependent variable is the median of three-year post-issue OPROA (Post-issue MOPROA). The variable [I(0-2)/A(−1)] is the post-issue abnormal investment ratio, measured as the difference in the mean of the investments in years 0, +1, and +2, divided by the book value of total assets in year −1, between SEO firms and their matched control firms. The variable LAG(OPROA) is the OPROA in year −1. The dividend dummy (D_Dummy) is equal to one if a firm pays no dividend in years 0, +1, and +2, and is equal to zero if a firm pays consecutive dividends in the same period. ***, **, and * indicate significance level at 1%, 5%, and 10%, respectively.

	Dependent Variable: Post-Issue MOPROA (+1 to +3)	
	(a)	(b)
[I(0-2)/A(−1)]	0.068***	0.194***
	(2.62)	(3.71)
[I(0-2)/A(−1)]-Square		−0.014***
		(−2.77)
TQ	−0.048***	−0.051***
	(−2.95)	(−3.14)
LAG(OPROA)	0.027***	0.026***
	(5.78)	(5.66)
LN(TA)	0.074***	0.072***
	(3.77)	(3.69)
D_Dummy	−0.107	−0.114*
	(−1.60)	(−1.70)
INTERCEPT	−0.344	−0.339
	(−0.73)	(−0.72)
Industry FE	Yes	Yes
F Value	13.61***	13.33***
R-Square	0.208	0.217
Number	739	739

Table 2.A3: This table presents the results of the regression analysis. The dependent variable is the median of three-year post-issue asset turnover. In panel A, the variable [I(0-2)/A(−1)] is the post-issue abnormal investment ratio, measured as the difference in the mean of the investments in years 0, +1, and +2, divided by the book value of total assets in year −1, between SEO firms and their matched control firms. The dividend dummy (D_Dummy) is equal to one if a firm pays no dividend in years 0, +1, and +2, and is equal to zero if a firm pays consecutive dividends in the same period. The investment opportunity dummy (D_TQ) is equal to one if a firm's Tobin's Q is higher than the median and is equal to zero if it is less than the median. In panel B, the variable I(0-2)/A(−1) is the post-issue investment ratio, measured as the mean of the investments in years 0, +1, and +2, divided by the book value of total assets in year −1. The sample is separated into two groups based on the post-issue abnormal investment. The "Negative abnormal investment" group includes the firms that have negative abnormal investment, and the "Overinvestment" group includes the firms that have positive abnormal investment. ***, **, and * indicate significance level at 1%, 5%, and 10%, respectively.

Panel A: Post-issue Asset Turnover

	Dependent Variable: Post-Issue Asset Turnover (+1 to +3)	
	(a)	(b)
[I(0-2)/A(−1)]	−0.118**	−0.208***
	(−2.41)	(−2.70)
[I/A]-Square		0.009
		(1.51)
[I/A]*D_TQ	0.053	0.069
	(0.87)	(1.13)
TQ	−0.001	0.0003
	(−0.03)	(0.02)
LN(TA)	−0.102***	−0.101***
	(−4.56)	(−4.51)
D_Dummy	−0.174**	−0.171**
	(−2.29)	(−2.25)
INTERCEPT	3.337***	3.337***
	(6.20)	(6.20)
Industry FE	Yes	Yes
F Value	13.38***	12.66***
R-Square	0.204	0.206
Number	746	746

TABLE 2.A3 (CONTINUED)

Panel B: Post-issue Asset Turnover

	Dependent Variable: Post-Issue Asset Turnover (+1 to +3)					
	All		Negative abnormal investment		Overinvestment	
	(a)	(b)	(c)	(d)	(e)	(f)
I(0-2)/A(−1)	−0.097***	−0.145***	−0.605	−0.708	−0.098***	−0.132***
	(−3.29)	(−3.00)	(−1.48)	(−1.06)	(−3.50)	(−2.96)
I/A*D_TQ		0.073		0.145		0.053
		(1.25)		(0.19)		(0.98)
TQ	0.002	−0.004	−0.007	−0.009	0.015	0.008
	(0.11)	(−0.19)	(−0.21)	(−0.25)	(0.67)	(0.35)
LN(TA)	−0.105***	−0.106***	−0.090**	−0.089**	−0.116***	−0.116***
	(−4.82)	(−4.86)	(−2.07)	(−2.04)	(−4.72)	(−4.73)
D_Dummy	−0.153**	−0.158**	−0.145	−0.148	−0.184**	−0.187**
	(−2.06)	(−2.12)	(−0.95)	(−0.97)	(−2.23)	(−2.25)
INTERCEPT	3.335***	3.354***	1.956***	1.949***	3.406***	3.422***
	(6.26)	(6.30)	(3.63)	(3.60)	(6.91)	(6.94)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
F Value	15.00***	14.05***	5.30***	4.84***	12.75***	11.91***
R-Square	0.206	0.207	0.192	0.192	0.251	0.252
Number	767	767	258	258	509	509

Chapter 3

The Curious Case of One-Dollar CEO Salaries: Evidence from Market Reaction to Salary Decision Announcements

3.1 Introduction

Over the last several decades, executive compensation has been an often discussed subject in academic research on corporate governance. When it comes to the principal-agent problem between managers and shareholders, executive compensation packages, including compensation components, remuneration levels, and performance targets, have been questioned as incentive mechanisms to alleviate the conflict. With the facts about the escalation in executive compensation and the shift in the dominant type of compensation, prior research in this field has examined the magnitude and structure of remuneration paid to managers and provided diverse insights and inconclusive results.[1]

In recent years, an annual salary of only $1, a rare case of executive compensation, has been adopted by several CEOs of well-known corporations—Citigroup, Eli Lilly, Facebook, Hewlett Packard, Papa John's, and Twitter, to name a few. Beyond a literal dollar coin, the $1 salary involves a shift in CEO compensation components, which transfers a CEO's remuneration from mixed to equity-based compensation only. As a result, this specific payment echoes the question of whether equity-based compensation is an effective incentive mechanism that encourages managers to accomplish the goal of firm value maximization (Berger, Ofek, and Yermack, 1997; Demsetz and Villalonga, 2001; Frye, 2004; Goergen and Renneboog, 2011; Himmelberg, Hubbard, and Palia, 1999; Jensen and Murphy, 1990; Kim and Lu, 2011; McConnell and Servaes, 1990; Morck, Shleifer, and Vishny, 1988). Some studies support the positive relationship between equity incentives and firm performance (Carpenter and Sanders, 2002; McConnell and Servaes, 1990; Morck, Shleifer, and Vishny, 1988), while others doubt the simple relationship and find no or mixed evidence (Bhagat and Black, 1999; Demsetz and Villalonga, 2001; Himmelberg, Hubbard, and Palia, 1999; Sanders and Hambrick, 2007).[2] Despite a relatively small number of public firms adopting a $1 CEO salary, this extreme case of pay-per-performance compensation provides a unique opportunity to contribute to the above debate.

A few studies recently explored the motivations behind and consequences of the

[1] In addition to the effectiveness in corporate governance, another debate on executive compensation is about whether CEOs acquire excessive compensation (Frydman and Jenter, 2010; Frydman and Saks, 2010; Gabaix and Landier, 2008; Sauerwald, Lin, and Peng, 2016; Wade, O'Reilly III, and Pollock, 2006).

[2] Bhagat and Black (1999) question the effectiveness of incentive pay due to internal governance issues such as the intimate relationship between managers and boards of directors or remuneration committees. Carpenter and Sanders (2002) support the positive relationship between CEO long-term pay and subsequent firm performance. Sanders and Hambrick (2007) argue that CEO stock options bring about extreme corporate performance, including significant gains and losses.

$1 CEO salary decision from different perspectives (Hamm, Jung, and Wang, 2015; Loureiro, Makhija, and Zhang, 2020).[3] Sorting $1 salary decisions into two categories according to reasons and analyzing firm and CEO characteristics, Hamm, Jung, and Wang (2015) explore the factors deciding the $1 compensation scheme and argue that a $1 salary can be a performance signal or a sacrifice gesture depending on its reason category. On the other hand, Loureiro, Makhija, and Zhang (2020) examine the consequences of adopting a $1 CEO salary for long-term stock return performance and CEO total compensation. Following the adoption of a $1 salary, CEO total compensation can either increase or decrease depending on firm/CEO characteristics, and long-run firm performance can also vary.[4] Unlike the research looking at long-run firm performance mentioned above, I propose investigating the market reaction to specific $1 salary decision announcements. Yermack (1997) argues that the disclosure timing relates to the motives of CEOs who specifically announce their compensation plans. I also research the extent to which CEO compensation changes and the motives behind the practical approaches to reduce/re-allocate CEO salaries. Therefore, this study fills the gap in the recent studies on $1 CEO compensation and contributes to the literature on executive compensation by teasing out the market view of the transition of CEO compensation components in the announcements.[5] I built a sample of 63 CEOs who initiated a move to $1 base salaries between 1997 and 2020, for which the exact announcement date is

[3]Loureiro, Makhija, and Zhang (2014) test two competing hypotheses—incentive alignment and managerial power hypotheses—by examining long-term stock returns and operating performance and argue that a $1 salary is just a ruse for CEOs to pursue personal interests, not a mechanism to align their interests with those of shareholders. Loureiro, Makhija, and Zhang (2020) focus on the consequences of total CEO pay and stock performance with more advanced measures for categorization.

[4]The study argues that the impact of adopting a $1 CEO salary on total CEO pay and long-run stock performance can be affected by different firm or CEO characteristics. It assures that the virtually eliminated salary in this extreme CEO compensation scheme does not imply that total CEO pay necessarily decreases.

[5]$1 salary decisions result in a unique type of equity-based compensation package. Hamm, Jung, and Wang (2015) also argue that $1 CEO salary firms are distinct from other firms that shift CEO compensation toward variable pay.

available.[6]

The motivation of $1 salary decisions is of interest. The announcement of a $1 CEO salary could send an optimistic signal of future promising growth opportunities in a firm. On the other hand, a $1 CEO salary announcement could happen when a firm encounters a downturn or crisis. Facing a predicament, CEOs could make the salary decision to show their sacrifice. Typically, the reasons for those decisions are explicitly expressed in company announcements or listed in a company's financial statements. Following Hamm, Jung, and Wang (2015), I utilize two main reasons—*Alignment* and *Downturn*—for $1 salary decisions in this study. The *Alignment* category includes the cases where a firm claims in its proxy statement that "the CEO's $1 salary is part of a new compensation arrangement that aims to better align the CEO's interests with those of shareholders." The *Downturn* category consists of the cases where a firm experienced a downturn or crisis—poor recent performance, government investigation, or the terrorist attacks of September 11, 2001. Twenty-nine firms/CEOs in my sample fall into the *Alignment* category, while twenty-three fall into the *Downturn* category.[7]

In addition to the reasons for adopting a $1 salary, this study emphasizes the practical mechanisms to reduce a CEO's salary. In particular, some CEOs gave up their base salaries entirely, while others shifted their salaries to other variable compensation components, thus changing, but not reducing, their total compensation. Therefore, changes in total compensation after the announcement may differ depending on the adopted mechanism.[8] In order to explore the informational content brought about depending on

[6] I find that not all $1 salary decisions are specifically announced by firms/CEOs. The exact announcement date is not available for about 25% of the $1 CEO compensation data I initially collected.

[7] Eleven firms with specific reasons or no reason are listed in the other categories. The details of all the reasons listed are summarized in Table 3.2.

[8] Loureiro, Makhija, and Zhang (2020) examine the change in CEO's total compensation three years after the adoption of a $1 salary, while this study looks at how the market reacts to the expected change based on the adopted mechanism after the announcement.

the ways of reducing a CEO's base salary, I define two mechanism categories: *Exchange* and *Salary Cuts*. The *Exchange* category includes cases where a firm indicates in the proxy statement that its CEO is granted equity-based compensation arrangements in lieu of cash payment for base salary. The *Salary Cuts* category consists of the cases where a firm accepts its CEO's request to cut the base salary to $1. In this case, the base salary is eliminated. For example, on September 8, 2014, MicroStrategy Incorporated, an American business intelligence service company, stated in its 8-K filing that "on September 5, 2014, at the request of Michael J. Saylor, the Chief Executive Officer of MicroStrategy Incorporated, the Compensation Committee of the Board of Directors of the company approved a reduction in Mr. Saylor's annual base salary to $1."[9] In my sample, fourteen CEOs moved their base salary to variable compensation, whereas forty-nine chose to eliminate the base salary. Appendix 3.A provides more examples of different categories.

I find a negative market reaction to the $1 CEO salary announcements for the *Downturn* firms/CEOs (-2.91%, significant at the one percent level). It is worth noting that the CEOs of these troubled firms all chose to give up their base salaries. The number indicates that the $1 CEO salary announcements hurt stock prices when $1 CEO salary firms are during a business downturn or in crisis and CEOs choose to give up their base salaries. I also compare the results of the *Alignment* and *Downturn* subgroups when CEOs only choose to cut base salaries. The result shows that the market reacts significantly negatively to the intertwined *Downturn* and *Salary Cuts* news. The multivariate regression results provide qualitatively similar conclusions, indicating that the market

[9]The reason behind the decision can be inferred from the news or the company's reports. For example, Washington Business Journal reported on September 8, 2014, that MicroStrategy has been under pressure and announced a corporate restructuring to better align its cost structure with its business strategy. Its 10-K filing also noted that "the Compensation Committee adopted these changes in connection with the Company's restructuring efforts and cost reduction initiatives announced in the second half of 2014." The information is collected and categorized into the reason category defined by Hamm, Jung, and Wang (2015).

puts its weight on the stated reasons for reducing the fixed component (base salary) to $1. Previous studies argue that CEOs of firms in crisis cut their salaries as a personal sacrifice to lower stakeholder pressures, and the pay cuts could be an alternative for forced layoffs due to poor firm performance (Gao, Harford, and Li, 2012; Hamm, Jung, and Wang, 2015). In this study, the negative market reaction to public announcements of salary cuts in response to poor firm performance suggests that shareholders do not regard the cuts as a gesture of sacrifice. It rather hints at a CEO eager to cover their incompetence. The significantly positive coefficients for the *Alignment* reason and newly hired $1 CEOs suggest a negative view of the announcement of salary cuts coming from a firm's incumbent CEO. The patterns of abnormal returns for the *Alignment* and *Downturn* groups are also consistent with the findings of long-term stock performance in Hamm, Jung, and Wang (2015). My results, taken together with previous research, show that when firms are in trouble, the decision to cut their CEOs' salaries neither convinces the public nor brings share prices back.

The remainder of this paper is divided into five sections. Section 3.2 reviews the previous literature on executive compensation and develops testable hypotheses. Section 3.3 describes the research methodology, including data collection and variable construction. I examine announcement-date abnormal returns and conduct the regression analysis in section 3.4. Section 3.5 concludes.

3.2 Theoretical framework and hypotheses

Most CEO compensation packages consist of the following components: base salary, annual bonus based on performance, stock options, restricted stock, and long-term incentive plans. Published literature reviews on executive compensation have documented the increase in compensation levels and the changing composition of compensation packages (Core, Guay, and Larcker, 2003; Edmans, Gabaix, and Jenter, 2017; Frydman and Jenter, 2010; Murphy, 1999). Though base salary accounts for a relatively small part of CEO compensation packages, typically less than 20 percent of total compensation, it usually works as a basis for other components. To better understand $1 CEO salary decisions, recent studies researched the determinants of adopting a $1 CEO salary and examined the subsequences of the adoption, including stock returns, operating performance, and changes in total compensation (Hamm, Jung, and Wang, 2015; Loureiro, Makhija, and Zhang, 2020).

When a $1 CEO salary decision is announced publicly or disclosed in the proxy statement, the firm usually explains why its CEO adopts a one-dollar base salary. Hamm, Jung, and Wang (2015) categorized their sample into two mutually exclusive categories—the *Alignment* category and the *Downturn* category—to understand the motives behind the decision. The former included the firms stating that aligning the interests of managers and shareholders was the primary reason for the decision, and the latter consisted of firms that experienced a downturn or crisis—performing poorly recently, seeking or receiving a government bailout, or citing a negative outlook in response to adverse events such as the September 11 attacks. The results indicate that CEOs and firms with certain specific characteristics are more likely to initiate a $1 salary—CEOs with higher equity ownership, CEOs having tense relations with employees, firms with a depressed stock, or firms in the Silicon Valley in northern California. The examination of stock returns after the $1 salary decision and the analysis of changes to total CEO compensation in Hamm, Jung, and Wang (2015) suggests that a $1 salary decision made by CEOs of growing firms can be interpreted as a signal of better future performance, supporting the signalling explanation for *Alignment* firms. On the other hand, a $1 salary decision made by CEOs of *Downturn* firms in a predicament is a gesture of self-sacrifice to alleviate stakeholder pressures and prolong their tenure. Meanwhile, Loureiro, Makhija, and Zhang (2014) presented a different approach and argued that adopting a $1 salary is more like a gimmick to deceive shareholders when CEOs try to pursue their personal objectives instead of shareholder interests. Firms are differentiated into four groups according to firm characteristics (restructuring versus non-restructuring firms) and CEO characteristics (founder CEOs, entrenched versus professional CEOs, and overconfident CEOs). The authors examine firm performance and corporate strategies of different categories to see whether the $1 salary decision is made to maximize shareholder value or not. The results show no superior firm performance and no difference in the corporate strategies following the adoption of a $1 CEO salary, supporting the managerial power thesis. A $1 salary is not a mechanism for incentive alignment but camouflage for CEOs to prevent outrage over their total compensation.

This study takes a different approach to examine the motives behind one-dollar CEO salaries. First, this study extends previous research by focusing on market reactions to one-dollar salary announcements. Second, I focus on not only publicly stated reasons for the change in compensation but, more importantly, what happens with the overall CEO remuneration package. Therefore, for each $1 salary decision announcement, I search for the reasons and the mechanisms to classify $1 salary CEOs and examine the market view of the decision with an event study methodology. Though the reason for the decision and the way to deal with base salary intertwine in the announcement, I discuss each in turn and then compile them to consider the impact.

The agency cost theory implies that equity-based CEO compensation aligns interests between CEOs and shareholders and motivates CEOs to pursue long-term goals of maximizing firm value accordingly. If a company claims that adopting a $1 CEO salary is for interest alignment, the decision announcement should significantly affect the company's stock price, and the market reaction to the announcement should be positive. On the other hand, when firms are in a downturn or crisis, the $1 salary is supposed to be a gesture of self-sacrifice, while it might prove the need to reduce expenses in response to their revenue losses. Also, the news of voluntarily giving up base salary may distract the public from the lack of CEO abilities—that is, it is an attempt by CEOs to try to prolong their tenure to escape dismissals. If a $1 CEO salary is regarded as camouflage to hide the CEO's intention to secure their position in the firm according to the skimming approach[10], the market reaction to its announcement should be negative. I formulate the following hypotheses:

H1 Market reaction to the announcement of a $1 CEO salary should be positive when firms announce the decision as an explicitly stated alignment with shareholders' interests.

H2 Market reaction to the announcement of a $1 CEO salary should be negative when firms explicitly announce the decision in connection with a downturn or crisis.

Regarding the change in CEO compensation, two approaches can result in a CEO's $1 fixed salary. A CEO can negotiate a shift of base salary to other equity-based compensation components (e.g., stock and option grants). On the other hand, a CEO can choose to forego the base salary component of their compensation package entirely. Both ways result in a $1 or $0 base salary for the CEO, while total compensation could decrease or stay the same.[11] Total compensation levels decrease when CEOs forego their base

[10]The "skimming" or the managerial power approach is proposed in Loureiro, Makhija, and Zhang (2014) as an alternative explanation for the $1 CEO salary decision. The skimming approach also implies that the decision is more likely a ruse for CEOs to pursue other objectives instead of maximizing shareholder value.

[11]In this paper, both $1 and $0 base salary in CEO compensation are defined as "$1 salary" following previous literature.

salaries from their total compensation. On the other hand, when CEOs shift their base salaries into equity-based compensation components, total compensation stays the same at the time of exchange, becomes more sensitive to changes in underlying stock prices, and potentially could exceed the original total compensation amount.

Stock prices should reflect the anticipated changes in total compensation of CEOs following the adoption of a $1 salary. If CEOs exchange their base salary, the neutral total compensation changes would positively affect the stock price, considering that CEOs tie all their income to future stock price. On the other hand, if CEOs cut their base salaries, the negative compensation changes would have a negative effect on the stock price. If the salary cutting happens when a firm is in trouble, it could hint at the dire financial circumstances of a firm. Alternatively, withdrawing their base salary could help CEOs avoid potential layoffs due to unsatisfactory firm performance. In this case, CEOs' intentions of prolonging their tenure may outweigh the virtue of sacrifice. On the other hand, if firms are not in a downturn, it seems unlikely that CEOs would voluntarily give up their base salaries and earn less unless they plan to use the foregone money in other activities not directly related to shareholder value maximization (e.g., personal charitable activities for reputation building). Thus, I conjecture the following hypotheses:

H3 Market reaction to the announcement of a $1 CEO salary should be positive when CEOs exchange their base salaries for equity-based compensation.

H4 Market reaction to the announcement of a $1 CEO salary should be negative when CEOs' base salaries are cut.

In practice, pay cuts and CEO turnover are complementary tools for incompetent CEOs with poor performance. Gao, Harford, and Li (2012) have examined the similarity of the causes and outcomes of sharp pay cuts and forced turnover for their substitutability. When companies are in a downturn, they could resort to cutting CEO compensation or hiring a new manager, making the new compensation package design another factor of concern. Previous studies have observed positive stock price reactions to CEO turnover announcements, especially for forced CEO turnover associated with preceding poor performance (Denis and Denis, 1995; Huson, Parrino, and Starks, 2001).[12] The market could react to the news differently when the new CEOs are compared to their predecessors based on, for example, reputation, experience, and management ability. Looking at the market response to successor appointments, the successor's origin (insider or outsider), position, age, and education may be factored in (Bhagat, Bolton, and Subramanian, 2010; Davidson III, Worrell, and Cheng, 1990).[13] Davidson III, Worrell, and Cheng (1990) argue that insider successions bring less disruption of operations and are favoured more, and the stock market reacts more positively to younger successors. Aside from these characteristics, whether maintaining a $1 salary for new CEOs would bring positive market reaction needs to be examined. Therefore, I specifically distinguish firms that hire new CEOs in my category settings and look for reasons the predecessors left the position when I examine the market reaction to the salary announcement.[14] When a new successor is hired to replace an incompetent predecessor, I conjecture that maintaining a $1 salary arrangement signals the firm's commitment to preserving firm value to investors.

[12]Normal retirement events are compared with forced resignations due to poor preceding performance. The market reaction to forced CEO turnover are significantly driven by preceding poor performance. Normal retirements are not preceded by unusual negative performance.

[13]Though Bhagat, Bolton, and Subramanian (2010) show the significant correlation between the education levels of replaced CEOs and their successors, they do not see it as either a reason why CEOs are replaced or a good measure of the competence of CEOs. CEO ability is usually evaluated by the following firm performance, and there is no significant relationship between CEO education and long-term performance.

[14]However, the small number of firms in my sample may limit the examination of the reaction to salary itself and other reasons/new CEO characteristics for the *New Employment Agreement* subgroup.

Combining reasons and mechanisms in hypotheses 2 and 4, I conjecture that when firms are in a downturn, the decision to cut CEO salaries will move their stock prices further down because the additional information revealed is very pessimistic. A real decrease in CEO compensation indicates the necessity of reducing costs. For incumbent CEOs, a temporary pay cut is minuscule compared to their potential reputation loss from the dismissal. Their purpose of remaining in office will cause negative responses from the market if they are seen as incompetent. If new CEOs are hired with predetermined $1 salaries under poor firm performance, the doubt about the management incompetence could be dispelled.

To sum up, this paper raises questions as to how the market reacts to the announcement of a $1 CEO salary decision, inferring information from various reasons and approaches for the elimination of base salary. Firm performance and the inferences drawn from the methods of reducing base salary impact the market reaction to the news. Though both Salary Cuts and Exchange approaches make CEOs' income tied mostly to performance-based and equity-based compensation, it is important to understand what the market infers from them.

3.3 Sample selection and methodology

The executive compensation data are collected from 1991 to 2020 from the Execucomp database.[15] I search for $1 CEO salary firms using annual salary data and cross-check the obtained sample with the $1 CEO lists in Hamm, Jung, and Wang (2015) and Loureiro, Makhija, and Zhang (2014). The sample is further screened down to include only firms with the exact dates of new salary announcements. I search for the news and exact announcement dates of $1 CEO salaries using the Factiva and LexisNexis databases.

[15] The Execucomp database begins in 1991. It helps me classify whether a $1 salary is adopted by an incumbent or a successor.

The data is verified with companies' proxy statements from the SEC's EDGAR database in case of discrepancy among data sources. Table 3.1 provides the sample distribution by year. From 1997 to 2020, sixty-three $1 CEO salary firms had exact announcement dates and necessary background information.

Following Hamm, Jung, and Wang (2015), I differentiate the sample into *Alignment* and *Downturn* categories according to reasons explicitly stated in public sources. Companies are assigned into the *Alignment* category if provided reasons for adopting a $1 CEO salary are consistent with the notion of aligning the interests between managers and shareholders. Companies are assigned into the *Downturn* category if provided reasons for adopting a $1 CEO salary are in response to poor firm performance or negative events. Most firms can be assigned to the *Alignment* and *Downturn* categories as long as the reasons are explicitly listed in their proxy statements, annual reports, or news reports. Panel A of Table 3.2 summarizes all reasons why a CEO reduces their salary to $1 or zero. Twenty-nine of sixty-three CEOs aim to align their interests with those of shareholders, and twenty-three of sixty-three CEOs have a $1 salary when their firms suffer a downturn in business or an exogenous crisis. Several firms have provided other specific reasons, including conveying personal confidence and participating in charity activities.

Next, I categorize the firms that adopt a $1 CEO salary according to whether the CEO's base salary is eliminated at the announcement of the $1 salary decision or shifted to equity-based compensation. I look for detailed descriptions of what happened with the base salary in the proxy statement or annual report of each $1 CEO salary firm.[16] I also search the Factiva and LexisNexis databases for information on the $1 salary decision. According to what happened with the base salary in a compensation package,

[16]In the proxy statement of a firm, the explanation of changes in each executive's compensation is usually made in a notation below the annual compensation table.

I categorize the sample into two mutually exclusive categories, *Exchange* and *Salary Cuts*. The *Salary Cuts* category includes firms that accept their CEO's request or consent to cut base salary to $1 or zero. Therefore, the level of total compensation decreases since the base salary is erased without other adjustments. The *Exchange* category includes firms where CEOs negotiated re-allocating the base salary to equity-based compensation arrangements such as options or stock grants. In this case, the proxy statements of the *Exchange* firms indicate that their CEOs are granted options in lieu of cash payment for their full salary. According to Murphy (1999), since part of the CEOs' income shifts from the fixed component to the variable and risky stock-based instruments of their compensation package, a premium is always required in the exchange process. Therefore, the *Exchange* CEOs might end up having an increase in total compensation after the transition. Panel B of Table 3.2 shows the number of CEOs in each category based on whether CEOs forewent their fixed base salaries or shifted the base salaries to variable compensation. More than 75% of my sample CEOs forewent their base salaries. Fourteen of sixty-three CEOs chose to shift base salaries to other components in compensation, and forty-nine chose to give up base salaries completely.

As mentioned above, the $1 fixed salary was used both for incumbent CEOs and newly hired successors. To differentiate between those two groups, I created a *New Employment Agreement* category to include new CEOs who accepted a $1 salary when they took the position with a firm. To properly assign the *New Employment Agreement* CEOs to the *Salary Cuts* or the *Exchange* group, I compared their salaries with the salaries they earned in their prior positions or the salaries of their predecessors. Panel C of Table 3.2 shows that twenty-two out of sixty-three CEOs in the sample are new. Twenty out of twenty-two new CEOs have a fixed component of their compensation set at $1, and in the case of two new CEOs, the salary was allocated to equity-based compensation.

Panel D provides a three-by-two matrix using the categorization methods above to differentiate the sample. For simplicity, I include four firms with the "To convey CEO's confidence in future" reason in the *Alignment* category and one with the "To fund CEO's preferred charitable cause" reason in the *Downturn* category.[17] Fifteen out of twenty-four *Downturn* CEOs belong to the *Salary Cuts* category, suggesting that these incumbent CEOs chose to forego their base salaries when their firms experienced a downturn in business or an exogenous crisis. The other nine *Downturn* firms hired a new CEO with a $1 salary scheme. Ten out of thirty-three *Alignment* CEOs shifted their base salaries to variable compensation components.

Table 3.4 summarizes the characteristics of firms and CEOs for the whole sample in the announcement year.[18] I collected data on CEO age, salary, the sum of salary and bonus, total compensation, and percentage of shares owned by CEOs from the Execucomp database. The median amount of salary (and salary plus bonus) in panel A of Table 3.4 is $1. The mean salary/salary plus bonus is $73,039/$195,918 because some firms adopted the $1 CEO salary in the middle of the year, and the number represents the amount that CEOs had received prior to the adoption of the $1 CEO salary.[19] The median total compensation is $2,983,490, which indicates that CEOs earn other variable pay.

[17]I check additional information about these companies to make sure they can be properly assigned to the *Alignment* and *Downturn* categories.

[18]The initial year of the $1 CEO salary in the Execucomp database is sometimes inconsistent with the SEC filing. For example, a new CEO of HCA Healthcare, starting on July 25, 1997 was supposed to receive no base salary. The SEC filing for the 1997 fiscal year lists the new CEO, while the Execucomp database still lists the preceding CEO. Therefore, the CEO salary data in Execucomp is higher than $1. I manually replace these outgoing CEOs with new ones included in the SEC filing.

[19]For example, after the events of September 11, 2001, two CEOs in the sample waived their base salaries from October 1, 2001 through the end of the year. The reduction ceased beginning January 1, 2002. Therefore, their salaries reported in the proxy statement are higher than $1. There are the other 12 CEOs in the sample who received part of their salaries and had non-$1 salaries in the announcement year.

The set of firm characteristics includes total assets, book-to-market ratio (B/M), return on assets (ROA), return on equity (ROE), debt-to-equity (D/E) ratio, earnings-to-assets ratio, Tobin's Q, leverage, long-term debt ratio, tangibility, R&D expenses, and R&D intensity ratio.[20] Table 3.3 provides a description of all the variables used in the study. The data are from the Compustat database. The B/M ratio is the ratio of the book value of equity to the market value of equity. Return on assets (ROA) is net income divided by total assets. Return on equity (ROE) is net income divided by the market value of equity. I measure the D/E ratio using the sum of short-term and long-term debt divided by the book value of equity. The earnings-to-assets ratio is earnings before interest and taxes (EBIT) divided by total assets. Tobin's Q is the market value of assets divided by total assets. Leverage is total liabilities divided by total assets, and long-term debt ratio is long-term debts divided by total assets. Tangibility is property, plant, and equipment divided by total assets. Last, R&D intensity is research and development expenditure divided by total assets. Panel B of Table 3.4 reports firm characteristics in the announcement year. The negative mean ROA, ROE, and earnings-to-assets ratio (-0.05, -0.53, and -0.01) indicate the financial downturn in which my sample firms are, while the greater-than-unity mean (median) Tobin's Q, 2.43 (1.56), suggests that they have potential growth opportunities. Besides, an average (median) firm has \$512.12 (\$38.24) million in R&D expenses.

In panel C of Table 3.4, I calculate the CEO post \$1 adoption tenure as the length of time from the \$1 salary decision announcement date to the date when they leave the position. The \$1 CEO departure dates are also from the Execucomp database.[21] The average number of years for *Alignment* CEOs is 8.77 years, and for *Downturn* CEOs

[20]Variables capturing firm characteristics are selected partly following Loureiro, Makhija, and Zhang (2020).

[21]If a CEO is still with a firm by December 31, 2021 (the sample end date), I use December 31, 2021 to calculate the length of time in the position.

is 9.22 years. The results suggest that when firms are in trouble, CEOs who cut their salary can prolong their tenure. For the *Exchange* and *Salary Cuts* categories, the average number of years is 8.50 and 8.41, respectively.

I examine board independence from management by looking at the CEO and Chairman of the Board duality. Panel D of Table 3.4 shows that forty-six of sixty-three CEOs in the sample are also Chairmen. Seventeen of twenty-two *Alignment* CEOs and eleven of fifteen *Downturn* CEOs are Chairmen when *New Employment Agreement* CEOs are excluded.[22]

I investigate the one-year cumulative stock performance leading to the $1 CEO salary announcement. The results for three categories (*Alignment*, *Downturn*, and *New Employment Agreement*) are in panel E of Table 3.4. The mean of cumulative stock returns for *Alignment* firms is positive (2.32%), while it is negative (−40.46%) for *Downturn* firms. The median is −11.73% for *Alignment* firms and −45.99% for *Downturn* firms. When *New Employment Agreement* firms are separated from the above two categories, the mean and median of cumulative stock returns for *Alignment* firms are both positive (10.69% and 5.61%), while they are both negative (−42.83% and −46.15%) for *Downturn* firms. The prior stock performance of *Downturn* firms is statistically lower than that of *Alignment* firms.[23] The results show that incumbent CEOs announce reasons for their $1 salary decisions consistently with past firm stock performance. Besides, *New Employment Agreement* firms have a negative mean and median of cumulative stock returns (−25.30% and −26.80%).[24]

[22]The role of president is also examined. Twenty-two of sixty-three CEOs in the sample are also presidents.

[23]I also calculate market-adjusted stock returns for *Alignment* and *Downturn* firms and make the comparison between the two groups. The results of lower stock performance of *Downturn* firms still hold.

[24]When the *New Employment Agreement* firms are separated into two subgroups by reasons, both means and medians of cumulative stock returns for two subgroups are still negative. While

Table 3.5 reports the comparison of firm characteristics in years −1 and 0 for reason- and mechanism-based groups. Panels A and B show the difference between groups in year 0; panels C and D show the results in year −1. In panels A and C, the *Downturn* firms have a lower ROA, ROE, and earnings-to-assets ratio than the *Alignment* firms while having a higher R&D intensity. In panels B and D, the *Exchange* and *Salary Cuts* firms have significant differences in ROA, ROE, earnings-to-assets ratio, D/E ratio, and R&D intensity.

3.4 Empirical results

3.4.1 Event study on the announcement of $1 CEO salary decisions

To understand possible motives behind $1 CEO salary decisions, I calculate the abnormal returns of the whole sample first and then differentiate it into different groups according to the categorization methods described above (*Alignment* vs. *Downturn* and *Exchange* vs. *Salary Cuts*).[25] Abnormal returns are estimated using the market model with the CRSP equally/value-weighted index, and two/three-day cumulative average abnormal returns (CAARs) summed over days 0 to +1 (+2) relative to the announcement date are used. Table 3.6 reports the results of (0, +1) and (0, +2) CAARs. Panels A and B show the results for categories by reasons with *New Employment Agreement* firms included as well as singled out into a separate category. Panel C shows the results based on the mechanisms for lowering the base salary. In panel D, I separate the *Salary Cuts* category into two subgroups by reasons for further analysis.

the numbers are more negative in the *Downturn* category than in the *Alignment* category, the difference is not statistically significant between the two.

[25] The *New Employment Agreement* group is also examined. I compare *Exchange* and *Salary Cuts* first.

When firms are categorized according to the reasons for adoption of the $1 CEO salary, the results in panel A show that the reaction is significantly negative if the firms have operating difficulties, where the −2.30% (−1.89%) CAAR at the (0, +1) window is significant at the one percent level. The reaction is insignificantly positive at the same window when the firms claim to align the interests between their managers and shareholders, while the (0, +2) CAARs, 1.53% and 1.74%, are significant at the ten percent level for *Alignment* firms. Even though CEOs can potentially use a $1 salary to show self-sacrifice when firms are in trouble, the results show that the market does not appreciate it. Instead, the results raise concerns about whether CEOs use a $1 salary as camouflage for the real intentions of prolonging their own tenure. Panel B shows the results when the *New Employment Agreement* firms are singled out from two reason-based categories. Ten of thirty *Alignment* firms and nine of twenty-four *Downturn* firms in panel A are separated into the *New Employment Agreement* sub-category.[26] Panel B shows that the −2.91% (−3.10%) CAAR for the period (0, +1) is still significantly negative in the *Downturn* category at the one percent level. The CAAR for the period (0, +2), −2.31% (−2.52%), is significantly negative as well. Therefore, the results based on reason categorization do not change after the adjustment.

When firms are categorized according to the ways firms and CEOs deal with base salaries, the reaction is negative if CEOs forego their base salaries altogether. The value-weighted CAAR for the (0, +1) is −1.25% in panel C, significant at the ten percent level. The reaction to the shifting base salary to stock and option grants is insignificantly positive (0.47%) for the same period. When companies hire new CEOs and announce new compensation packages with a $1 salary, the reaction is also insignificantly positive (1.31%) for the same period. The results show that CEOs' act of giving up their base

[26]Nineteen firms are selected from panel A, and one *New Employment Agreement* firm has no reason cited when the reason categorization is made. In total, the *New Employment Agreement* category has 20 firms in panels B and C.

salary seems not to convince the market.

Taking mechanisms and reasons for a \$1 CEO salary into consideration together, I separate the *Salary Cuts* category into two subgroups by reasons. When the reason is *Downturn* in panel D, the cumulative average abnormal return is negative in the (0, +1) window, −2.91% (−3.10%), and significant at the one percent level. The results of (0, +2) CAARs, −2.31% (−2.52%), are qualitatively similar. When a company faces a downturn in operation and decreasing its CEO's salary for cost-cutting is inevitable, the market sees the \$1 salary decision as a bad signal. The evidence supports my conjecture in Section 3.3 that both the need to reduce firm costs and doubts about the CEO's intention to stay in office under poor firm performance negatively impact the stock price.[27]

The results provide a clear view of the market response to the compensation decision and the information content it reveals. The response is significantly negative when firms announce the decision after a poor firm performance. Firms and CEOs need to take action to recover from poor performance. Previous literature claims that cutting CEO compensation can demonstrate a CEO's self-sacrifice; however, the results above show that the market sees the decision as either a necessary action to save the firm or just a gimmick for the CEO to avoid being dismissed. Therefore, the announcement brings pessimistic information to the market. For firms with the *Alignment* reason and the *Exchange* approach, the market does not react significantly to the announcement.

[27] On the other hand, I have eight *New Employment Agreement* firms whose new CEO's salary drops to \$1 compared to their predecessors when these firms are in trouble. The results of abnormal returns for these firms are not significantly negative, which indicates the different reactions to incumbent CEOs and newly hired CEOs who both accept \$1 salaries because of poor performance.

3.4.2 Regression analysis

This section examines the effects of firm-related variables on the abnormal returns of $1 CEO salary announcements. The dependent variable is (0, +1) and (0, +2) cumulative abnormal return (CAR), and independent variables include firm characteristics in year −1, as described in the previous section. Table 3.7 reports the correlations between variables. I control for firm size, book-to-market ratio, tangibility, return on equity (ROE), and prior stock performance in the regressions. Better prior performance should result in a more positive market reaction to the announcement. If prior performance is subpar, the announcement by firms or CEOs can further exacerbate the market's concerns about firms' operations and intentions. In addition to the variables mentioned above, the regression model contains dummy variables that control for the reasons, mechanisms, and new employment agreements. The *Reason* dummy is equal to 1 when CEOs have the *Alignment* reason and 0 when CEOs have the *Downturn* reason. The *Mechanism* dummy is equal to 1 when the mechanism is *Exchange* and 0 when it is *Salary Cuts*. The *New* dummy is equal to 1 when CEOs are in the *New Employment Agreement* category. I expect the coefficient signs of the three dummy variables to be not negative.

The regression results for the market reaction to firm characteristics controls and my category dummies are in Table 3.8. In section (1) (columns (a) to (d)), I only consider *Salary Cuts* firms.[28] The results show that the coefficients on the *Reason* dummy are significantly positive at the five percent level in the regressions (a), (c), and (d), which is consistent with the results in panel D of Table 3.6. The higher market reaction to *Alignment* than to *Downturn* implies that when a firm is in trouble, the public is not

[28] In panel D of Table 3.2, I find that all *Downturn* firms/CEOs choose to eliminate base salary. Therefore, I only can compare the results of *Alignment* and *Downturn* firms/CEOs when the adopted mechanism is *Salary Cuts*. I also utilize *Alignment* firms only to compare *Exchange* with *Salary Cuts*, but I find no significant results in the regressions and decide to exclude them from Table 3.8.

persuaded by its CEO's proposal to accept a $1 salary as a response. The $1 CEO salary is not seen purely as a gesture of sacrifice. The pessimistic concern about the firm future and the inevitable reduction of expenses may dominate the view of the announcement. Besides, the more negative reaction to the *Downturn* category is consistent with the findings of long-term negative stock performance when firms are in crisis in Hamm, Jung, and Wang (2015). The deterioration in performance suggests that when firms are in trouble, the $1 CEO salary neither convinces the public nor brings the stock price back. In section (2), three dummies for the $1 CEO salary decisions are considered in the regressions (e) to (h) for the whole sample. Taking them together into consideration, the significant positive (at the five percent level) coefficients on the *Reason* dummy show that the market reacts to the $1 salary announcements by the *Alignment* and by the *Downturn* firms differently. The coefficients on the *New* dummy are also significantly positive, at the five or ten percent level in Table 3.8. Maintaining a $1 salary arrangement for newly hired CEOs signals their commitment to an alignment of interests between them and shareholders. Therefore, the market reacts positively. In Table 3.9, I add return-on-equity (ROE) and prior stock performance as independent variables in the regressions. The results demonstrate that the market reaction to the $1 CEO salary announcement is positively related to the prior stock performance. The signs of the independent variables are the same as those in Table 3.8. In summary, the results of the regressions support my hypotheses. The market reacts to the announcement of a $1 CEO salary negatively when firms are in a downturn and CEOs forego their salary and positively when firms hire new CEOs who will start with a $1 salary.[29]

[29]Roberts and Whited (2013) use executive compensation as an example to illustrate potential endogeneity problems caused by omitted variables such as executives' abilities. I acknowledge that there could be a similar endogeneity problem in this study which should be addressed in further empirical research.

3.4.3 Post $1 CEO salary decision developments and potential future research

I examine how long the $1 compensation lasts and whether $1 CEOs leave the position at the time of the salary reversals. Twenty CEOs in my sample remain at their positions after their salaries are restored or increased, with eleven of them being in the *Downturn* category. The cease of their pay cuts should be attributed to the turnaround in the firm performance or the ending of short-lived adverse events. Twenty-nine CEOs retired, leaving the position or the company with $ 1 salaries.

The observed differences in the market reaction to $1 CEO salary announcements between different reason and mechanism categories can lead to further research on wide executive compensation-related issues. Since previous research has shown that the determinants of the $1 CEO salary and other mixed compensation plans are different, it is important to understand whether the reactions to mixed compensation plans also differ.[30] The effect of the $1 CEO salary on subsequent corporate operating strategies is another issue to consider. Since *Alignment* CEOs tie their income to stock price appreciation, reflecting the interest alignment with shareholders, whether the CEOs will increase R&D expenditure to boost innovation and stock prices will need to be examined. Likewise, exploring whether *Downturn* CEOs effectively save the firm following $1 salary decisions is another avenue for exploration.

[30]Other mixed compensation plans examined in Hamm, Jung, and Wang (2015) include plans that increase the variable pay and hold fixed pay constant and plans that decrease fixed pay and hold variable pay constant. Both shift CEO pay toward variable pay to a certain extent but still retain some fixed pay.

3.5 Conclusion

This paper examines the market reaction to the announcement of a $1 CEO salary decision. I use both reasons for a $1 CEO salary and mechanisms for reducing the base salary to disentangle possible explanations for market reaction. I find a significantly negative price reaction to the Downturn reason and the Salary Cuts approach. The worries about poor firm performance and the doubts about the self-saving behaviour of CEOs both contribute to negative reactions to $1 CEO salary announcements. The results indicate that these actions are regarded more as camouflage by CEOs than a gesture of sacrifice when firms are in trouble. Otherwise, the reaction is significantly positive when firms hire new CEOs who accept a $1 salary. The mixed findings of abnormal returns suggest that a $1 salary is not seen purely as a vehicle for the alignment of interests between CEOs and shareholders.

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Table 3.1: The sample consists of firms whose CEOs adopt $1 salaries with the exact announcement dates.

Year	CEOs
1997	1
1998	2
1999	1
2000	2
2001	3
2002	1
2003	2
2004	0
2005	3
2006	6
2007	3
2008	7
2009	4
2010	3
2011	3
2012	1
2013	5
2014	3
2015	5
2016	2
2017	1
2018	2
2019	0
2020	3
Total	63

Table 3.2: This table lists the reasons why firms/CEOs choose to adopt $1 salaries and the ways they deal with base salary for the $1 salary decision.

Panel A: Summary of stated reasons for a $1 CEO salary

Reasons	Number of CEOs
1. Alignment with shareholder interests	
CEO opted into equity-based pay in lieu of salary	12
CEO waived all forms of compensation due to equity stake	5
Firm recently had an IPO or spin-off	3
Firm recently merged with another firm	1
No detailed reason	8
Subtotal for Alignment category	29
2. Firms are in a downturn or crisis	
Poor recent firm and stock performance	19
Firm cited September 11, 2001 terrorist attacks	2
CEO waived all forms of compensation due to equity stake	1
Firm recently was under government investigation	1
Subtotal for Downturn category	23
3. To convey CEO's confidence in future	4
4. To fund CEO's preferred charitable cause	1
5. No reason cited	6
Totals for all categories	63

Panel B: Summary of stated ways for a $1 CEO salary (I)

Mechanisms	Number of CEOs
Exchange	14
Salary Cuts	49

Panel C: Summary of stated ways for a $1 CEO salary (II)

Mechanisms	Number of CEOs
Exchange	12
Salary Cuts	29
New Employment Agreement	22

Panel D: Numbers of CEOs in all designated categories

Mechanisms/Reasons	Alignment	Downturn	No reason
Exchange	10	0	2
Salary Cuts	12	15	2
New Employment Agreement	11	9	2

Table 3.3: This table lists the definition of variables used in this essay, including dependent variables, CEO characteristics and firm characteristics.

Variable	Definition
Dependent variables	
CAR	Cumulative abnormal returns on the $1 salary announcement date and the day after the announcement, calculated from the market model; the estimation period are (−300, −46) days relative to the $1 salary announcement date
CEO characteristics	
Salary	Thousands of dollars
Bonus	Thousands of dollars
Total current compensation	Thousands of dollars
All other compensation	Thousands of dollars
Total compensation	Thousands of dollars
Firm characteristics	
AT	Total assets (Millions of dollars)
B/M ratio	Book value of equity divided by market value of equity
ROA	Return on assets
ROE	Return on equity
D/E ratio (DER)	The sum of short-term and long-term debt divided by book value of equity
Earnings-to-assets ratio (EARN)	Earnings divided by total assets
Tobin's Q (TQ)	Market value of assets divided by total assets
Leverage (LEV)	Total liabilities divided by total assets
Long-term debt ratio (LD)	Long-term debt divided by total assets
Tangibility (TANG)	Property, plant, and equipment divided by total assets
R&D Intensity (RDI)	Total research and development expenses divided by total assets
R&D expenses (RDX)	Total research and development expenses (Millions of dollars)

Table 3.4: This table provides descriptive statistics for $1 CEO salary firms at year 0. Panel A reports the CEO characteristics. Panel B reports the firm characteristics. Panel C reports the average/median tenure of $1 CEOs beginning from the decision announcement date. Panel D reports the number of CEOs who are also the Chairman of the Board. Panel E reports the prior stock performance a year before the announcement date.

Panel A: CEO characteristics

Year 0	Obs.	Mean	Median
Age	49	54	55
Salary	49	73.039	0.001
Salary + bonus	49	195.918	0.001
Total Compensation	37	7,267.67	2,983.49
% of shares owned	32	12.00	6.13
% of shares owned (options excluded)	38	11.17	5.67

Panel B: Firm characteristics

Year 0	Obs.	Mean	Median
Total assets	59	62,567.88	1,647.70
B/M ratio	59	0.69	0.33
ROA	59	−0.05	0.005
ROE	59	−0.53	0.003
D/E ratio	57	1.12	0.37
Earnings ratio	59	−0.01	0.04
Tobin's Q	59	2.43	1.56
Leverage	57	0.64	0.60
Long-term debt ratio	57	0.26	0.18
R&D Intensity	35	0.09	0.03
R&D expenses	35	512.12	38.24
Tangibility	55	0.28	0.15

Panel C: Summary of CEO tenures

Reasons	Average (Median) years
Alignment	8.77 (7.25)
Downturn	9.22 (8.74)
Mechanisms	**Average (Median) years**
Exchange	8.50 (6.94)
Salary Cuts	8.41 (7.31)

Table 3.4 (continued)

Panel D: Summary of CEO duality by reasons

Category	Number of CEOs	Number of Chairmen
All	63	46
Alignment (New Employment excluded)	22	17
Downturn (New Employment excluded)	15	11

Panel E: Summary of prior stock performance by reasons

Category	Mean	Median
Alignment (New Employment included)	2.32%	−11.73%
Downturn (New Employment included)	−40.46%	−45.99%
Difference T-test/Wilcoxon Test	−42.78%***	−2.95***
Alignment (New Employment excluded)	10.69%	5.61%
Downturn (New Employment excluded)	−42.83%	−46.15%
Difference T-test/Wilcoxon Test	−53.52%***	−2.52**
New Employment Agreement	−25.30%	−26.80%

TABLE 3.5: This table provides descriptive statistics of $1 CEO salary firms with the exact announcement dates of the event categorized by reasons and mechanisms. ***, **, and * indicate significance level at 1%, 5%, and 10%, respectively.

Panel A: Year 0 by reasons

	Alignment			*Downturn*				
Year 0	Obs.	Mean	Median	Obs.	Mean	Median	Diff.	Wilcoxon
AT	20	10,236	1,353	15	129,771	1,140	119,535	0.15
B/M	20	0.29	0.27	15	0.50	0.32	0.21	0.62
ROA	20	0.02	0.04	15	−0.13	−0.02	−0.15	−2.08**
ROE	20	0.01	0.03	15	−0.24	−0.01	−0.25*	−2.45**
D/E	19	0.76	0.18	15	0.69	0.02	−0.07	−0.42
Earnings	20	0.05	0.08	15	−0.10	−0.001	−0.15	−2.02**
TQ	20	3.08	1.60	15	2.66	2.27	−0.42	−0.25
Leverage	19	0.63	0.55	15	0.68	0.57	0.05	−0.07
LD	19	0.28	0.13	15	0.27	0.18	−0.01	0.07
RDI	8	0.07	0.07	9	0.18	0.18	0.11*	−1.71*
RDX	8	207.29	33.76	9	443.79	103.36	236.50	−0.83
Tangibility	18	0.32	0.15	14	0.29	0.20	−0.03	0.28

Panel B: Year 0 by mechanisms

	Alignment			*Downturn*				
Year 0	Obs.	Mean	Median	Obs.	Mean	Median	Diff.	Wilcoxon
AT	12	15,521	5,506	27	74,451	1,140	58,931	0.87
B/M	12	0.43	0.36	27	0.43	0.26	−0.004	0.56
ROA	12	0.04	0.04	27	−0.09	−0.001	−0.13**	1.60
ROE	12	0.02	0.03	27	−0.18	−0.01	−0.20**	1.93*
D/E	11	2.43	1.39	27	0.12	0.08	−2.31**	1.94*
Earnings	12	0.08	0.07	27	−0.05	0.004	−0.13**	1.63
TQ	12	2.02	1.40	27	3.06	2.27	1.04	−0.68
Leverage	11	0.60	0.62	27	0.66	0.57	0.06	0.26
LD	11	0.28	0.32	27	0.29	0.18	0.01	0.61
RDI	6	0.02	0.00	15	0.14	0.12	0.12***	−2.04**
RDX	6	13.93	0.00	15	374.28	103.36	360.35**	−1.88*
Tangibility	9	0.29	0.26	26	0.31	0.16	0.02	−0.36

Table 3.5 (continued)

Panel C: Year −1 by reasons

	Alignment			*Downturn*				
Year 0	Obs.	Mean	Median	Obs.	Mean	Median	Diff.	Wilcoxon
AT	20	8,364	1,171	15	134,434	1,208	126,070	0.22
B/M	19	0.26	0.26	15	0.50	0.29	0.24	0.80
ROA	20	−0.03	0.03	15	−0.13	0.03	−0.10	−0.55
ROE	19	−0.17	0.03	15	−0.17	0.004	−0.005	−0.66
D/E	20	−1.48	0.11	15	0.62	0.05	2.11	−0.12
Earnings	20	−0.03	0.06	15	−0.11	0.03	−0.08	−1.32
TQ	19	3.29	1.81	15	3.10	2.66	−0.18	−0.14
Leverage	20	0.63	0.64	15	0.62	0.57	−0.01	−0.18
LD	20	0.27	0.15	15	0.22	0.09	−0.05	0.03
RDI	8	0.08	0.07	9	0.18	0.15	0.10	−1.32
RDX	8	142.51	21.21	9	477.34	83.00	334.83	−0.83
Tangibility	18	0.28	0.19	14	0.31	0.17	0.03	0.47

Panel D: Year −1 by mechanisms

	Alignment			*Downturn*				
Year 0	Obs.	Mean	Median	Obs.	Mean	Median	Diff.	Wilcoxon
AT	12	13,530	4,299	27	76,512	1,208	62,982	0.90
B/M	12	0.46	0.37	26	0.41	0.29	−0.05	0.52
ROA	12	0.04	0.03	27	−0.13	0.02	−0.17**	0.78
ROE	12	0.04	0.04	26	−0.27	0.01	−0.31**	1.77*
D/E	12	2.29	1.02	27	−1.63	0.09	−3.92	1.57
Earnings	12	0.08	0.06	27	−0.11	0.05	−0.19**	1.08
TQ	12	2.49	1.38	26	3.23	2.16	0.73	−0.68
Leverage	12	0.55	0.56	27	0.65	0.59	0.10	−0.14
LD	12	0.24	0.28	27	0.27	0.14	0.03	0.02
RDI	6	0.02	0.00	15	0.14	0.15	0.13***	−2.20**
RDX	6	10.14	0.00	15	360.96	83.00	350.82*	−1.96**
Tangibility	9	0.25	0.19	26	0.31	0.17	0.06	−0.66

Table 3.6: This table presents the cumulative average abnormal returns (CAARs) for the periods (0, +1) and (0, +2), using the CRSP equally/value-weighted index. The Alignment category includes firms that explicitly state that the purpose of the $1 CEO salary is to align the interests of managers and shareholders in the announcement. The Downturn category includes firms that explicitly state that the $1 CEO salary is made because of recent difficulties. The Exchange category includes firms whose CEOs agree to shift their fixed base salaries to other compensation components in the packages. The Salary Cuts category includes firms whose CEOs give up their fixed base salaries. The New Employment Agreement category includes firms whose CEOs accept a $1 salary when they take their new positions or new compensation contracts. Panel A reports the results of reason categories. Panel B reports the results of reason categories when New Employment Agreement firms are separated. Panel C reports the results of mechanism categories when New Employment Agreement firms are separated. Panel D reports the results of Salary Cuts firms with two reason subgroups.

Panel A: Reasons

CAAR	All	Alignment	Downturn
EW (0, +1)	−0.26%	0.93%	−2.30%***
	(−1.068)	(0.820)	(−2.876)
VW (0, +1)	−0.03%	1.03%	−1.89%***
	(−0.913)	(0.834)	(2.657)
EW (0, +2)	0.36%	1.53%*	−1.81%
	(0.339)	(1.646)	(−1.560)
VW (0, +2)	0.64%	1.74%*	−1.31%
	(0.425)	(1.665)	(−1.411)
Numbers	59	30	24

Panel B: Reasons + New Employment Agreement

CAAR	All	Alignment	Downturn	New Employment Agreement
EW (0, +1)	−0.26%	1.08%	−2.91%***	0.47%
	(−1.068)	(1.233)	(−3.182)	(−0.028)
VW (0, +1)	−0.03%	1.02%	−3.10%***	1.31%
	(−0.913)	(0.971)	(−3.328)	(0.596)
EW (0, +2)	0.36%	1.45%*	−2.31%*	1.66%
	(0.339)	(1.731)	(−1.853)	(1.006)
VW (0, +2)	0.64%	1.58%	−2.52%**	2.53%
	(0.425)	(1.573)	(−1.994)	(1.416)
Numbers	59	20	15	20

Table 3.6 (continued)

Panel C: Mechanisms + New Employment Agreement

CAAR	All	Exchange	Salary Cuts	New Employment Agreement
EW (0, +1)	−0.26%	0.36%	−1.07%	0.47%
	(−1.068)	(0.102)	(−1.622)	(−0.028)
VW (0, +1)	−0.03%	0.47%	−1.25%*	1.31%
	(−0.913)	(0.202)	(−1.997)	(0.596)
EW (0, +2)	0.36%	0.76%	−0.79%	1.66%
	(0.339)	(0.325)	(−0.581)	(1.006)
VW (0, +2)	0.64%	0.84%	−0.85%	2.53%
	(0.425)	(0.357)	(−0.829)	(1.416)
Numbers	59	12	27	20

Panel D: Salary Cuts + Reasons

CAAR	Salary Cuts	Salary Cuts + Alignment	Salary Cuts + Downturn
EW (0, +1)	−1.07%	1.58%	−2.91%***
	(−1.622)	(1.396)	(−3.182)
VW (0, +1)	−1.25%*	1.38%	−3.10%***
	(−1.997)	(0.981)	(−3.328)
EW (0, +2)	−0.79%	1.58%	−2.31%*
	(−0.581)	(1.555)	(−1.853)
VW (0, +2)	−0.85%	1.76%	−2.52%**
	(−0.829)	(1.341)	(−1.994)
Numbers	27	10	15

Table 3.7: This table reports correlations between key variables used in this paper. In each row, the upper number reports the Pearson correlation coefficients. ***, **, and * indicate significance level at 1%, 5%, and 10%, respectively.

	SIZE	BMR	ROA	ROE	DER	EARN	TQ	LEV	LD	RDI	TANG
SIZE	1	0.28** 0.03	0.31** 0.02	0.26** 0.05	0.11 0.41	0.31** 0.02	−0.22* 0.09	0.13 0.34	0.04 0.76	−0.37** 0.03	0.10 0.48
BMR		1	0.29** 0.03	0.20 0.13	0.17 0.20	0.30** 0.02	−0.39*** <0.01	−0.22 0.10	−0.34** 0.01	−0.35** 0.03	0.29** 0.03
ROA			1	0.70*** <0.01	0.10 0.46	0.91*** <0.01	0.11 0.42	−0.67*** <0.01	−0.71*** <0.01	−0.61*** <0.01	−0.06 0.66
ROE				1	0.04 0.78	0.58*** <0.01	0.11 0.39	−0.47*** <0.01	−0.44*** <0.01	−0.21 0.21	−0.002 0.99
DER					1	0.10 0.46	−0.07 0.61	−0.10 0.94	−0.26** 0.05	−0.50*** <0.01	−0.27* 0.05
EARN						1	0.11 0.43	−0.70*** <0.01	−0.69*** <0.01	−0.65*** <0.01	−0.12 0.40
TQ							1	−0.35*** <0.01	−0.22 0.11	0.19 0.26	−0.18 0.20
LEV								1	0.79*** <0.01	0.25 0.15	0.10 0.47
LD									1	0.30* 0.09	0.22 0.11
RDI										1	0.02 0.93
TANG											1

TABLE 3.8: This table shows the results of the regression analysis. Section (1) controls for reasons and new employment when CEOs give up their base salary. Section (2) controls for reasons, mechanisms, and new employment. The dependent variable is the cumulative abnormal return (CAR) (day 0 to day +1 and day 0 to day +2). The "Reason," "Mechanism," and "New" terms are dummy variables for reasons, mechanisms, and new employment, respectively. *, **, and *** are statistically significant at the 0.10, 0.05, and 0.01 levels, respectively.

	(1) Reasons				(2) Reasons + Mechanisms			
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
	EW (0, +1) CAR	EW (0, +2) CAR	VW (0, +1) CAR	VW (0, +2) CAR	EW (0, +1) CAR	EW (0, +2) CAR	VW (0, +1) CAR	VW (0, +2) CAR
Reason	0.071**	0.068*	0.070**	0.071**	0.063**	0.064**	0.062**	0.068**
	(2.47)	(1.95)	(2.62)	(2.28)	(2.47)	(2.13)	(2.65)	(2.49)
Mechanism	N/A	N/A	N/A	N/A	−0.017	−0.010	−0.015	−0.013
					(−0.60)	(−0.31)	(−0.59)	(−0.44)
New	0.042*	0.048*	0.051**	0.063**	0.039*	0.047*	0.047**	0.061**
	(1.84)	(1.74)	(2.39)	(2.54)	(1.81)	(1.83)	(2.36)	(2.63)
Firm size	−0.010**	−0.011**	−0.009**	−0.009*	−0.008**	−0.010**	−0.007*	−0.008*
	(−2.25)	(−2.06)	(−2.08)	(−1.83)	(−2.08)	(−2.11)	(−1.87)	(−1.93)
B/M	0.013	0.015	0.010	0.010	0.008	0.012	0.005	0.010
	(0.79)	(0.78)	(0.67)	(0.60)	(0.54)	(0.73)	(0.42)	(0.65)
Tangibility	−0.041	−0.042	−0.063	−0.056	−0.046	−0.041	−0.064*	−0.058
	(−1.00)	(−0.85)	(−1.66)	(−1.28)	(−1.27)	(−0.96)	(−1.93)	(−1.50)
Intercept	0.046	0.059	0.042	0.045	0.039	0.053	0.034	0.042
	(1.26)	(1.34)	(1.26)	(1.16)	(1.20)	(1.35)	(1.15)	(1.22)
F Value	2.39*	1.79	2.85**	2.35*	2.09*	1.76	2.55**	2.32**
Adj R^2	0.14	0.08	0.17	0.13	0.11	0.08	0.15	0.13
Numbers	45	45	45	45	54	54	54	54

TABLE 3.9: This table shows the results of the regression analysis. Section (1) controls for reasons and new employment when CEOs give up their base salary. Section (2) controls for reasons, mechanisms, and new employment. The dependent variable is the cumulative abnormal return (CAR) (day 0 to day +1 and day 0 to day +2). The "Reason," "Mechanism," and "New" terms are dummy variables for reasons, mechanisms, and new employment, respectively. *, **, and *** are statistically significant at the 0.10, 0.05, and 0.01 levels, respectively.

	(1) Reasons				(2) Reasons + Mechanisms			
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
	EW (0, +1) CAR	EW (0, +2) CAR	VW (0, +1) CAR	VW (0, +2) CAR	EW (0, +1) CAR	EW (0, +2) CAR	VW (0, +1) CAR	VW (0, +2) CAR
Reason	0.054*	0.068*	0.054*	0.070**	0.047*	0.062*	0.046*	0.065**
	(1.78)	(1.80)	(1.95)	(2.09)	(1.76)	(1.91)	(1.88)	(2.18)
Mechanism	N/A	N/A	N/A	N/A	−0.022	−0.017	−0.022	−0.018
					(−0.76)	(−0.47)	(−0.81)	(−0.56)
New	0.037	0.048	0.048**	0.062**	0.034	0.045*	0.043**	0.060**
	(1.60)	(1.66)	(2.24)	(2.42)	(1.57)	(1.71)	(2.19)	(2.48)
Firm size	−0.008*	−0.012*	−0.007	−0.009*	−0.007	−0.010**	−0.005	−0.008*
	(−1.75)	(−2.02)	(−1.52)	(−1.74)	(−1.59)	(−2.06)	(−1.27)	(−1.80)
B/M	0.017	0.014	0.015	0.010	0.013	0.012	0.012	0.010
	(1.04)	(0.68)	(1.04)	(0.55)	(0.87)	(0.65)	(0.93)	(0.66)
ROE	−0.026	0.011	−0.032	0.004	−0.025	0.008	−0.033*	0.001
	(−1.13)	(0.37)	(−1.53)	(0.16)	(−1.18)	(0.32)	(−1.71)	(0.03)
Performance	0.040	0.004	0.037	0.003	0.035*	0.009	0.036*	0.010
	(1.56)	(0.13)	(1.58)	(0.11)	(1.71)	(0.36)	(1.86)	(0.42)
Tangibility	−0.049	−0.041	−0.073*	−0.056	−0.054	−0.042	−0.077**	−0.060
	(−1.22)	(−0.80)	(−1.93)	(−1.23)	(−1.52)	(−0.95)	(−2.33)	(−1.50)
Intercept	0.044	0.069	0.036	0.050	0.037	0.063	0.028	0.048
	(1.12)	(1.40)	(0.99)	(1.14)	(1.05)	(1.44)	(0.87)	(1.23)
F Value	2.12*	1.25	2.57**	1.61	2.01*	1.33	2.57**	1.71
Adj R^2	0.15	0.04	0.20	0.09	0.13	0.05	0.19	0.10
Numbers	45	45	45	45	54	54	54	54

Appendix

3.A Examples of reasons and mechanisms of \$1 CEO salary decisions

Example of ***Alignment***—William Douglas Parker, CEO of AMR Corporation

The proxy statement says, "In April 2015, Mr. Parker requested and the Compensation Committee agreed to provide 100% of his direct compensation in the form of equity incentives, underscoring our commitment to paying for performance and further aligning his interests with that of our stockholders. Mr. Parker will no longer receive any base salary and will no longer participate in the Company's 2015 Short-term Incentive Program."

Example of ***Downturn***—Michael J. Saylor, CEO of MicroStrategy, Inc.

The proxy statement says, "In September 2014, at Mr. Saylor's request, the Compensation Committee reduced Mr. Saylor's annual base salary to \$1... The Compensation Committee adopted these changes in connection with the Company's restructuring efforts and cost reduction initiatives announced in the second half of 2014."

Example of ***Exchange***—Paul Varello, CEO of Sterling Construction Company

The proxy statement says, "Mr. Varello's compensation of one dollar per year is unusual and was adopted at his request to conserve the Company's cash resources and because of his faith in the future of the Company. His restricted stock award was made in lieu of a cash salary and was submitted to, and approved by, stockholders at the 2015 Annual Meeting of Stockholders."

Example of ***Salary Cuts***—Mark Pincus, CEO of Zynga Inc.

The proxy statement says, "The Company, at Mr. Pincus' request, has reduced his annual salary to $1.00. Mr. Pincus will not participate in the performance cash bonus program for 2013 and will not receive any equity awards."

Example of ***New Employment Agreement***—Edward S. Lampert, CEO of Sears Holdings Corp.

The proxy statement says, "On March 18, 2013, the Compensation Committee and the Board, with Edward S. Lampert recusing himself, approved the terms of an offer letter with Mr. Lampert under which he serves as the Company's Chief Executive Officer. Under the offer letter, Mr. Lampert is paid an annual base salary of $1, effective as of February 1, 2013, the date on which Mr. Lampert began to serve as our Chief Executive Officer."

3.B Sample list of $1 CEO salary announcements

Year	Company Name	Industry	CEO Name	Mechanism
1997	Netscape Communications Corp.	Business Services	James L. Barksdale	Salary Cuts
1998	Capital One Financial Corp.	Banking	Richard D. Fairbank	Exchange
1998	ZixIt Corp.	Business Services	David P. Cook	New Employment Agreement
1999	Kinder Morgan, Inc.	Utilities	Richard D. Kinder	New Employment Agreement
2000	Conseco, Inc.	Insurance	Gary C. Wendt	Exchange
2000	Divine, Inc.	Business Services	Andrew J. Filipowski	Salary Cuts
2001	AMR Corporation	Transportation	Donald J. Carty	Salary Cuts
2001	Delta Air Lines, Inc.	Transportation	Leo F. Mullin	Salary Cuts
2001	Ford Motor Company	Automobiles and Trucks	William Clay Ford, Jr.	Exchange
2002	Lilly Eli & Co.	Pharmaceutical Products	Sidney Taurel	Salary Cuts
2003	Bombay Co.	Retail	James D. Carreker	Exchange
2003	Duke Energy Corp.	Utilities	Paul M. Anderson	New Employment Agreement
2005	Fossil Group, Inc.	Consumer Goods	Kosta N. Kartsotis	Salary Cuts
2005	Google, Inc.	Business Services	Eric E. Schmidt	Salary Cuts
2005	Marvel Entertainment, Inc.	Trading	Isaac Perlmutter	New Employment Agreement
2006	Apartment Investment & Management Co.	Trading	Terry Considine	Exchange
2006	CapitalSource Inc.	Banking	John K. Delaney	Exchange
2006	China Direct Industries, Inc.	Steel Works Etc	Yuejian Wang	New Employment Agreement
2006	Duke Energy Corp.	Utilities	James E. Rogers, Jr.	New Employment Agreement

2006	Flagstar Bancorp, Inc.	Banking	Mark T. Hammond	Salary Cuts
2006	Yahoo!, Inc.	Business Services	Terry S. Semel	Salary Cuts
2007	Bidz.com, Inc.	Retail	David Zinberg	Salary Cuts
2007	Trident Microsystems, Inc.	Electronic Equipment	Glen M. Antle	New Employment Agreement
2007	Whole Foods Market, Inc.	Retail	John P. Mackey	Salary Cuts
2008	American International Group, Inc.	Insurance	Edward M. Liddy	New Employment Agreement
2008	Central Pacific Financial Corp.	Banking	Ronald K. Migita	New Employment Agreement
2008	Emmis Communications	Communication	Jeffrey H. Smulyan	Salary Cuts
2008	Life Time Fitness, Inc.	Entertainment	Bahram Akradi	Salary Cuts
2008	Marvell Technology Group Ltd.	Electronic Equipment	Sehat Sutardja	Salary Cuts
2008	Nautilus, Inc.	Recreation	Edward J. Bramson	New Employment Agreement
2008	Papa Johns International, Inc.	Restaurants, Hotels, Motels	John H. Schnatter	New Employment Agreement
2009	Citigroup, Inc.	Banking	Vikram S. Pandit	Salary Cuts
2009	Coldwater Creek, Inc.	Retail	Dennis C. Pence	New Employment Agreement
2009	Copart, Inc.	Wholesale	Willis J. Johnson	Exchange
2009	GLG Partners	Trading	Noam Gottesman	Salary Cuts
2010	Biolase, Inc.	Medical Equipment	Federico Pignatelli	New Employment Agreement
2010	Copart, Inc.	Wholesale	A. Jayson Adair	New Employment Agreement
2010	National Instrument Corp.	Business Services	James J. Truchard	Salary Cuts
2011	Coldwater Creek, Inc.	Retail	Dennis C. Pence	Salary Cuts
2011	Hewlett-Packard Company	Computers	Margaret C. Whitman	New Employment Agreement
2011	Northern Oil & Gas, Inc.	Petroleum and Natural Gas	Michael L. Reger	Exchange
2012	Teletech Holdings, Inc.	Business Services	Kenneth D. Tuchman	Salary Cuts
2013	Akamai Technologies, Inc.	Business Services	F. Thomson Leighton	New Employment Agreement

2013	Facebook, Inc.	Business Services	Mark Zuckerberg	Salary Cuts
2013	Sears Holdings Corp.	Retail	Edward Scott Lampert	New Employment Agreement
2013	Yelp Inc.	Personal Services	Jeremy Stoppelman	Salary Cuts
2013	Zynga Inc.	Business Services	Mark Pincus	Salary Cuts
2014	MicroStrategy, Inc.	Business Services	Michael J. Saylor	Salary Cuts
2014	Shutterstock, Inc.	Business Services	Jonathan Oringer	Exchange
2014	ZaZa Energy	Petroleum and Natural Gas	Todd A. Brooks	Salary Cuts
2015	AMR Corporation	Transportation	William Douglas Parker	Exchange
2015	Cheniere Energy	Utilities	Charif Souki	Salary Cuts
2015	Sterling Construction Company	Construction	Paul Varello	Exchange
2015	Twitter, Inc.	Business Services	Jack Dorsey	New Employment Agreement
2015	Valeant	Pharmaceutical Products	Michael Pearson	New Employment Agreement
2016	Inseego Corp. (Novatel Wireless)	Electronic Equipment	Susan G. Swenson	New Employment Agreement
2016	Unilife Corporation	Medical Equipment	Alan Shortall	Salary Cuts
2018	Tandem Diabetes Care, Inc.	Medical Equipment	Kim D. Blickenstaff	Salary Cuts
2019	Ebix, Inc.	Business Services	Robin Raina	Exchange
2019	Prologis, Inc.	Trading	Hamid R. Moghadam	Exchange
2020	EQT Corporation	Utilities	Toby Z. Rice	New Employment Agreement
2020	Luby's, Inc.	Restaurants, Hotels, Motels	Christopher J. Pappas, Jr.	Salary Cuts
2020	Mednax, Inc.	Healthcare	Roger J. Medel	Salary Cuts

Chapter 4

The Role of Corporate Social Responsibility: Evidence from Market Reaction to Data Breach Announcements

4.1 Introduction

The discussion of corporate social responsibility (CSR) activities in empirical research on firm performance has proliferated in recent years.[1] In terms of firm performance and

[1]Empirical research on CSR includes socially responsible investing (SRI) performance and the relationship between firms' CSR attributes and firm characteristics such as firm management, ownership structure, and firm risk (Gillan, Koch, and Starks, 2021; Renneboog, Ter Horst, and Zhang, 2008). In this study on CSR in corporate finance, I primarily focus on the relationship between CSR activities and firm performance/value, using event study methodology in my empirical analysis. Therefore, I may omit some reviews or discussions of the broader social capital literature. For the research on whether CSR affects firm performance, previous studies that examined short-term stock reactions to CSR-related events have shown mixed results (Flammer, 2015; Krüger, 2015; Masulis and Reza, 2015). Also, unexpected events can be used to measure the effect of CSR on firm value by comparing event announcement returns between high and low

firm value, there is still considerable debate on whether CSR activities benefit a firm, with two competing views. The stakeholder value maximization view suggests that CSR activities positively affect shareholder wealth due to the greater alignment of interests of shareholders and other stakeholders through higher investment in CSR. In contrast, the shareholder expense view suggests that CSR activities are made at the expense of shareholders to help other stakeholders, resulting in reductions in shareholder wealth (Deng, Kang, and Low, 2013; Ferrell, Liang, and Renneboog, 2016). To reconcile the dispute over social capital, studies in the CSR field rely on a firm's social performance measurement to reflect the firm's engagement in CSR activities. At the firm level, environmental, social, and corporate governance (ESG) ratings are often used in empirical research to quantify CSR activities.[2] ESG refers to how companies integrate concerns about these dimensions into their business models, and ESG ratings from rating providers allow investors to examine companies for ESG performance (Berg, Kölbel, and Rigobon, 2022; Gillan, Koch, and Starks, 2021). In practice, the Governance & Accountability Institute reported that ninety-six percent of S&P 500 companies and eighty-one percent of Russell 1000 companies published ESG reports in 2021, highlighting the importance of ESG to investors and stakeholders in practice.[3] However, a divergence of ESG scores from different providers still exists, challenging the credibility of the ratings and warning investors to interpret the scores with caution (Berg, Kölbel, and Rigobon, 2022; Chatterji, Durand, Levine, and Touboul, 2016; Dorfleitner, Halbritter, and Nguyen, 2015).[4]

CSR firms (Deng, Kang, and Low, 2013). In addition to short-term stock returns, according to Gillan, Koch, and Starks (2021), other firm performance measures in previous studies include long-run stock returns, return on assets (ROA), return on equity (ROE), Tobin's Q, etc.

[2]Following previous studies, I use the terms sustainability ratings, CSR ratings and ESG ratings interchangeably.

[3]https://www.ga-institute.com/nc/storage/press-releases/article/new-ga-institute-research-shows-sustainability-reporting-by-largest-us-public-companies-reached-a.html

[4]Berg, Kölbel, and Rigobon (2022) examine six ESG rating agencies, including Kinder, Lydenberg, and Domini (KLD), Sustainalytics, Moody's ESG (Vigeo-Eiris), S&P Global (RobecoSAM), Refinitiv (Asset4), and MSCI to research the disagreement among ESG ratings. In this paper, I utilize the MSCI ESG KLD STATS data set and Bloomberg ESG Ratings.

This study uses US data breaches as an exogenous adverse event to explore the relationship between CSR activities and stock performance. As an unexpected event for companies, a data breach involves an intentional or unintentional leakage of proprietary information that can compromise the security and privacy of a firm and its stakeholders. The breach may vary in the way that information is leaked and in the extent of its consequences.[5] If not managed properly, data breaches can cause a loss of reputation and stakeholder confidence and lead to financial losses and litigation. Consequently, data breaches affect shareholder wealth. According to IBM's annual Cost of a Data Breach Report for 2022, the average cost of a data breach in the United States was $9.44 million, and the breaches occurred in firms, large and small, across all sectors of the economy.[6] Many empirical studies on CSR argue that firms' existing CSR engagement can act as insurance against adverse shocks (Barrage, Chyn, and Hastings, 2020; Godfrey, Merrill, and Hansen, 2009; Lins, Servaes, and Tamayo, 2017). Considering the reported odds/scope of data breaches and the consequences for firm operations, this study's investigation into the announcements of information leakage augments prior research, linking the literature on CSR with data breaches.

This study focuses on the public disclosure of data breaches to examine their economic effect on publicly traded firms. When a company publicly announces a data breach, it reports the details of the event and the affected populations.[7] For example, on March 29, 2018, Under Armour, Inc., an American sports equipment company headquartered in Baltimore, issued a press release regarding a data breach, noting in an 8-K filing that "an unauthorized party acquired data associated with MyFitnessPal user accounts," and

[5]The company data can be either stolen intentionally or misplaced by accident. Examples of different kinds of data breaches are shown in Appendix 4.B.

[6]https://www.ibm.com/reports/data-breach

[7]The announcement of data breach events may be postponed or suppressed. In this study, the announcement dates are gathered from the Privacy Rights Clearinghouse (PRC) website (https://privacyrights.org).

that "approximately 150 million user accounts were affected by this issue." The news sent Under Armour's shares down almost four percent in after-hours trading. In addition, the consequences of the data breach were disclosed in its 2019 10-K filing: "a consumer class action lawsuit has been filed against us in connection with this incident," and "we may face a number of legal claims or investigations by government regulators and agencies." Considering the consequences for the firm, data breaches will precipitate a stock price reaction, and the expected costs should be reflected in the extent of this reaction. Supporting this argument, previous research on data breaches has shown that the stock market reacts to data breaches negatively and that corporate policies and managerial compensation plans change as a result (Arcuri, Brogi, and Gandolfi, 2017; Campbell, Gordon, Loeb, and Zhou, 2003; Cavusoglu, Mishra, and Raghunathan, 2004; Das, Mukhopadhyay, and Anand, 2012; Gatzlaff and McCullough, 2010; Kamiya, Kang, Kim, Milidonis, and Stulz, 2021; Lending, Minnick, and Schorno, 2018).

To examine the impact of breached firms' CSR activities on investors' reactions to them, I build a sample of 167 data breaches at publicly traded US companies between 2005 and 2019. I collected data on the calendar dates of disclosure, the types of data breaches, and the numbers of affected populations from the Privacy Rights Clearinghouse (PRC) website.[8] Using event study methodology, I estimate the consequences of data breaches on the market value of breached firms. Like the findings of previous studies, I find significantly negative cumulative average abnormal returns (CAARs) in the event windows relative to the announcement date.[9] The quartile analysis also shows that the larger the affected populations in data breaches, the more negative the CAARs.

[8]The database on the PRC website starts in 2005, and I need breached firms' three-year accounting data after their data breaches for analysis. Therefore, I use the data breaches between 2005 and 2019.

[9]I use different event windows in the empirical analysis, following previous studies. The results are generally consistent. Negative returns prior to the event date indicate possible "leakage" of bad news.

To investigate whether CSR activities provide insurance-like protection against negative shocks, I utilize annual ESG score data of breached companies provided by the MSCI ESG KLD STATS and Bloomberg databases to examine the effect on data breach-related stock performance of perceived trust built through CSR activities. I split the sample into high and low CSR groups based on whether the pre-breach ESG scores of a breached company are above or below the median and compare the CAARs of the two groups. I find that the market reaction is significantly negative for only the low CSR group. Furthermore, multivariate regression results indicate that, in addition to the negative impact of breach size, the pre-breach ESG scores of breached companies are positively associated with the announcement date abnormal returns. Since data breaches happen in different industries in several ways, I also investigate whether the types of data breaches and companies make a difference in the market reaction to the announcement. I do not find that cyberattacks using hacking or malware precipitate larger reactions than other types of breaches, while the results for the financial sector indicate that financial firms may be affected more by data breaches than firms in other sectors. As robustness checks, I consider multiple data breach events for a firm as well as other announcements before a data breach. The results are the same. In addition, comparing the results for different ESG scores during the same period, I conclude that whether investors can rely on CSR ratings from a specific provider consistently to make decisions requires careful consideration.

Overall, this study adds to the literature on CSR activities by using corporate information leakage as a negative shock to examine how the market assesses the event when it hurts the trustworthiness and reputation of a company and whether CSR activities pay off in the face of adversity. Using announcement date returns for unanticipated events such as data breaches avoids the reverse causality problem in the relationship between CSR and firm value. My findings are consistent with the argument of previous studies that CSR performance before the event acts as insurance to ameliorate investors' negative views of the firm when an exogenous adverse event happens. I find that the market response operates through the social performance (S) category, which may answer the question of how a firm should improve its CSR standing. I also examine breached firms' business operations and their commitment to enhancing CSR performance after data breaches. I find weak evidence that the low CSR group needs to decrease R&D expenditures and hoard cash more in response to potential expenses due to data breaches. Also, low CSR firms have a significantly positive change in their post-breach ESG scores compared to high CSR counterparts. At the same time, this study acknowledges the difficulty of using a single ESG rating to evaluate a firm's commitment to CSR. When I use different ESG rating sources, the results of the CAAR comparison differ slightly.

The remainder of this paper proceeds as follows. The next section reviews the previous literature on the impact of data breaches and CSR activities on firm value. Then I develop my research hypotheses in Section 4.3. The research methodology, including data collection and variable construction, is described in Section 4.4. Section 4.5 presents the results of the empirical analyses, including the announcement-date abnormal returns of the breached firms and the regressions for the impact of CSR activities. Section 4.6 concludes.

4.2 Literature review

4.2.1 Data breaches

Previous studies have investigated the impact of data breaches on the stock price of breached firms when the news is disclosed to the public. A data breach announcement typically reveals the nature of the breach and its affected contents to the public. Quantifying the extent of a data breach, the size of affected populations and the contents of data lost or stolen determines the damage to breached firms. If private or sensitive information is leaked and then the leakage is disclosed, the breached firms may face significant financial losses and possible litigation, which will affect firm value. The breached firm may reveal its plans to correct or upgrade its information systems at the same time, which also increases the cost of data breaches. Thus, breached firms incur costs related to not only the loss of old and potential customers but also necessary repairs and upgrades. In addition, intangible costs such as loss of customer trust and firm reputation may represent a significant cost in the long run (Cavusoglu, Mishra, and Raghunathan, 2004). Previous studies on data breach announcement date returns find that the market generally reacts negatively to data breach news, while the reactions to data breach types and affected industries are mixed.[10] Campbell, Gordon, Loeb, and Zhou (2003) show that only breach events involving unauthorized access to confidential information are of significant concern to investors, while Cavusoglu, Mishra, and Raghunathan (2004) argue that breach types do not matter. As for the divisions of breached companies, Arcuri, Brogi, and Gandolfi (2017) show that financial firms suffer more severely from cyberattacks than other types of companies, in keeping with their greater sensitivity to such attacks.

Data breaches highlight not only the cost of information security but also the need for security products. After a breach, breached companies need to update their information security to prevent future intentional attacks. Examining the stock returns of both breached firms and internet security developers, Cavusoglu, Mishra, and Raghunathan

[10]Previous research on the market reaction to data breach announcements calculates the cumulative average abnormal returns (CAARs) in the event windows. The statistical results indicate significantly negative CAARs in most cases. The classification of data breaches can vary in different studies though. For example, when examining IT security breaches, Cavusoglu, Mishra, and Raghunathan (2004) classify the breaches into three types of attacks: access attacks, modification attacks, and denial-of-service (DOS) attacks. Arcuri, Brogi, and Gandolfi (2017) divide the breaches into four types of attacks: unauthorized access to confidential information, computer virus and worm, DOS attack, and system breakdown, and define unauthorized access to confidential information as a confidential attack.

(2004) show that the market reaction to data breach announcements is negative for breached firms but positive for security developers.

In addition to the stock market response to a data breach announcement, breached firms may be affected in other ways. Lending, Minnick, and Schorno (2018) argue that companies replace their CEOs and chief technology officers as a response to their customers or a need for a change in leadership following data breaches. Kamiya, Kang, Kim, Milidonis, and Stulz (2021) examine the impacts of cyberattacks on corporate debt and investment policies, operating performance, and CEO compensation plans. They argue that if a cyberattack leads to the reassessment of firm risk exposure by the board, it will result in changes in investment and compensation plans. They also find that the proportion of option awards of total CEO pay falls following a data breach. The components of equity-based compensation for CEOs are adjusted by replacing stock options with restricted stock to decrease the CEO's risk-taking incentives.

4.2.2 Corporate social responsibility

Previous literature has investigated the role of trust and social capital in markets and corporations (Jensen, 2001; Knack and Keefer, 1997). Corporate social responsibility (CSR) activities have been empirically examined to measure the concept of social capital at the firm level and to investigate the impact of these activities on firm value and financial performance. Two opposing views on CSR activities, namely shareholder cost and stakeholder value maximization, have emerged (Ferrell, Liang, and Renneboog, 2016; Gillan, Koch, and Starks, 2021; Lougee and Wallace, 2008). In empirical research, environmental, social, and corporate governance (ESG) scores from different rating providers have been utilized to quantify CSR activities, and an exogenous event can be used to examine the relationship between CSR activities and firm value. For example, using merger events and investigating merger announcement-date returns, Deng, Kang, and

Low (2013) support the good governance view that CSR activities focusing on stakeholder interests can also enhance shareholder wealth. For high CSR firms, a stronger alignment of the interests of shareholders and other stakeholders results in higher merger announcement returns and long-term firm profitability. Likewise, using data on the adoption of close-call CSR proposals[11], Flammer (2015) examines the causal effect of CSR on corporate financial performance and the channels through which CSR impacts shareholder value. Her results suggest that the relationship between CSR and corporate financial performance is concave. Ferrell, Liang, and Renneboog (2016) support the good governance view with global data, showing that well-governed firms tend to have higher CSR ratings, and thus, their firm value is enhanced.[12]

Consistent with the argument above, other empirical studies have shown that CSR activities can provide insurance against a negative shock such as an oil spill or a financial crisis (Barrage, Chyn, and Hastings, 2020; Godfrey, Merrill, and Hansen, 2009; Lins, Servaes, and Tamayo, 2017). Whether the trust built through CSR activities consistently benefits firms is uncertain though.[13] Godfrey, Merrill, and Hansen (2009) argue that companies engage in CSR activities to create value for shareholders when facing negative events. Examining 2008-2009 financial crisis period returns, Lins, Servaes, and Tamayo (2017) show that social capital, measured by a CSR index, has a positive impact on returns only during the period when investors and the overall economy face a catastrophic crisis of trust. According to Lins, Servaes, and Tamayo (2017), "during an unexpected decline in the general level of trust, outside shareholders are likely to be more concerned

[11]Close-call proposals are those that pass by a narrow margin of votes in annual meetings. Flammer (2015) utilizes the passage of the close-call CSR proposals as a random assignment of CSR to companies to deal with the endogeneity between CSR and corporate financial performance.

[12]Ferrell, Liang, and Renneboog (2016) conclude that more CSR activities are not always better though. They argue that CSR activities are not inevitably induced by agency problems.

[13]Bae, El Ghoul, Gong, and Guedhami (2021) find no evidence that CSR activities affected stock returns during the COVID-19 pandemic.

that the financial information they previously relied upon to guide investment decisions may not be credible" (p. 1791). Therefore, investors will seek metrics such as CSR ratings reflecting a firm's integrity and place a valuation premium on firms considered to be more trustworthy.

While previous research on CSR activities has shown their role in enhancing firm value, empirical identification of the divergence of CSR ratings from different providers has aroused concerns about the transparency and consistency of ESG scores (Berg, Kölbel, and Rigobon, 2022; Chatterji, Durand, Levine, and Touboul, 2016; Dorfleitner, Halbritter, and Nguyen, 2015; "Poor scores" 2019). Berg, Kölbel, and Rigobon (2022) argue that ESG rating disagreement could result in difficulties in performance evaluation and decision-making for managers, investors, and researchers. Identifying three sources of ESG rating divergence, including the scope of attributes, weights on attributes, and indicators for measuring attributes, they suggest that rating divergence arises primarily from different indicators used by rating agencies when they measure the same attribute.

4.3 Research questions and hypotheses

Based upon the findings of the previous literature on both data breaches and CSR, the main objective of this study is to examine the impact of CSR activities, measured by ESG scores, on the stock market reaction to public data breach announcements. To examine the stakeholder view of CSR, I ask whether intangible trust built through CSR investment benefits firms when an information security crisis unexpectedly occurs. In particular, I ask:

Q1 Do CSR activities benefit the breached companies when information security breaches happen?

Q2 Does the value of CSR activities in mitigating the negative impact of breaches depend on the firm's sector?

Q3 Do the breached companies improve their CSR performance following data breaches?

Lins, Servaes, and Tamayo (2017) have shown that high CSR firms performed better than low CSR firms during the 2008-2009 financial crisis and stated that "the trust between a firm and both its stakeholders and investors, built through investments in social capital, pays off when the overall level of trust in corporations and markets suffers a negative shock" (p. 1785). Likewise, revealing that private or sensitive information has been released, a data breach announcement can sabotage the trust of investors and other stakeholders in the breached company. The fear of being attacked can be contagious in the same industry or the overall market if the information release results from externally intentional attacks. A company's data breach may arouse public concerns about the vulnerability of the technology used in digital safety if the event results from hacking or malware, which causes the market to worry about similar attacks on other companies and perceive it as a systemic problem that indicates the susceptibility of an entire industry (Kashmiri, Nicol, and Hsu, 2017).[14] According to Godfrey (2005), certain types of CSR activities can generate more moral capital or goodwill during a negative event, creating value for shareholders in the face of adversity. If the trust built through CSR activities before a breach acts as insurance against the adverse shock, the negative market reaction to its announcement will be mitigated. This implies that higher CSR firms are rewarded for being more trustworthy. I also examine whether the mitigation effect is more significant in the sectors that suffer most from sensitive information loss, operation failure and reputation damage. Lev, Petrovits, and Radhakrishnan (2010) argue that the effect

[14]Looking into the contagion effect of a firm's customer data breach on other firms in the same industry, Kashmiri, Nicol, and Hsu (2017) argue that the better the CSR performance of a firm, the smaller its stock price reaction to another firm's data breach announcement. In this study, I focus on the objects of data breaches themselves.

of CSR activities is more significant in business-to-consumer (B2C) industries where individual consumers predominate. Arcuri, Brogi, and Gandolfi (2017) argue that the financial sector suffers most severely from cyberattacks due to higher sensitivity to such attacks than other entities. Kamiya, Kang, Kim, Milidonis, and Stulz (2021) also suggest that the impact of cyberattacks on operating performance may vary across industries. I should also find that the impact on operating performance differs between high and low CSR firms. Besides, after the information leakage or attacks, the breached companies endeavour to re-establish their reputation (Akey, Lewellen, Liskovich, and Schiller, 2021). If CSR performance is related to firms' reputation rebuilding, the breached firms with lower pre-breach ESG scores should be incentivized to make more efforts to improve their CSR performance. Therefore, I formulate the following hypotheses:

H1 High CSR firms should have fewer negative data breach announcement returns than low CSR firms.

H2 The mitigation effect should be more significant for the financial sector than for other sectors.

H3 The post-breach ESG scores of low CSR firms should improve more than those of high CSR firms.

4.4 Sample selection

To examine the impact of data breaches on breached companies, I gather relevant information, including the affected populations and the type of each data breach, from the Privacy Rights Clearinghouse (PRC) website (https://privacyrights.org) and impose several filters on the data set:

1. The breached companies are publicly traded on the NYSE, AMEX, or NASDAQ.

2. The announcement dates of data breaches are available on the PRC website.

3. The types of data breaches and involved organizations are available on the PRC website. The types of breaches include CARD (Payment card fraud), DISC (Unintended disclosure), HACK (Hacking or malware), INSD (Insider), PHYS (Physical loss), PORT (Portable device), and STAT (Stationary device). The types of firms include BSF (Businesses – Financial and Insurance Services), BSR (Businesses – Retail/Merchant), and BSO (Businesses – Other).

4. The breached companies' environmental, social, and corporate governance (ESG) performance indicators must be available from the MSCI ESG KLD STATS or Bloomberg database.[15]

5. The populations affected by a data breach (the "Total Records" number from the PRC website) must be greater than 1,000.

6. I utilize the first event if a firm has multiple data breaches during the sample period from 2005 to 2019, because the reaction to the first event will not be affected by previous firm breach events.

7. The companies have the necessary accounting data in the Compustat database.

This procedure produces a sample of 167 data breaches as the basis for the study. The frequency of data breaches over time and the types of data breaches and firms are reported in Table 4.1. Panel A of Table 4.1 provides the year-wise distribution of the sample, showing that data breaches between 2005 and 2008 account for more than half of my sample.[16] As for the types of breaches and firms, panels B and C show

[15]For my sample, the Bloomberg database provides the CSR data from 2005 to 2019, while the MSCI ESG KLD STATS database provides the data from 2005 to 2016.

[16]The data concentration in the earlier years in my data set is due to the collection of only the first data breach. I include multiple events of a firm in Section 4.5.3.

that "Hacking or malware (HACK)" and "Portable device (PORT)" are the main types of data breaches, while the sample is composed of the three types of firms in similar numbers. The details of the events, including the type of each breach and the size of the affected populations, are listed in Appendix 4.A. For greater clarity, examples of each breach type are provided in Appendix 4.B.

To gauge the effect of CSR activities, I use the ESG scores from the MSCI ESG KLD STATS and Bloomberg databases, which provide three standardized ESG scores for the breached companies. The MSCI ESG KLD STATS database lists ESG performance indicators in three categories: environmental, social, and governance. In each category, the score depends on the number of positive (strengths) and negative (concerns) indicators, and the composite is calculated using yearly data in different formulas. Appendix 4.C explains the detailed calculations of the standardized ESG scores.[17] I collect each breached firm's ESG scores evaluated before the data breach event. Then the entire sample is separated into high and low ESG groups for further comparison, according to whether the firm's ESG score is above or below the median. After combining with the data set of ESG scores from the MSCI ESG KLD STATS database, the sample includes 110 data breach announcements.[18]

4.5 Empirical analysis and results

4.5.1 Event study on the announcement of data breaches

To examine the market reaction to data breach announcements, I measure abnormal returns by using the market model with the CRSP equally weighted and value-weighted

[17] I utilize two standardized scores derived from the MSCI ESG KLD STATS data and one standardized score derived from the Bloomberg data.

[18] There are only fifty announcements when I use the Bloomberg database. The details are explained in Section 4.5.4.

indices. Expected returns are estimated using a 255-day estimation window and a 46-day gap between the estimation window and the announcement date.[19] Cumulative abnormal returns (CARs) are summed over days relative to the announcement date. The results of the cumulative average abnormal returns (CAARs) for five event windows are reported in Table 4.3. In panel A, the results for the entire sample show that the market reacts significantly negatively to public announcements of data breaches. The equally weighted CAARs in the (−1, +1) and (−2, +2) windows are significantly negative, −0.51% and −0.83%, respectively. The value-weighted CAARs in the same windows, −0.47% and −0.72%, are also significantly negative at the five percent level. The significantly negative CAARs before the official announcements of data breaches indicate the possibility of the leakage of bad news.[20] Panel B reports the CAARs in four quartiles based on the ranking of the size of the populations affected by a data breach (see Appendix 4.A for numbers). Firms in the first (fourth) quartile have the least (most) affected populations. I find that both equally weighted and value-weighted CAARs in the first four windows from (−1, +1) to (−5, +5) decrease with the severity of data breaches. In the (−2, +2) window, the CAARs reach their lowest value in the fourth quartile, −2.39% and −2.45%. The results of significantly negative CAARs suggest that the market sees a data breach announcement as an unexpected adverse event, and the potential consequences for the breached firm's future concern investors. More affected consumers or service users bring a more negative stock market reaction. Figure 4.1 illustrates the decreasing patterns of the CAARs with the scope of the data breaches.

[19]I also use a shorter estimation window to calculate the abnormal returns. In Table 4.D1 of Appendix 4.D, the estimation window ends 50 days before the event, and the window length is 100 days.

[20]The breached companies may try to cover or delay upcoming bad news about the data breach. Therefore, the data breach possibly happens some time before its public announcement date.

To examine the market's view of ESG scores rated for security-breached firms, I use pre-breach ESG scores to divide my sample into high and low ESG groups and compare the CAARs of the two groups. Considering the trust built through CSR activities, I expect the high CSR group to have lower negative abnormal returns than the low CSR group. Utilized in Albuquerque, Koskinen, and Zhang (2019), the ESG1 and ESG2 scores are two standardized measures of CSR bounded by −1 and 1 from the MSCI ESG KLD STATS database. I define the high and low ESG groups based on whether the ESG1 or ESG2 score of the firm is above zero or not. Panels C and E report the CAARs for the high and low ESG groups based on the ESG1 and ESG2 scores, respectively. In panel C, the breached companies with low (or negative) ESG1 scores have significantly negative announcement date abnormal returns. The equally weighted CAARs in the (−1, +1) and (−2, +2) windows are −1.32% and −2.00%, significant at the one percent level. The value-weighted CAARs in the same windows, −1.35% and −2.02%, are also significant at the one percent level. In contrast, all the equally weighted and value-weighted CAARs for the breached firms with high (or positive) ESG1 scores are insignificant in the same event windows. The results are similar when the ESG2 scores are used in panel E. The equally weighted CAARs in the (−1, +1) and (−2, +2) windows are −1.19% and −2.07%, and the value-weighted CAARs in the same windows are −1.21% and −2.10%, all significant at the one percent level. Panels D and F show that the difference in the CAARs between the two groups (low minus high) increases with the event window's length.

Overall, the event study results show that the breached firms with low (negative) standardized ESG scores experience a significantly negative market reaction to their data breach announcements, while the breached firms with high (positive) standardized ESG scores do not. The findings suggest that highly rated CSR activities quantified by positive ESG scores mitigate the market's negative view of data breach announcements, which supports my first hypothesis.

4.5.2 Firm characteristic statistics and regression analysis

The statistics for firm characteristics and data breaches are reported in Table 4.4, including total assets, breach size, return on assets (ROA), Tobin's Q, and leverage. I utilize these firm characteristic variables to examine the role of CSR activities in alleviating the negative market reaction to the news of data breaches in a multivariate setting. Table 4.2 provides a description of all the variables used in the study. Breach size is measured as the size of the populations affected by a data breach event to appraise the level of a data breach. For firm performance, the return-on-assets ratio (ROA) is defined as the ratio of net income to the book value of total assets. Tobin's Q is the ratio of the market-to-book value of assets. Leverage is the sum of short-term and long-term debt scaled by total assets. In panel A of Table 4.4, the median breach size is 55,819. When the whole sample is divided according to the ESG1 scores in panel B, I find no significant difference in the statistics for firm characteristics between the "High ESG1" and "Low ESG1" groups. The results hold when the ESG2 scores are used in panel C. Table 4.5 reports the correlations between independent variables used in the regression analysis that follows. They do not indicate the presence of multicollinearity, which I confirm with variance inflation factor (VIF) tests below. My main regressions take the form:

$$\begin{aligned} CAR_{i,t} = \alpha + \beta_1 \times ESG\ dummy_{i,t} + \beta_2 \times Breach\ size_{i,t} + \beta_3 \times Firm\ size_{i,t} + \\ \beta_4 \times ROA_{i,t} + \beta_5 \times TQ_{i,t} + \beta_6 \times Leverage_{i,t} + \epsilon_{i,t} \end{aligned} \tag{4.1}$$

where the main variables of interest in my tests are the ESG dummy and the size of the data breaches. For ESG scores, I have ESG1 and ESG2 scores from the MSCI ESG KLD STATS database; for the size of data breaches, I utilize both the actual number and the number scaled by firm size. The scores from the Bloomberg database are used for robustness checks.

The regression results are reported in Table 4.6. The dependent variables are the cumulative abnormal returns (CARs) in five event windows. Firm-level control variables in each regression include firm size, ROA, Tobin's Q, and leverage before the data breach announcement date. In addition, one dummy variable for the ESG score is added to the regressions to control for the CSR activities of breached firms. The ESG dummy is set equal to one if the standardized ESG score is above zero and equal to zero if the score is negative. According to my first hypothesis, I expect the coefficient for the ESG dummy to be positive.

Supporting my first hypothesis, the regression results in Table 4.6 show that the coefficient for the ESG dummy is significantly positive, and the coefficient for the measure of breach size is significantly negative. The coefficients indicate that when the extent of a data breach is more severe, with larger affected populations, the market reaction to the bad news is more negative. In terms of CSR activities and ratings, for a breached firm, a higher ESG score mitigates the market reaction to its data breach announcement. In panels C and D of Table 4.6, I scale the breach size, dividing the affected populations by total assets, and include an interaction term defined as the product of the dummy variable for ESG scores and scaled breach size. Significantly positive coefficients for the interaction term indicate that a higher positive pre-breach ESG score of the breached firm is associated with a less negative stock price reaction to the bad news of a data breach. The negative impact of data breaches is mitigated when firms have positive pre-breach ESG scores.[21] In my regression analyses, I rely on variance inflation factors (VIFs) to detect multicollinearity. In Table 4.6, the VIFs for all the estimated regression

[21]When examining the relation between a firm's CSR performance and the market reaction to its data breach announcement in this study, I need to acknowledge potential endogeneity issues which should be addressed in further empirical research. In particular, I need to be cautious in interpreting results in Table 4.6 due to potential endogeneity bias due to omitted variables.

coefficients are less than four, which suggests that their variances are not increased by intercorrelations among the independent variables.[22]

In Table 4.7, I add another dummy variable, denoted "D_FIN," which is equal to one if the company belongs to the financial sector according to four-digit Standard Industrial Classification (SIC) codes.[23] Thirty-two of 110 sample firms are classified as "Finance" firms. The results show that only the coefficients for the dummy variable for the financial sector are significantly negative in columns (b) and (e), which indicates that the companies in the financial sector may suffer more from data breaches than other firms. In addition to SIC codes, I use the firm type from the PRC website to create an alternative dummy variable, which is equal to one if the type of organization is "BSF (Businesses – Financial and Insurance Services)" in Table 4.8. In addition to the significantly negative coefficient for breach size, −0.006, only the coefficient for the "D_FIN" dummy is significantly negative, −0.023, at the ten percent level, in column (b). As for my second hypothesis, I include an interaction term defined as the product of the dummy variable for the financial sector and the actual ESG score to examine the additional effect of ESG scores in the financial sector, but the results for the interaction term are not significant.

4.5.3 Multiple events for a firm

For a firm, data breaches no doubt can happen several times; therefore, I create an alternative sample by retrieving multiple data breach events for the same firm. When using

[22] In the following regression analyses, I also use VIFs to detect multicollinearity when I add additional dummy variables and use alternative subsamples. The VIFs for the estimated regression coefficients are still less than four, which is satisfactory. I also test for heteroscedasticity and normality of residuals. My main regression results in the (−1, +1) window in Section 4.5 are not against null hypotheses for homoscedasticity and normality of residuals.

[23] I utilize "Finance" firms with the SIC codes 6000-6999 based on the twelve industry classifications from Kenneth French's website (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html).

multiple events for a firm, I need to prevent the possible overlap between events. That is, for a data breach event, the overlap between its estimation window and the last event of the same firm needs to be avoided. According to the default length of the estimation window in this study, the difference between two event dates of the same firm is more than a year. With this no-overlap requirement, the alternative sample includes 139 data breach events after being combined with the data set of ESG scores.[24] The cumulative average abnormal returns (CAARs) and regression results for the alternative sample are shown in Tables 4.9 and 4.10, respectively. Like the findings above, the CAARs deteriorate with increasingly affected populations in breach quartiles. The market reaction to data breach announcements for the low CSR firms is significantly negative in panels C and E of Table 4.9, and the coefficients for the ESG dummy and the breach size in panels A and B of Table 4.10 are significantly positive and negative, respectively. Panels C and D of Table 4.10 also show the significantly negative coefficients for the scaled breach size and the significantly positive coefficients for the interaction term, which is consistent with the results in section 4.5.2.

4.5.4 Alternative CSR measurement

Previous research has indicated that the ratings of the various ESG agencies may not be highly correlated with each other (Berg, Kölbel, and Rigobon, 2022; Diebecker, Rose, and Sommer, 2019; "Poor scores" 2019). To examine if the market reaction corresponds to different ESG scores in the same way, I use standardized and raw Bloomberg ESG scores as alternatives. Table 4.11 uses the standardized Bloomberg ESG scores bounded between −1 and 1 for classification. The sample includes only fifty data breach events,

[24] Using multiple events for a firm, I have 208 data breach events before combining them with the data set of ESG scores. Compared to Table 4.1, the percentage of events in each year after 2010 increases, which indicates recurring data breach events. When I use the alternative shorter estimation window (see note 18 above), my sample size increases from 139 to 147. The CAAR results for multiple events using the shorter estimation window are shown in Table 4.D2 of Appendix 4.D.

indicating that not all my sample firms have both the MSCI ESG KLD and Bloomberg ESG scores. The negative market reaction to data breach announcements in panel C is only significant for the low ESG group. However, the difference test results in panel D do not show a significantly negative difference in CAARs between the high and low ESG groups. The regression results using the standardized Bloomberg ESG scores in Table 4.12 do not support my earlier findings either. The coefficient for the ESG dummy is still positive in each column of panel A but not significant. I only find significantly negative coefficients for the scaled breach size in columns (a) and (b) of panel B when the interaction term is included.[25]

I also calculate the correlations among the three standardized ESG scores used above. Of the 110 data breach events used in Table 4.3, only forty-nine have Bloomberg ESG scores. The correlation between the MSCI ESG1 scores and the MSCI ESG2 scores is 0.86, while the correlation between the MSCI ESG1 scores and the Bloomberg ESG scores is 0.36, and the correlation between the MSCI ESG2 scores and the Bloomberg ESG scores is 0.40. The less-than-fifty percent correlations are consistent with the findings in previous studies, which suggests that there is at least some level of disagreement regarding CSR activities when different providers measure them.

4.5.5 Types of breaches

As for the types of data breaches, the data from the PRC website include technology-related types such as hacking, malware, or portable devices, and employment-related types such as insider behaviour. I investigate whether the positive impact of CSR ratings

[25] A comparison between high and low ESG groups based on the median of the raw Bloomberg scores is provided in Table 4.D3 of Appendix 4.D. In addition, I use the raw scores to form an alternative sample and define a superior (inferior) firm as a firm with a z-score half a standard deviation above (below) the sample mean. However, the comparison of CAARs using this alternative method is inconsistent with the other results in section 4.5. The table is available upon request.

is more significant in a certain type of data breach than another. I use a dummy variable (D_BRE), which is equal to one if the type of breach is "HACK (Hacking or malware)." The results in Table 4.13 do not show that the market reaction to hacking events is significantly stronger than the reaction to other types of data breaches. Even though the "HACK" breaches could result in additional information security costs afterwards, compared to other accidental breaches, my results show that the market still emphasizes the affected populations when data breaches happen. Though not presented here, I do not find an additional effect of ESG scores for the "HACK" type of data breaches either.[26]

4.5.6 Do all measures of CSR activities matter?

Another question I can ask is whether all measures of CSR activities matter in alleviating the negative market reaction to public data breach announcements. Standardized ESG scores from the MSCI ESG KLD STATS database are composed of three categories, specifically environmental, social, and corporate governance. I examine the effect of the scores for each category on the CARs to determine which are of most concern to investors. For each category, a dummy variable is set equal to one if the standardized score is above zero and equal to zero if the score is negative. The regression results with the three categories of ESG1 in panel A of Table 4.14 show that the coefficients for only the social score (SOC1) dummy are significantly positive in columns (d), (e), and (f). In Table 4.15, when the scaled breach size and the interaction term are used, the regression results for the social score dummy indicate the mitigating effect of positive social performance scores on the negative market reaction to the news of a data breach.

[26]As I did for the additional impact of ESG scores on the financial sector in section 4.5.2, an interaction item defined as the product of the "HACK" dummy variable and the actual ESG score is included in the regressions. The table is available upon request.

4.5.7 Pre-breach events

The occurrence of other events before the announcements of data breaches could affect the estimation of abnormal returns. I investigate whether firms report their earnings within fourteen days before data breach announcements. Earnings announcement dates were collected from the I/B/E/S database to create a sample that excludes firms that announce quarterly earnings within the two-week period preceding their data breach announcements. The result was a sub-sample of ninety-six of the breached firms in the original sample. The regression results in Table 4.16 are consistent with those in Tables 4.6 and 4.10, indicating a negative and significant impact on data breaches of CARs. In addition, a dummy variable used to control for negative earnings disclosure is set equal to one if the disclosed earnings are negative. However, the coefficient for the dummy turned out to be insignificant.[27]

4.5.8 Post-breach CSR investment

I also examine whether the CSR investment of the breached companies changes after a breach has occurred. CSR investment is regarded as a tool to restore a company's reputation harmed by a data breach (Akey, Lewellen, Liskovich, and Schiller, 2021). As discussed earlier, I found that low CSR firms experienced a stronger negative market reaction to the announcement of data breaches than high CSR firms. For each breached firm, I calculate the ESG score change one, two, and three years after the event, compared with its pre-breach ESG score, to examine the score's evolution after the breach event.[28] In panel A of Table 4.17, for 110 breached firms, I observe that the average ESG1 score

[27]The table for the regressions with the insignificant dummy for negative disclosed earnings is not shown but is available upon request.

[28]Since the ESG data from the database is reported annually, I use the nearest three annually reported ESG scores after the announcement date of the data breach to calculate the score change. Considering the possibility that the report date of the first post-breach ESG score is close to the announcement date of the data breach, I may not find that the ESG score improves immediately.

of forty-four low ESG1 firms improves after the breach event. The one-year average (median) ESG1 score change is −0.0031 (−0.0001). However, the two-year average (median) change is slightly positive, 0.0160 (0.0130), and the three-year average (median) change is even larger, 0.0224 (0.0143). Thus, low ESG firms experience ESG score improvement in the years following data breaches. In contrast, I do not observe the same pattern for the sixty-six firms with high ESG1 scores. In panel B, the results are similar when ESG2 scores are used. For fifty low ESG2 firms, the one-year average (median) ESG2 score change is −0.0035 (−0.0027), and then in years two and three, it turns positive. Since social (S) performance significantly impacts the market reaction to data breach announcements in section 4.5.6, I also compare the SOC score changes between high SOC and low SOC firms. In panels C and D, I find similar patterns. For only low SOC1 and SOC2 firms, the two-year and three-year average (median) changes become positive. The positive change in post-breach scores suggests that the breached firms with relatively low ESG scores commit to their ESG investment to rebuild their reputation.

4.5.9 Post-breach firm operations

In addition to the impact of CSR activities on the stock reaction to the announcement of data breaches, I compare the operations of high and low ESG firms to investigate the channel through which a firm's CSR attributes affect firm performance following data breaches. The variables include cash holdings, investment, long-term leverage, R&D expenditures, and sales growth. Cash holdings are measured as cash and short-term investments divided by book value of total assets. Investment is capital expenditures scaled by book value of total assets. Long-term leverage is the sum of long-term debt and long-term debt due in one year divided by book value of total assets. R&D expenditures are measured as research and development expenses divided by book value of total assets. The affected firms may adjust their financing and investment policies for potential expenses such as litigation fees after data breaches. They may decrease leverage, reduce capital and R&D expenditures, and hoard cash to secure available funds. I conjecture that the levels of these ratios would differ between high and low CSR firms. Low CSR firms should set aside more money to protect themselves from the greater consequences of a data breach and prepare to rebuild their reputation. I collect the data on the variables one year after the data breaches and compare the ratios of high and low ESG1 and ESG2 groups. Table 4.18 reports the statistics for the variables one year after the data breaches. Panels B and C show that only the R&D expenditures of low ESG firms are significantly lower than those of high ESG firms after their data breaches on average.[29]

4.6 Conclusion

This study examines the impact of CSR activities on firm performance using data breach events that are believed to sabotage stakeholders' trust in breached companies and have an adverse impact on firm value. Severe data breaches involve the leakage of sensitive or confidential information about company operations and customer data, which can have significant consequences for a company and its value. In light of the direct costs of repairing the damage and the potential loss of reputation, profitability, and competitive advantage of a company, the market reacts negatively to data breach announcements. Using a sample of US data breaches and public companies' ESG ratings, I find, among other things, that pre-breach CSR mitigates the market's negative view of the breached firm. I separate the sample firms into high and low CSR groups based on the level

[29]I also calculate the growth of the first four ratios in the table using the actual numbers (not scaled by book value of total assets) before and after data breaches. In panel B, the average cash holdings growth of low ESG1 firms is significantly higher than that of high ESG1 firms, which supports my conjecture. I ignore the result for R&D growth due to its limited sample size.

of their ESG scores and compare their announcement date abnormal returns. The announcement date abnormal returns are more negative when the breach size measured by the affected populations is larger. As for the impact of CSR activities undertaken by the breached companies before the event, my results show that high CSR firms experience a significantly less negative market reaction to the announcements of data breaches than do low CSR firms. The findings affirm that CSR activities can act as insurance against negative shocks. I also find that the data breaches due to hacking or malware or the data breaches in the financial sector do not strongly affect the magnitude of the market reaction, and the impact of CSR activities does not differ either. I also find that, following data breaches, low CSR companies try to improve their ESG scores in order to restore their reputation, focusing, in particular, on social performance. As for post-breach firm operations, I only find significant differences in the R&D expenditures and cash needs between high and low CSR firms after their data breaches, which illustrates the impact of CSR on their investment policies. Finally, using two sources of ESG scores, I find that the market reacts differently to ESG scores provided by different agencies. As for the efficacy of CSR ratings, the correlation among ESG scores is divergent. While my findings suggest that CSR activities are value-increasing when a data breach causes damage to a company's reputation, the quality of the information provided by different providers is a question that requires further investigation.

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Table 4.1: This table presents the breakdown of data breach events that record affected populations of 1,000 or more between 2005 and 2019 from the Privacy Rights Clearinghouse (PRC) website. Panel A reports the annual numbers and percentages of data breach announcements. Panel B reports the types of data breaches. Panel C reports the types of firms.

Panel A: Annual numbers and percentages of data breaches

Year	Number of Data Breaches	Percentage of Sample
2005	19	11.38%
2006	31	18.56%
2007	21	12.57%
2008	19	11.38%
2009	7	4.19%
2010	12	7.19%
2011	6	3.59%
2012	10	5.99%
2013	7	4.19%
2014	5	2.99%
2015	4	2.40%
2016	7	4.19%
2017	6	3.59%
2018	12	7.19%
2019	1	0.60%
Total	167	100.00%

Panel B: Types of data breaches

Types	Number
CARD (Payment card fraud)	2
DISC (Unintended disclosure)	19
HACK (Hacking or malware)	58
INSD (Insider)	11
PHYS (Physical loss)	7
PORT (Portable device)	59
STAT (Stationary device)	11

Panel C: Types of entities

Types	Number
BSF (Businesses – Financial and Insurance Services)	54
BSR (Businesses – Retail/Merchant)	46
BSO (Businesses – Other)	67

Table 4.2: This table lists the definition of variables used in this essay, including dependent variables and firm characteristics.

Variable	Definition
Dependent variables	
CAR	Cumulative abnormal returns for event windows, calculated from the market model; the estimation period is (−300, −46) days relative to the data breach announcement date
Firm characteristics	
AT	Total assets (millions of dollars)
ROA	Return on assets (Net income divided by book value of total assets)
Tobin's Q (TQ)	Market value of assets divided by book value of total assets
Leverage	The sum of short-term debt and long-term debt divided by total assets
Breach	The number of total records collected from the PRC website
Breach size	The natural logarithm of the number of total records
Scaled breach size	The natural logarithm of the ratio of the number of total records to total assets
Cash holdings	Cash and short-term investments divided by book value of total assets
Investment	Capital expenditures divided by book value of total assets
Long-term leverage	Long-term debt plus long-term debt due in one year divided by book value of total assets
R&D expenditures	Research and development expenses divided by book value of total assets
Sales growth	(Sale−lagged sale)/lagged sale

Table 4.3: This table reports the results of cumulative average abnormal returns (CAARs) for five event windows relative to the announcement date. Panel A shows the results for the whole sample. Panel B shows the quartile analysis. Quartile partitions are based on the size of affected populations in a data breach. Panels C, D, E, and F show the results for the "High ESG" and "Low ESG" groups based on whether the actual ESG1 and ESG2 scores of the firm are above zero or not. For each CAAR, the test statistic in the parentheses is based on the Patell test. *, **, and *** are statistically significant at the 0.10, 0.05, and 0.01 levels, respectively.

Panel A: Market Model

	Equally Weighted	Value Weighted
(−1, +1) CAAR	−0.51%**	−0.47%**
	(−2.247)	(−2.112)
(−2, +2) CAAR	−0.83%***	−0.72%**
	(−2.602)	(−2.421)
(−3, +3) CAAR	−0.43%*	−0.32%*
	(−1.714)	(−1.722)
(−5, +5) CAAR	−0.58%**	−0.37%**
	(−2.131)	(−2.070)
(−10, +10) CAAR	−1.45%**	−1.14%**
	(−2.444)	(−2.521)
Number	110	110

Table 4.3 (continued)

Panel B: Quartile Analysis

Event Window	Breach Quartile	Equally Weighted CAAR	Value Weighted CAAR	Number
(−1, +1)	1 (low)	0.40%	0.78%	27
	2	−0.52%	−0.40%	28
	3	−0.66%	−0.86%	28
	4 (high)	−1.26%	−1.37%	27
(−2, +2)	1 (low)	0.07%	0.71%	27
	2	−0.03%	0.17%	28
	3	−1.02%	−1.34%	28
	4 (high)	−2.39%	−2.45%	27
(−3, +3)	1 (low)	0.53%	1.13%	27
	2	−0.08%	0.31%	28
	3	−0.39%	−0.81%	28
	4 (high)	−1.80%	−1.91%	27
(−5, +5)	1 (low)	0.83%	1.55%	27
	2	−0.73%	0.08%	28
	3	−1.01%	−1.49%	28
	4 (high)	−1.40%	−1.60%	27
(−10, +10)	1 (low)	−2.02%	−0.97%	27
	2	−1.78%	−1.11%	28
	3	−0.12%	−0.60%	28
	4 (high)	−1.90%	−1.89%	27

Table 4.3 (continued)

Panel C: ESG1 category

	Equally Weighted		Value Weighted	
	High ESG1	Low ESG1	High ESG1	Low ESG1
(−1, +1) CAAR	0.04%	−1.32%***	0.12%	−1.35%***
	(−0.530)	(−2.904)	(−0.285)	(−2.989)
(−2, +2) CAAR	−0.06%	−2.00%***	0.14%	−2.02%***
	(−0.592)	(−3.390)	(−0.236)	(−3.539)
(−3, +3) CAAR	0.43%	−1.72%**	0.59%	−1.69%***
	(−0.256)	(−2.397)	(−0.082)	(−2.623)
(−5, +5) CAAR	0.56%	−2.29%***	0.76%	−2.07%***
	(−0.538)	(−2.711)	(−0.366)	(−2.824)
(−10, +10) CAAR	−0.03%	−3.57%***	0.42%	−3.48%***
	(−0.819)	(−2.860)	(−0.563)	(−3.296)
Number	66	44	66	44

Panel D: ESG1 Difference T-test

	L−H, Equally Weighted	L−H, Value Weighted
(−1, +1) CAAR	−1.36%**	−1.47%**
(−2, +2) CAAR	−1.94%	−2.15%
(−3, +3) CAAR	−2.15%	−2.28%
(−5, +5) CAAR	−2.85%*	−2.83%*
(−10, +10) CAAR	−3.54%*	−3.90%*

Table 4.3 (continued)

Panel E: ESG2 category

	Equally Weighted		Value Weighted	
	High ESG2	Low ESG2	High ESG2	Low ESG2
(−1, +1) CAAR	0.06%	−1.19%***	0.15%	−1.21%***
	(−0.455)	(−2.834)	(−0.231)	(−2.879)
(−2, +2) CAAR	0.19%	−2.07%***	0.43%	−2.10%***
	(−0.418)	(−3.402)	(−0.026)	(−3.563)
(−3, +3) CAAR	0.88%	−2.00%**	1.10%	−2.03%***
	(−0.092)	(−2.442)	(0.159)	(−2.728)
(−5, +5) CAAR	0.77%	−2.20%**	1.06%	−2.09%**
	(−0.802)	(−2.282)	(−0.537)	(−2.483)
(−10, +10) CAAR	0.66%	−3.98%***	1.14%	−3.87%***
	(−0.606)	(−2.961)	(−0.376)	(−3.328)
Number	60	50	60	50

Panel F: ESG2 Difference T-test

	L−H, Equally Weighted	L−H, Value Weighted
(−1, +1) CAAR	−1.25%**	−1.36%**
(−2, +2) CAAR	−2.26%*	−2.53%**
(−3, +3) CAAR	−2.87%**	−3.13%**
(−5, +5) CAAR	−2.97%*	−3.15%**
(−10, +10) CAAR	−4.64%**	−5.02%***

Table 4.4: This table reports the statistics of firm characteristics and the size of data breaches. Panel A shows the results for the whole sample. Panel B shows the results for two groups, "High ESG" and "Low ESG," based on whether the ESG1 score of the firm is above or below the median. Panel C shows the results for two groups, "High ESG" and "Low ESG," based on whether the ESG2 score of the firm is above or below the median.

Panel A: Full sample

Variable	N	Mean	Median	Q1	Q3
Total Assets	110	102,542.03	16,634.70	3,499.61	60,667.06
Breach	110	6,183,814	55,819	5,210	200,000
ROA	110	0.04	0.04	0.01	0.08
Tobin's Q	110	1.71	1.46	1.10	2.06
Leverage	110	0.27	0.22	0.13	0.36

Panel B: High ESG1 vs. Low ESG1

	Mean		Difference	Median		Wilcoxon
	High	Low		High	Low	
Total Assets	123,464.38	71,158.51	−1.18	22,627.00	12,445.85	−1.03
Breach	7,934,195	3,558,243	−0.94	61,740	41,882	−1.39
ROA	0.05	0.03	−1.08	0.04	0.03	−1.17
Tobin's Q	1.80	1.57	−1.48	1.49	1.34	−0.99
Leverage	0.26	0.28	0.45	0.23	0.22	0.05

Panel C: High ESG2 vs. Low ESG2

	Mean		Difference	Median		Wilcoxon
	High	Low		High	Low	
Total Assets	104,813.35	99,816.45	−0.10	25,511.00	9,810.85	−1.17
Breach	7,045,756	5,149,484	−0.38	60,040	46,225	−1.03
ROA	0.04	0.04	−0.37	0.04	0.03	−0.54
Tobin's Q	1.76	1.65	−0.72	1.50	1.34	−0.72
Leverage	0.27	0.26	−0.11	0.23	0.22	−0.56

Table 4.5: This table reports correlations between key variables used in this paper. In each row, the upper number reports the Pearson correlation coefficient, and the lower number reports the p-value. *, **, and *** are statistically significant at the 0.10, 0.05, and 0.01 levels, respectively.

	ESG1 dummy	ESG2 dummy	Breach size	Firm size	ROA	Tobin's Q	Leverage
ESG1 dummy	1	0.86***	0.13	0.10	0.10	0.13	−0.05
		(< 0.0001)	(0.1697)	(0.2970)	(0.2818)	(0.1668)	(0.6357)
ESG2 dummy		1	0.09	0.10	0.04	0.07	0.01
			(0.3745)	(0.3044)	(0.7152)	(0.4701)	(0.9098)
Breach size			1	0.07	0.10	0.09	−0.21**
				(0.4540)	(0.3154)	(0.3474)	(0.0303)
Firm size				1	−0.07	−0.34***	−0.01
					(0.4927)	(0.0003)	(0.9107)
ROA					1	0.52***	−0.46***
						(< 0.0001)	(< 0.0001)
Tobin's Q						1	−0.15
							(0.1081)
Leverage							1

Table 4.6: This table reports regression results based on Equation (4.1). The dependent variables are cumulative abnormal returns (CARs) for five event windows. Panels A and C include the dummy variable for the ESG1 scores, and panels B and D include the dummy variable for the ESG2 scores. The dummy is equal to one if the firm's ESG score is above zero and equal to zero if it is below zero. Panels C and D use scaled breach size and include the product of the dummy variable for the ESG score and scaled breach size, ESG×Breach. *, **, and *** are statistically significant at the 0.10, 0.05, and 0.01 levels, respectively.

Panel A: ESG1

	Dependent Variable: CAR				
	(a) (−1, +1) CAR	(b) (−2, +2) CAR	(c) (−3, +3) CAR	(d) (−5, +5) CAR	(e) (−10, +10) CAR
ESG1 dummy	0.016***	0.023*	0.027**	0.034**	0.035*
	(2.80)	(1.97)	(2.02)	(2.15)	(1.83)
Breach size	−0.003***	−0.006***	−0.005**	−0.003	−0.003
	(−2.85)	(−3.03)	(−2.04)	(−1.23)	(−0.96)
Firm size	−0.002	0.004	0.0004	−0.001	0.003
	(−1.18)	(1.20)	(0.12)	(−0.28)	(0.67)
ROA	0.072	−0.072	−0.184	0.028	−0.083
	(1.37)	(−0.68)	(−1.54)	(0.20)	(−0.49)
Tobin's Q	−0.004	0.002	0.005	−0.004	0.011
	(−0.94)	(0.22)	(0.55)	(−0.38)	(0.80)
Leverage	0.004	0.004	0.027	0.076	−0.026
	(0.29)	(0.14)	(0.82)	(1.97)	(−0.56)
Intercept	0.038*	0.009	0.019	0.009	−0.041
	(1.79)	(0.21)	(0.40)	(0.15)	(−0.61)
F Value	2.95**	2.49**	2.33**	1.90*	0.89
Adj R-Sq	0.10	0.08	0.07	0.05	−0.01
Number	110	110	110	110	110

Table 4.6 (continued)

Panel B: ESG2

Dependent Variable: CAR					
	(a) (−1, +1) CAR	(b) (−2, +2) CAR	(c) (−3, +3) CAR	(d) (−5, +5) CAR	(e) (−10, +10) CAR
ESG2 dummy	0.015**	0.024**	0.031**	0.031**	0.046**
	(2.52)	(2.09)	(2.39)	(2.06)	(2.54)
Breach size	−0.003***	−0.006***	−0.005**	−0.003	−0.003
	(−2.72)	(−2.99)	(−2.02)	(−1.16)	(−0.96)
Firm size	−0.002	0.004	0.0004	−0.001	0.003
	(−1.10)	(1.22)	(0.11)	(−0.24)	(0.63)
ROA	0.075	−0.067	−0.178	0.035	−0.076
	(1.42)	(−0.64)	(−1.51)	(0.25)	(−0.46)
Tobin's Q	−0.003	0.002	0.006	−0.003	0.011
	(−0.81)	(0.29)	(0.60)	(−0.29)	(0.82)
Leverage	0.003	0.003	0.025	0.074	−0.030
	(0.23)	(0.09)	(0.76)	(1.91)	(−0.64)
Intercept	0.037*	0.007	0.017	0.006	−0.043
	(1.71)	(0.17)	(0.36)	(0.11)	(−0.64)
F Value	2.68**	2.58**	2.63**	1.84*	1.42
Adj R-Sq	0.08	0.08	0.08	0.04	0.02
Number	110	110	110	110	110

Table 4.6 (continued)

Panel C: ESG1 + ESG1×Breach

	Dependent Variable: CAR				
	(a) (−1, +1) CAR	(b) (−2, +2) CAR	(c) (−3, +3) CAR	(d) (−5, +5) CAR	(e) (−10, +10) CAR
ESG1 dummy	0.008	0.003	0.009	0.014	0.018
	(1.45)	(0.29)	(0.68)	(0.90)	(0.94)
Scaled breach	−0.007***	−0.017***	−0.014***	−0.014***	−0.012**
	(−5.04)	(−6.19)	(−4.41)	(−3.57)	(−2.46)
ESG1×breach	0.007***	0.017***	0.015***	0.016***	0.014**
	(4.04)	(5.28)	(3.97)	(3.64)	(2.43)
Firm size	−0.005***	−0.003	−0.004	−0.005	0.0002
	(−2.86)	(−0.80)	(−1.15)	(−1.01)	(0.03)
ROA	0.088*	−0.030	−0.146	0.069	−0.049
	(1.81)	(−0.32)	(−1.31)	(0.52)	(−0.30)
Tobin's Q	−0.005	−0.002	0.002	−0.008	0.008
	(−1.34)	(−0.19)	(0.26)	(−0.71)	(0.61)
Leverage	0.003	0.001	0.024	0.073**	−0.029
	(0.22)	(0.04)	(0.79)	(2.00)	(−0.63)
Intercept	0.044**	0.025	0.034	0.024	−0.028
	(2.24)	(0.67)	(0.74)	(0.45)	(−0.42)
F Value	5.24***	6.67***	4.54***	3.72***	1.65
Adj R-Sq	0.21	0.27	0.19	0.15	0.04
Number	110	110	110	110	110

Table 4.6 (continued)

Panel D: ESG2 + ESG2×Breach

	Dependent Variable: CAR				
	(a) (−1, +1) CAR	(b) (−2, +2) CAR	(c) (−3, +3) CAR	(d) (−5, +5) CAR	(e) (−10, +10) CAR
ESG2 dummy	0.008	0.008	0.015	0.013	0.030
	(1.37)	(0.68)	(1.15)	(0.85)	(1.60)
Scaled breach	−0.006***	−0.013***	−0.011***	−0.011***	−0.010**
	(−4.18)	(−5.08)	(−3.85)	(−3.12)	(−2.30)
ESG2×breach	0.005***	0.013***	0.013***	0.014***	0.012**
	(3.10)	(4.04)	(3.40)	(3.33)	(2.36)
Firm size	−0.005***	−0.003	−0.005	−0.005	−0.001
	(−2.79)	(−0.91)	(−1.29)	(−1.08)	(−0.12)
ROA	0.095*	−0.017	−0.130	0.091	−0.027
	(1.86)	(−0.17)	(−1.14)	(0.68)	(−0.17)
Tobin's Q	−0.004	0.0002	0.004	−0.006	0.009
	(−1.05)	(0.03)	(0.40)	(−0.54)	(0.67)
Leverage	0.002	−0.0003	0.022	0.071*	−0.032
	(0.15)	(−0.01)	(0.71)	(1.91)	(−0.72)
Intercept	0.043**	0.025	0.034	0.025	−0.026
	(2.11)	(0.62)	(0.74)	(0.47)	(−0.40)
F Value	3.86***	4.88***	4.14***	3.32***	2.06*
Adj R-Sq	0.16	0.20	0.17	0.13	0.06
Number	110	110	110	110	110

Table 4.7: This table reports the regression results considering the types of entities. The dependent variables are CARs in different event windows. The dummy variable D_FIN is equal to one if the firm belongs to the financial sector. The financial sector is determined according to four-digit SIC codes. *, **, and *** are statistically significant at the 0.10, 0.05, and 0.01 levels, respectively.

	Dependent Variable: CAR					
	(a) (−1, +1) CAR	(b) (−2, +2) CAR	(c) (−3, +3) CAR	(d) (−1, +1) CAR	(e) (−2, +2) CAR	(f) (−3, +3) CAR
ESG1 dummy	0.016***	0.023*	0.027**			
	(2.78)	(1.96)	(2.00)			
ESG2 dummy				0.014**	0.021*	0.029**
				(2.45)	(1.86)	(2.25)
Breach size	−0.003***	−0.006***	−0.005**	−0.003***	−0.006***	−0.005*
	(−2.81)	(−2.99)	(−1.99)	(−2.69)	(−2.93)	(−1.97)
Firm size	−0.002	0.005*	0.002	−0.002	0.005*	0.001
	(−1.00)	(1.74)	(0.43)	(−0.97)	(1.73)	(0.37)
ROA	0.070	−0.084	−0.192	0.074	−0.079	−0.185
	(1.33)	(−0.81)	(−1.61)	(1.40)	(−0.76)	(−1.56)
Tobin's Q	−0.004	−0.001	0.004	−0.004	0.0004	0.005
	(−1.01)	(−0.06)	(0.39)	(−0.84)	(0.04)	(0.48)
Leverage	0.003	−0.007	0.020	0.002	−0.007	0.019
	(0.19)	(−0.23)	(0.61)	(0.17)	(−0.24)	(0.59)
D_FIN	−0.004	−0.030**	−0.019	−0.002	−0.027**	−0.015
	(−0.58)	(−2.26)	(−1.25)	(−0.33)	(−2.05)	(−1.01)
Intercept	0.038*	0.007	0.018	0.036*	0.005	0.016
	(1.77)	(0.16)	(0.36)	(1.70)	(0.12)	(0.33)
F Value	2.56**	2.95***	2.24**	2.30**	2.88***	2.40**
Adj R-Sq	0.09	0.11	0.07	0.08	0.11	0.08
Number	110	110	110	110	110	110

Table 4.8: This table reports the regression results considering the types of entities. The dependent variables are CARs in different event windows. The dummy variable D_FIN is equal to one if the firm belongs to the financial sector. The financial sector is determined according to the "BSF" entity label from the PRC website. *, **, and *** are statistically significant at the 0.10, 0.05, and 0.01 levels, respectively.

	Dependent Variable: CAR					
	(a) (−1, +1) CAR	(b) (−2, +2) CAR	(c) (−3, +3) CAR	(d) (−1, +1) CAR	(e) (−2, +2) CAR	(f) (−3, +3) CAR
ESG1 dummy	0.016***	0.022*	0.026*			
	(2.71)	(1.82)	(1.93)			
ESG2 dummy				0.014**	0.021*	0.030**
				(2.37)	(1.80)	(2.24)
Breach size	−0.003***	−0.006***	−0.005*	−0.003***	−0.006***	−0.005*
	(−2.76)	(−2.89)	(−1.96)	(−2.65)	(−2.85)	(−1.95)
Firm size	−0.002	0.004	0.001	−0.002	0.004	0.001
	(−1.07)	(1.43)	(0.23)	(−1.00)	(1.44)	(0.20)
ROA	0.070	−0.081	−0.189	0.073	−0.076	−0.182
	(1.33)	(−0.77)	(−1.58)	(1.39)	(−0.72)	(−1.53)
Tobin's Q	−0.005	−0.0001	0.004	−0.004	0.001	0.005
	(−1.04)	(−0.02)	(0.44)	(−0.88)	(0.08)	(0.52)
Leverage	0.001	−0.008	0.021	0.001	−0.008	0.020
	(0.10)	(−0.26)	(0.61)	(0.08)	(−0.27)	(0.60)
D_FIN	−0.005	−0.023*	−0.012	−0.004	−0.021	−0.009
	(−0.82)	(−1.78)	(−0.85)	(−0.63)	(−1.61)	(−0.63)
Intercept	0.039*	0.014	0.022	0.037*	0.012	0.019
	(1.84)	(0.33)	(0.45)	(1.75)	(0.28)	(0.40)
F Value	2.62**	2.63**	2.10*	2.34**	2.62**	2.30**
Adj R-Sq	0.09	0.09	0.07	0.08	0.09	0.08
Number	110	110	110	110	110	110

Table 4.9: This table reports the results of cumulative average abnormal returns (CAARs) for five event windows for the alternative sample that includes multiple events of a firm. Panel A shows the results for the whole sample. Panel B shows the quartile analysis. Quartile partitions are based on the size of affected populations in a data breach. Panels C, D, E, and F show the results for two groups, "High ESG" and "Low ESG," based on whether the ESG1 score or ESG2 score of the firm is above zero or not, respectively. For each CAAR, the test statistic in the parentheses is based on the Patell test. *, **, and *** are statistically significant at the 0.10, 0.05, and 0.01 levels, respectively.

Panel A: Market Model

	Equally Weighted	Value Weighted
(−1, +1) CAAR	−0.38%**	−0.37%**
	(−2.283)	(−2.291)
(−2, +2) CAAR	−0.61%**	−0.59%***
	(−2.563)	(−2.705)
(−3, +3) CAAR	−0.23%	−0.24%*
	(−1.497)	(−1.839)
(−5, +5) CAAR	−0.41%**	−0.38%***
	(−2.342)	(−2.655)
(−10, +10) CAAR	−0.73%**	−0.63%**
	(−2.033)	(−2.279)
Number	139	139

Table 4.9 (continued)

Panel B: Quartile Analysis

Event window	Breach Quartile	Equally Weighted CAAR	Value Weighted CAAR	Number
(−1, +1)	1 (low)	0.11%	0.43%	34
	2	−0.18%	−0.10%	35
	3	−0.62%	−0.75%	35
	4 (high)	−0.82%	−1.05%	35
(−2, +2)	1 (low)	−0.15%	0.29%	34
	2	0.36%	0.42%	35
	3	−0.67%	−0.86%	35
	4 (high)	−1.95%	−2.20%	35
(−3, +3)	1 (low)	0.44%	0.85%	34
	2	0.25%	0.45%	35
	3	−0.07%	−0.42%	35
	4 (high)	−1.51%	−1.81%	35
(−5, +5)	1 (low)	0.70%	1.10%	34
	2	−0.29%	0.29%	35
	3	−0.59%	−1.10%	35
	4 (high)	−1.44%	−1.76%	35
(−10, +10)	1 (low)	−0.96%	−0.42%	34
	2	−1.00%	−0.55%	35
	3	−0.22%	−0.65%	35
	4 (high)	−0.76%	−0.89%	35

Table 4.9 (continued)

Panel C: ESG1 category

	Equally Weighted		Value Weighted	
	High ESG1	Low ESG1	High ESG1	Low ESG1
(−1, +1) CAAR	0.16%	−1.34%***	0.19%	−1.38%***
	(−0.236)	(−3.492)	(−0.115)	(−3.667)
(−2, +2) CAAR	0.22%	−2.08%***	0.28%	−2.15%***
	(−0.069)	(−4.181)	(−0.007)	(−4.501)
(−3, +3) CAAR	0.64%	−1.77%***	0.65%	−1.83%***
	(0.352)	(−2.966)	(0.229)	(−3.371)
(−5, +5) CAAR	0.82%	−2.60%***	0.83%	−2.52%***
	(−0.086)	(−3.790)	(−0.210)	(−4.146)
(−10, +10) CAAR	0.88%	−3.61%***	1.03%	−3.59%***
	(0.020)	(−3.418)	(0.078)	(−3.904)
Number	89	50	89	50

Panel D: ESG1 Difference T-test

	L−H, Equally Weighted	L−H, Value Weighted
(−1, +1) CAAR	−1.50%**	−1.57%**
(−2, +2) CAAR	−2.30%*	−2.44%*
(−3, +3) CAAR	−2.41%*	−2.48%*
(−5, +5) CAAR	−3.42%**	−3.35%**
(−10, +10) CAAR	−4.50%**	−4.62%**

Table 4.9 (continued)

Panel E: ESG2 category

	Equally Weighted		Value Weighted	
	High ESG2	Low ESG2	High ESG2	Low ESG2
(−1, +1) CAAR	0.21%	−1.23%***	0.25%	−1.27%***
	(−0.091)	(−3.457)	(0.040)	(−3.626)
(−2, +2) CAAR	0.43%	−2.09%***	0.52%	−2.20%***
	(0.103)	(−4.125)	(0.215)	(−4.483)
(−3, +3) CAAR	0.99%	−1.97%***	1.06%	−2.10%***
	(0.511)	(−2.951)	(0.480)	(−3.448)
(−5, +5) CAAR	1.04%	−2.50%***	1.12%	−2.52%***
	(−0.232)	(−3.378)	(−0.262)	(−3.831)
(−10, +10) CAAR	1.48%	−3.92%***	1.64%	−3.90%***
	(0.248)	(−3.473)	(0.302)	(−3.921)
Number	82	57	82	57

Panel F: ESG2 Difference T-test

	L−H, Equally Weighted	L−H, Value Weighted
(−1, +1) CAAR	−1.44%**	−1.53%***
(−2, +2) CAAR	−2.52%**	−2.72%**
(−3, +3) CAAR	−2.96%**	−3.16%**
(−5, +5) CAAR	−3.55%**	−3.64%**
(−10, +10) CAAR	−5.40%***	−5.55%***

TABLE 4.10: This table reports the regression results for the alternative sample that includes multiple events of a firm. The dependent variables are CARs for five event windows. Panels A and C include the dummy variable for the ESG1 scores, and panels B and D include the dummy variable for the ESG2 scores. The dummy is equal to one if the firm's ESG score is above zero and equal to zero if it is below zero. Panels C and D use scaled breach size and include the product of the dummy variable for the ESG score and scaled breach size, ESG×Breach. *, **, and *** are statistically significant at the 0.10, 0.05, and 0.01 levels, respectively.

Panel A: ESG1

	Dependent Variable: CAR				
	(a) (−1, +1) CAR	(b) (−2, +2) CAR	(c) (−3, +3) CAR	(d) (−5, +5) CAR	(e) (−10, +10) CAR
ESG1 dummy	0.017***	0.023**	0.027**	0.038***	0.039**
	(3.00)	(2.12)	(2.33)	(2.66)	(2.30)
Breach size	−0.002**	−0.005***	−0.004**	−0.004*	−0.004
	(−2.23)	(−2.89)	(−2.32)	(−1.71)	(−1.43)
Firm size	−0.002	0.003	0.0001	−0.001	0.005
	(−1.29)	(1.01)	(0.03)	(−0.32)	(1.11)
ROA	−0.011	−0.158*	−0.237**	−0.132	−0.266*
	(−0.22)	(−1.76)	(−2.44)	(−1.10)	(−1.86)
Tobin's Q	0.002	0.008	0.009	0.006	0.020**
	(0.56)	(1.33)	(1.29)	(0.70)	(2.01)
Leverage	−0.006	−0.007	0.015	0.041	−0.061
	(−0.42)	(−0.26)	(0.50)	(1.12)	(−1.42)
Intercept	0.025	0.003	0.019	0.012	−0.042
	(1.32)	(0.09)	(0.50)	(0.25)	(−0.75)
F Value	2.48**	2.79**	3.20***	2.40**	2.44**
Adj R-Sq	0.06	0.07	0.09	0.06	0.06
Number	139	139	139	139	139

TABLE 4.10 (CONTINUED)

Panel B: ESG2

Dependent Variable: CAR					
	(a) (−1, +1) CAR	(b) (−2, +2) CAR	(c) (−3, +3) CAR	(d) (−5, +5) CAR	(e) (−10, +10) CAR
ESG2 dummy	0.016***	0.024**	0.031***	0.037***	0.049***
	(2.96)	(2.33)	(2.75)	(2.69)	(3.01)
Breach size	−0.002**	−0.005***	−0.004**	−0.004*	−0.004
	(−2.23)	(−2.91)	(−2.36)	(−1.72)	(−1.47)
Firm size	−0.002	0.003	−0.0001	−0.001	0.004
	(−1.24)	(1.00)	(−0.04)	(−0.30)	(1.00)
ROA	−0.006	−0.150*	−0.227**	−0.121	−0.250*
	(−0.12)	(−1.68)	(−2.35)	(−1.00)	(−1.77)
Tobin's Q	0.002	0.008	0.008	0.006	0.019*
	(0.59)	(1.32)	(1.25)	(0.71)	(1.94)
Leverage	−0.007	−0.009	0.013	0.038	−0.064
	(−0.49)	(−0.32)	(0.44)	(1.06)	(−1.50)
Intercept	0.025	0.005	0.021	0.013	−0.038
	(1.35)	(0.13)	(0.56)	(0.28)	(−0.69)
F Value	2.43**	2.96***	3.59***	2.43**	3.11***
Adj R-Sq	0.06	0.08	0.10	0.06	0.08
Number	139	139	139	139	139

Table 4.10 (continued)

Panel C: ESG1 + ESG1×Breach

Dependent Variable: CAR					
	(a) (−1, +1) CAR	(b) (−2, +2) CAR	(c) (−3, +3) CAR	(d) (−5, +5) CAR	(e) (−10, +10) CAR
ESG1 dummy	0.007	−0.0004	0.007	0.013	0.018
	(1.21)	(−0.04)	(0.62)	(0.90)	(1.03)
Scaled breach	−0.007***	−0.016***	−0.014***	−0.016***	−0.014***
	(−5.33)	(−6.83)	(−5.17)	(−4.86)	(−3.40)
ESG1×breach	0.007***	0.016***	0.014***	0.018***	0.015***
	(4.97)	(6.22)	(4.69)	(4.85)	(3.23)
Firm size	−0.003**	−0.001	−0.003	−0.004	0.002
	(−2.20)	(−0.42)	(−1.05)	(−0.99)	(0.38)
ROA	0.019	−0.091	−0.180*	−0.060	−0.206
	(0.42)	(−1.15)	(−1.98)	(−0.53)	(−1.48)
Tobin's Q	−0.000 03	0.004	0.005	0.001	0.016*
	(−0.01)	(0.73)	(0.80)	(0.15)	(1.67)
Leverage	−0.006	−0.006	0.015	0.042	−0.060
	(−0.44)	(−0.27)	(0.56)	(1.23)	(−1.45)
Intercept	0.028	0.012	0.026	0.021	−0.035
	(1.64)	(0.37)	(0.74)	(0.48)	(−0.64)
F Value	6.03***	8.60***	6.32***	5.76***	3.73***
Adj R-Sq	0.20	0.28	0.21	0.19	0.12
Number	139	139	139	139	139

TABLE 4.10 (CONTINUED)

Panel D: ESG2 + ESG2×Breach

Dependent Variable: CAR					
	(a) (−1, +1) CAR	(b) (−2, +2) CAR	(c) (−3, +3) CAR	(d) (−5, +5) CAR	(e) (−10, +10) CAR
ESG2 dummy	0.009	0.007	0.016	0.018	0.033*
	(1.63)	(0.73)	(1.41)	(1.30)	(1.95)
Scaled breach	−0.005***	−0.013***	−0.011***	−0.013***	−0.011***
	(−4.48)	(−5.78)	(−4.62)	(−4.24)	(−3.14)
ESG2×breach	0.006***	0.013***	0.012***	0.015***	0.004***
	(4.04)	(5.08)	(4.10)	(4.26)	(2.98)
Firm size	−0.004**	−0.002	−0.004	−0.005	0.0002
	(−2.42)	(−0.83)	(−1.41)	(−1.26)	(0.04)
ROA	0.026	−0.078	−0.162*	−0.037	−0.179
	(0.57)	(−0.93)	(−1.75)	(−0.32)	(−1.29)
Tobin's Q	0.0001	0.004	0.005	0.001	0.015
	(0.05)	(0.71)	(0.74)	(0.15)	(1.56)
Leverage	−0.007	−0.009	0.013	0.038	−0.064
	(−0.53)	(−0.36)	(0.46)	(1.11)	(−1.55)
Intercept	0.031*	0.018	0.033	0.028	−0.026
	(1.74)	(0.54)	(0.91)	(0.63)	(−0.48)
F Value	4.66***	6.70***	5.85***	4.95***	4.10***
Adj R-Sq	0.16	0.22	0.20	0.17	0.14
Number	139	139	139	139	139

TABLE 4.11: This table reports the results of cumulative average abnormal returns (CAARs). Panel A shows the results for the whole sample. Panel B shows the quartile analysis. Quartile partitions are based on the size of affected populations in a data breach. Panels C and D show the results for two groups, "High ESG" and "Low ESG," based on whether the standardized ESG score of firms from Bloomberg is above zero or not. For each CAAR, the test statistic in the parentheses is based on the Patell test. *, **, and *** are statistically significant at the 0.10, 0.05, and 0.01 levels, respectively.

Panel A: Market Model

	Equally Weighted	Value Weighted
(−1, +1) CAAR	−1.18%***	−1.06%***
	(−2.945)	(−2.599)
(−2, +2) CAAR	−1.14%**	−0.84%**
	(−2.526)	(−1.994)
(−3, +3) CAAR	−1.66%***	−1.22%**
	(−2.821)	(−2.301)
(−5, +5) CAAR	−1.96%***	−1.30%**
	(−2.865)	(−2.341)
(−10, +10) CAAR	−1.86%*	−1.23%
	(−1.867)	(−1.616)
Number	50	50

Table 4.11 (continued)

Panel B: Quartile Analysis

Event window	Breach Quartile	Equally Weighted CAAR	Value Weighted CAAR	Number
(−1, +1)	1 (low)	−0.88%	−0.42%	12
	2	−0.47%	−0.41%	13
	3	−1.42%	−1.30%	13
	4 (high)	−2.00%	−2.14%	12
(−2, +2)	1 (low)	−1.33%	−0.44%	12
	2	0.60%	0.66%	13
	3	−0.97%	−0.77%	13
	4 (high)	−3.03%	−2.93%	12
(−3, +3)	1 (low)	−2.80%	−1.87%	12
	2	−0.03%	0.45%	13
	3	−0.75%	−0.40%	13
	4 (high)	−3.28%	−3.27%	12
(−5, +5)	1 (low)	−2.04%	−0.92%	12
	2	−1.23%	0.04%	13
	3	−1.30%	−0.79%	13
	4 (high)	−3.40%	−3.69%	12
(−10, +10)	1 (low)	−3.74%	−2.67%	12
	2	−2.28%	−0.83%	13
	3	1.18%	1.79%	13
	4 (high)	−2.81%	−3.51%	12

Table 4.11 (continued)

Panel C: Standardized Bloomberg ESG category

	Equally Weighted		Value Weighted	
	High ESG	Low ESG	High ESG	Low ESG
(−1, +1) CAAR	−0.69%	−1.44%***	−0.46%	−1.37%***
	(−1.269)	(−2.714)	(−0.827)	(−2.605)
(−2, +2) CAAR	−0.78%	−1.33%*	−0.38%	−1.07%
	(−1.618)	(−1.948)	(−1.130)	(−1.643)
(−3, +3) CAAR	−0.54%	−2.24%**	−0.01%	−1.85%**
	(−1.504)	(−2.392)	(−1.013)	(−2.106)
(−5, +5) CAAR	−1.04%	−2.44%**	−0.25%	−1.84%**
	(−1.568)	(−2.401)	(−1.008)	(−2.159)
(−10, +10) CAAR	0.45%	−3.05%*	1.44%	−2.61%*
	(−0.814)	(−1.714)	(−0.194)	(−1.850)
Number	17	33	17	33

Panel D: ESG Difference T-test

	L−H, Equally Weighted	L−H, Value Weighted
(−1, +1) CAAR	−0.75%	−0.91%
(−2, +2) CAAR	−0.55%	−0.70%
(−3, +3) CAAR	−1.70%	−1.84%
(−5, +5) CAAR	−1.40%	−1.60%
(−10, +10) CAAR	−3.50%	−4.05%

Table 4.12: This table reports the regression results with standardized ESG scores from Bloomberg. The dependent variables are CARs for five event windows. Panel A includes the dummy variable for the standardized Bloomberg ESG scores. Panel B uses scaled breach size and includes the product of the dummy variable for the standardized Bloomberg ESG score and scaled breach size, ESG×Breach. *, **, and *** are statistically significant at the 0.10, 0.05, and 0.01 levels, respectively.

Panel A: ESG

	Dependent Variable: CAR				
	(a) (−1, +1) CAR	(b) (−2, +2) CAR	(c) (−3, +3) CAR	(d) (−5, +5) CAR	(e) (−10, +10) CAR
ESG dummy	0.003	0.003	0.015	0.009	0.029
	(0.43)	(0.22)	(0.87)	(0.52)	(1.00)
Breach size	−0.002	−0.003	−0.001	−0.001	0.001
	(−1.65)	(−1.56)	(−0.36)	(−0.33)	(0.24)
Firm size	0.003	0.002	0.006	0.0001	0.007
	(1.16)	(0.44)	(1.00)	(0.01)	(0.70)
ROA	0.137*	0.098	0.126	0.265*	0.195
	(1.94)	(0.90)	(0.86)	(1.73)	(0.78)
Tobin's Q	−0.002	−0.001	−0.004	−0.010	0.001
	(−0.35)	(−0.19)	(−0.44)	(−0.97)	(0.09)
Leverage	0.026	0.048	0.108**	0.126**	0.108
	(1.17)	(1.42)	(2.38)	(2.64)	(1.38)
Intercept	−0.031	−0.010	−0.093	−0.039	−0.148
	(−0.86)	(−0.18)	(−1.24)	(−0.49)	(−1.15)
F Value	2.03*	1.16	1.60	1.80	0.69
Adj R-Sq	0.11	0.02	0.07	0.09	−0.04
Number	50	50	50	50	50

Table 4.12 (continued)

Panel B: ESG + ESG×Breach

Dependent Variable: CAR					
	(a) (−1, +1) CAR	(b) (−2, +2) CAR	(c) (−3, +3) CAR	(d) (−5, +5) CAR	(e) (−10, +10) CAR
ESG dummy	0.002	−0.001	0.007	0.003	0.017
	(0.19)	(−0.04)	(0.43)	(0.19)	(0.58)
Scaled breach	−0.003*	−0.004*	−0.003	−0.002	−0.002
	(−1.82)	(−1.81)	(−1.00)	(−0.80)	(−0.42)
ESG×breach	0.002	0.004	0.008	0.006	0.013
	(0.78)	(0.93)	(1.53)	(1.15)	(1.48)
Firm size	0.001	−0.001	0.005	−0.0003	0.009
	(0.39)	(−0.21)	(0.86)	(−0.05)	(0.85)
ROA	0.134*	0.091	0.112	0.254	0.172
	(1.87)	(0.84)	(0.78)	(1.66)	(0.69)
Tobin's Q	−0.001	−0.0001	−0.002	−0.008	0.006
	(−0.20)	(−0.02)	(−0.16)	(−0.75)	(0.36)
Leverage	0.027	0.049	0.112**	0.129***	0.113
	(1.20)	(1.46)	(2.49)	(2.71)	(1.47)
Intercept	−0.034	−0.015	−0.103	−0.047	−0.164
	(−0.92)	(−0.26)	(−1.39)	(−0.59)	(−1.28)
F Value	1.81	1.11	1.75	1.74	0.92
Adj R-Sq	0.10	0.02	0.10	0.10	−0.01
Number	50	50	50	50	50

Table 4.13: This table reports the regression results considering the types of data breaches. The dependent variables are CARs in different event windows. D_BRE is the dummy variable for the type of data breach, which is set equal to one if the type is "HACK." *, **, and *** are statistically significant at the 0.10, 0.05, and 0.01 levels, respectively.

	Dependent Variable: CAR					
	(a) (−1, +1) CAR	(b) (−2, +2) CAR	(c) (−3, +3) CAR	(d) (−1, +1) CAR	(e) (−2, +2) CAR	(f) (−3, +3) CAR
ESG1 dummy	0.017***	0.023*	0.027*			
	(2.83)	(1.87)	(1.98)			
ESG2 dummy				0.015**	0.024**	0.032**
				(2.56)	(1.99)	(2.36)
Breach size	−0.003**	−0.006***	−0.005*	−0.003**	−0.006***	−0.005*
	(−2.59)	(−2.96)	(−1.93)	(−2.47)	(−2.89)	(−1.87)
Firm size	−0.002	0.004	0.0004	−0.002	0.004	0.0003
	(−1.22)	(1.21)	(0.11)	(−1.14)	(1.22)	(0.09)
ROA	0.075	−0.075	−0.182	0.079	−0.069	−0.174
	(1.42)	(−0.70)	(−1.51)	(1.47)	(−0.65)	(−1.45)
Tobin's Q	−0.004	0.002	0.005	−0.003	0.002	0.006
	(−0.94)	(0.22)	(0.55)	(−0.80)	(0.28)	(0.60)
Leverage	0.005	0.004	0.027	0.004	0.002	0.024
	(0.31)	(0.13)	(0.82)	(0.25)	(0.08)	(0.77)
D_BRE	−0.003	0.003	−0.001	−0.003	0.002	−0.003
	(−0.50)	(0.21)	(−0.09)	(−0.51)	(0.13)	(−0.23)
Intercept	0.037*	0.009	0.019	0.036*	0.008	0.017
	(1.76)	(0.22)	(0.39)	(1.69)	(0.18)	(0.35)
F Value	2.55**	2.12**	1.98*	2.32**	2.19**	2.24**
Adj R-Sq	0.09	0.07	0.06	0.08	0.07	0.07
Number	110	110	110	110	110	110

Table 4.14: This table reports the regression results for three subcategories of ESG scores. The dependent variables are CARs in different event windows. Three dummy variables are included respectively for environmental, social, and corporate governance dimensions. *, **, and *** are statistically significant at the 0.10, 0.05, and 0.01 levels, respectively.

	Dependent Variable: CAR								
	(a) (−1, +1) CAR	(b) (−2, +2) CAR	(c) (−3, +3) CAR	(d) (−1, +1) CAR	(e) (−2, +2) CAR	(f) (−3, +3) CAR	(g) (−1, +1) CAR	(h) (−2, +2) CAR	(i) (−3, +3) CAR
ENV1 dummy	0.007	0.011	0.018						
	(0.85)	(0.67)	(0.94)						
SOC1 dummy				0.018***	0.024*	0.029**			
				(2.85)	(1.94)	(2.02)			
CGOV1 dummy							−0.006	−0.019	−0.025*
							(−1.07)	(−1.65)	(−1.86)
Breach size	−0.003**	−0.006***	−0.005*	−0.003***	−0.006***	−0.005*	−0.003**	−0.006***	−0.004*
	(−2.59)	(−2.87)	(−1.95)	(−2.76)	(−2.96)	(−1.97)	(−2.51)	(−2.85)	(−1.87)
Firm size	−0.001	0.005	0.002	−0.002	0.003	0.0001	−0.001	0.004	0.0005
	(−0.72)	(1.50)	(0.46)	(−1.31)	(1.11)	(0.03)	(−0.92)	(1.22)	(0.13)
ROA	0.074	−0.068	−0.179	0.071	−0.073	−0.185	0.072	−0.075	−0.188
	(1.38)	(−0.64)	(−1.48)	(1.36)	(−0.69)	(−1.55)	(1.33)	(−0.71)	(−1.58)
Tobin's Q	−0.003	0.004	0.007	−0.004	0.002	0.005	−0.002	0.005	0.009
	(−0.64)	(0.40)	(0.71)	(−0.94)	(0.23)	(0.56)	(−0.51)	(0.56)	(0.91)
Leverage	0.006	0.007	0.032	0.003	0.003	0.026	0.005	0.006	0.029
	(0.41)	(0.24)	(0.94)	(0.22)	(0.10)	(0.77)	(0.34)	(0.20)	(0.89)
Intercept	0.031	−0.002	0.003	0.037*	0.007	0.017	0.041*	0.021	0.035
	(1.36)	(−0.04)	(0.07)	(1.73)	(0.17)	(0.35)	(1.82)	(0.48)	(0.70)
F Value	1.66	1.86*	1.75	3.00***	2.46**	2.34**	1.74	2.28**	2.22**
Adj R-Sq	0.03	0.05	0.04	0.10	0.07	0.07	0.04	0.07	0.06
Number	110	110	110	110	110	110	110	110	110

Table 4.15: This table reports the regression results for the social performance scores. The dependent variables are CARs in different event windows. The scaled breach size and the product of the dummy variable for the social performance score and scaled breach size, SOC×Breach, are included. *, **, and *** are statistically significant at the 0.10, 0.05, and 0.01 levels, respectively.

SOC1 + SOC1×Breach

	Dependent Variable: CAR		
	(a) (−1, +1) CAR	(b) (−2, +2) CAR	(c) (−3, +3) CAR
SOC1 dummy	0.008	0.0002	0.008
	(1.25)	(0.02)	(0.54)
Scaled breach	−0.008***	−0.019***	−0.016***
	(−5.39)	(−6.43)	(−4.48)
SOC1×breach	0.008***	0.019***	0.016***
	(4.49)	(5.53)	(4.03)
Firm size	−0.005***	−0.002	−0.004
	(−2.83)	(−0.67)	(−1.06)
ROA	0.080*	−0.051	−0.166
	(1.67)	(−0.54)	(−1.49)
Tobins'Q	−0.006	−0.002	0.002
	(−1.48)	(−0.31)	(0.18)
Leverage	0.002	0.0004	0.023
	(0.17)	(0.02)	(0.76)
Intercept	0.045**	0.026	0.034
	(2.29)	(0.70)	(0.75)
F Value	5.93***	7.09***	4.62***
Adj R-Sq	0.24	0.28	0.19
Number	110	110	110

Table 4.16: This table reports the regression results for the alternative sample that excludes firms that announce earnings within the fourteen day period preceding data breach announcements. The dependent variables are CARs for five event windows. Panels A and C include the dummy variable for the ESG1 scores, and panels B and D include the dummy variable for the ESG2 scores. The dummy is equal to one if the firm's ESG score is above zero and equal to zero if it is below zero. Panels C and D use scaled breach size and include the product of the dummy variable for the ESG score and scaled breach size, ESG×Breach. *, **, and *** are statistically significant at the 0.10, 0.05, and 0.01 levels, respectively.

Panel A: ESG1

	Dependent Variable: CAR				
	(a) (−1, +1) CAR	(b) (−2, +2) CAR	(c) (−3, +3) CAR	(d) (−5, +5) CAR	(e) (−10, +10) CAR
ESG1 dummy	0.015**	0.020	0.024	0.029*	0.032
	(2.23)	(1.49)	(1.57)	(1.69)	(1.54)
Breach size	−0.003***	−0.006***	−0.005**	−0.004	−0.004
	(−2.66)	(−2.70)	(−2.01)	(−1.38)	(−1.27)
Firm size	−0.001	0.005	0.001	−0.002	0.002
	(−0.78)	(1.45)	(0.14)	(−0.53)	(0.36)
ROA	0.059	−0.097	−0.181	0.042	−0.035
	(1.06)	(−0.85)	(−1.40)	(0.28)	(−0.20)
Tobin's Q	−0.003	0.005	0.006	−0.004	0.007
	(−0.65)	(0.51)	(0.60)	(−0.30)	(0.51)
Leverage	0.003	−0.002	0.022	0.093*	−0.028
	(0.15)	(−0.05)	(0.54)	(1.96)	(−0.50)
Intercept	0.034	−0.009	0.022	0.025	−0.007
	(1.38)	(−0.19)	(0.38)	(0.38)	(−0.09)
F Value	2.14*	2.02*	1.76	1.76	0.71
Adj R-Sq	0.07	0.06	0.05	0.05	−0.02
Number	96	96	96	96	96

TABLE 4.16 (CONTINUED)

Panel B: ESG2

	Dependent Variable: CAR				
	(a) (−1, +1) CAR	(b) (−2, +2) CAR	(c) (−3, +3) CAR	(d) (−5, +5) CAR	(e) (−10, +10) CAR
ESG2 dummy	0.014**	0.021	0.030**	0.031*	0.048**
	(2.16)	(1.58)	(2.04)	(1.84)	(2.38)
Breach size	−0.003**	−0.006***	−0.005**	−0.004	−0.004
	(−2.58)	(−2.67)	(−2.00)	(−1.33)	(−1.29)
Firm size	−0.002	0.005	−0.0001	−0.003	0.001
	(−0.91)	(1.33)	(−0.03)	(−0.66)	(0.13)
ROA	0.064	−0.090	−0.172	0.053	−0.021
	(1.15)	(−0.79)	(−1.34)	(0.36)	(−0.12)
Tobin's Q	−0.003	0.005	0.006	−0.003	0.007
	(−0.58)	(0.55)	(0.60)	(−0.27)	(0.47)
Leverage	0.002	−0.003	0.020	0.091*	−0.033
	(0.12)	(−0.09)	(0.48)	(1.92)	(−0.59)
Intercept	0.035	−0.007	0.026	0.028	−0.0003
	(1.44)	(−0.14)	(0.46)	(0.44)	(−0.00)
F Value	2.09*	2.07*	2.07*	1.86*	1.28
Adj R-Sq	0.06	0.06	0.06	0.05	0.02
Number	96	96	96	96	96

Table 4.16 (continued)

Panel C: ESG1 + ESG1×Breach

Dependent Variable: CAR					
	(a)	(b)	(c)	(d)	(e)
	(−1, +1)	(−2, +2)	(−3, +3)	(−5, +5)	(−10, +10)
	CAR	CAR	CAR	CAR	CAR
ESG1 dummy	0.006	−0.002	0.003	0.005	0.012
	(0.89)	(−0.17)	(0.19)	(0.32)	(0.57)
Scaled breach	−0.007***	−0.017***	−0.015***	−0.016***	−0.014***
	(−4.80)	(−5.76)	(−4.42)	(−3.95)	(−2.83)
ESG1×breach	0.007***	0.017***	0.016***	0.018***	0.015***
	(3.89)	(5.02)	(4.02)	(4.00)	(2.65)
Firm size	−0.005**	−0.002	−0.005	−0.008	−0.003
	(−2.49)	(−0.51)	(−1.26)	(−1.52)	(−0.53)
ROA	0.080	−0.043	−0.130	0.100	0.013
	(1.54)	(−0.43)	(−1.09)	(0.73)	(0.08)
Tobin's Q	−0.005	0.001	0.003	−0.008	0.004
	(−1.05)	(0.11)	(0.28)	(−0.69)	(0.28)
Leverage	0.003	−0.001	0.023	0.093**	−0.028
	(0.18)	(−0.05)	(0.60)	(2.13)	(−0.51)
Intercept	0.044*	0.016	0.046	0.052	0.016
	(1.93)	(0.37)	(0.87)	(0.87)	(0.21)
F Value	4.29***	5.81***	4.08***	4.06***	1.65
Adj R-Sq	0.19	0.26	0.19	0.18	0.05
Number	96	96	96	96	96

Table 4.16 (continued)

Panel D: ESG2 + ESG2×Breach

	Dependent Variable: CAR				
	(a) (−1, +1) CAR	(b) (−2, +2) CAR	(c) (−3, +3) CAR	(d) (−5, +5) CAR	(e) (−10, +10) CAR
ESG2 dummy	0.006	0.001	0.011	0.009	0.028
	(0.96)	(0.10)	(0.73)	(0.52)	(1.35)
Scaled breach	−0.006***	−0.014***	−0.013***	−0.013***	−0.012***
	(−4.06)	(−4.85)	(−3.91)	(−3.39)	(−2.69)
ESG2×breach	0.005***	0.014***	0.014***	0.016***	0.014**
	(3.07)	(4.03)	(3.47)	(3.47)	(2.52)
Firm size	−0.005**	−0.002	−0.006	−0.008	−0.004
	(−2.42)	(−0.50)	(−1.34)	(−1.53)	(−0.72)
ROA	0.086	−0.033	−0.116	0.117	0.035
	(1.60)	(−0.32)	(−0.95)	(0.83)	(0.21)
Tobin's Q	−0.004	0.002	0.004	−0.006	0.004
	(−0.84)	(0.28)	(0.38)	(−0.54)	(0.29)
Leverage	0.001	−0.006	0.017	0.087*	−0.036
	(0.05)	(−0.19)	(0.43)	(1.96)	(−0.67)
Intercept	0.044*	0.014	0.047	0.053	0.021
	(1.85)	(0.31)	(0.87)	(0.85)	(0.28)
F Value	3.31***	4.40***	3.72***	3.51***	2.07*
Adj R-Sq	0.15	0.20	0.17	0.16	0.07
Number	96	96	96	96	96

Table 4.17: This table reports the results of the ESG score changes before and after data breach announcements for 110 affected firms included in Table 4.3. The change is calculated as the difference between the ESG score in one, two, and three years, respectively, after the event and the ESG score before the event for each breached firm. The sample is divided into the "High ESG" and "Low ESG" subgroups in panels A and B. The sample is divided into the "High SOC" and "Low SOC" subgroups in panels C and D. *, **, and *** are statistically significant at the 0.10, 0.05, and 0.01 levels, respectively.

Panel A: ΔESG1

Group	Number	1-year ΔESG1	2-year ΔESG1	3-year ΔESG1
			Mean	
High ESG1	66	−0.0050	−0.0101	0.0002
Low ESG1	44	−0.0031	0.0160	0.0224
T-test		0.0019	0.0261***	0.0222*
			Median	
High ESG1	66	−0.0004	−0.0025	−0.0137
Low ESG1	44	−0.0001	0.0130	0.0143
Wilcoxon stat		0.4253	2.8806***	2.3714**

Panel B: ΔESG2

Group	Number	1-year ΔESG2	2-year ΔESG2	3-year ΔESG2
			Mean	
High ESG2	60	0.0002	−0.0118	0.0119
Low ESG2	50	−0.0035	0.0279	0.0429
T-test		−0.0037	0.0398*	0.0310
			Median	
High ESG2	60	−0.0080	−0.0098	−0.0145
Low ESG2	50	−0.0027	−0.0010	0.0197
Wilcoxon stat		−0.7890	−1.9175*	−1.4243

TABLE 4.17 (CONTINUED)

Panel C: ΔSOC1

Group	Number	1-year ΔSOC1	2-year ΔSOC1	3-year ΔSOC1
			Mean	
High SOC1	76	−0.0051	−0.0131	−0.0119
Low SOC1	34	−0.0022	0.0162	0.0238
T-test		0.0029	0.0293**	0.0357**
			Median	
High SOC1	76	0.0000	−4.3368E−18	0.0000
Low SOC1	34	0.0000	3.4694E−18	0.0163
Wilcoxon stat		0.8647	2.4516**	1.9669**

Panel D: ΔSOC2

Group	Number	1-year ΔSOC2	2-year ΔSOC2	3-year ΔSOC2
			Mean	
High SOC2	62	−0.0028	−0.0310	−0.0279
Low SOC2	48	−0.0095	0.0269	0.0435
T-test		−0.0067	0.0578**	0.0715**
			Median	
High SOC2	62	0.0000	−0.0238	−0.0296
Low SOC2	48	0.0000	0.0000	0.0214
Wilcoxon stat		−0.2615	−2.4688**	−2.4711**

TABLE 4.18: This table reports the statistics for the post-breach financial ratios of breached firms, including cash holdings, investment, long-term leverage, R&D expenditures, and sales growth. Panel A shows the results for the full sample of 110 breached firms. Panel B shows the comparison between high and low ESG1 groups, and panel C shows the comparison between high and low ESG2 groups. *, **, and *** are statistically significant at the 0.10, 0.05, and 0.01 levels, respectively.

Panel A: Full sample

Variable	Number	Mean	Median
Cash holdings	105	0.1377	0.0854
Investment	105	0.0356	0.0281
Long-term lev.	103	0.2281	0.1857
R&D exp.	105	0.0136	0.0000
Sales growth	105	0.0492	0.0480

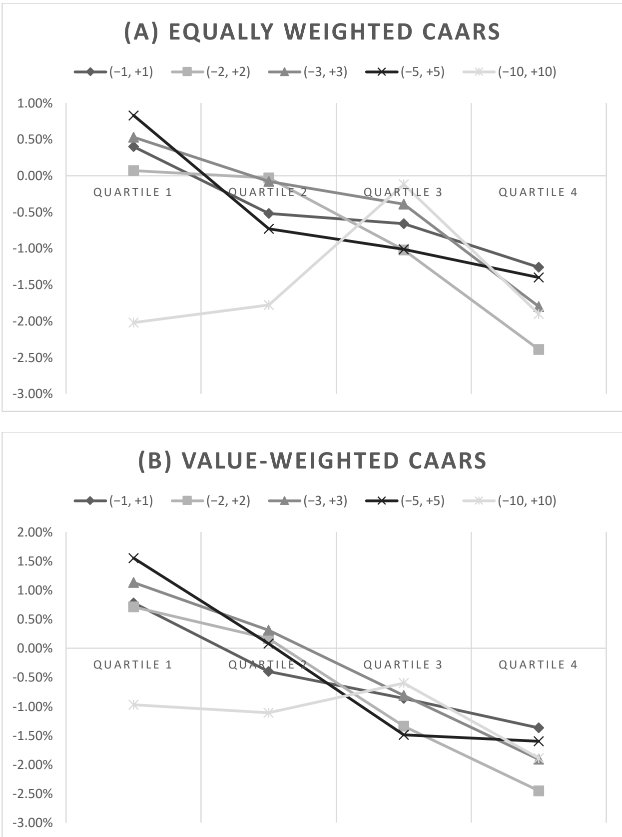
Panel B: High ESG1 vs. Low ESG1

	Mean		Difference	Median		Wilcoxon
	High	Low	(L−H)	High	Low	
Cash holdings	0.14	0.13	−0.01	0.10	0.07	−0.59
Investment	0.04	0.03	−0.01	0.03	0.03	0.22
Long-term lev.	0.20	0.26	0.06	0.17	0.20	0.86
R&D exp.	0.02	0.01	−0.01**	0.00	0.00	−0.92
Sales growth	0.05	0.05	0.00	0.05	0.05	0.06
CH growth	0.18	0.91	0.73*	0.07	0.12	1.28
Inv. growth	−0.22	−0.16	0.05	−0.03	−0.11	0.16
LL growth	1.50	1.16	−0.34	0.00	−0.03	−0.65

Panel C: High ESG2 vs. Low ESG2

	Mean		Difference	Median		Wilcoxon
	High	Low	(L−H)	High	Low	
Cash holdings	0.13	0.15	0.02	0.09	0.09	0.45
Investment	0.04	0.03	−0.01	0.03	0.03	−0.76
Long-term lev.	0.21	0.25	0.04	0.17	0.20	0.45
R&D exp.	0.02	0.01	−0.02**	0.00	0.00	−1.27
Sales growth	0.06	0.04	−0.01	0.05	0.05	0.36
CH growth	0.18	0.79	0.61	0.07	0.10	1.03
Inv. growth	−0.18	−0.21	−0.03	−0.03	−0.11	−0.78
LL growth	1.65	1.03	−0.63	0.01	−0.03	−0.68

Figure 4.1: This figure displays the cumulative average abnormal returns (CAARs) in four quartiles based on the level of the affected populations in data breaches in panel B of Table 4.3.



Appendix

4.A List of 167 data breach events

Years	Company	Type	Total Records
2005	Ameriprise Financial Inc.	PORT	226,000
2005	Bank of America Corp.	PORT	1,200,000
2005	Boeing	PORT	161,000
2005	ChoicePoint	INSD	163,000
2005	Citigroup	PORT	3,900,000
2005	Eastman Kodak	PORT	5,800
2005	Ford Motor Co.	STAT	70,000
2005	Guidance Software, Inc.	HACK	3,800
2005	Marriott International Inc.	PORT	206,000
2005	MCI	PORT	16,500
2005	North Fork Bank	PORT	9,000
2005	Polo Ralph Lauren	HACK	180,000
2005	RBC Dain Rauscher	INSD	300,000
2005	Safeway	PORT	1,400
2005	Science Applications International Corp. (SAIC)	STAT	45,000
2005	TD Ameritrade	PORT	200,000
2005	Time Warner	PORT	600,000
2005	TransUnion Credit Bureau	STAT	3,623
2005	Wachovia	INSD	676,000
2006	Circuit City	PORT	2,600,000
2006	AllState Insurance Huntsville branch	STAT	27,000
2006	American International Group (AIG)	STAT	930,000
2006	America Online (AOL)	DISC	650,000
2006	Armstrong World Industries	PORT	12,000
2006	AT&T	HACK	19,000
2006	Bisys Group Inc.	PORT	61,000
2006	The New York Times Company	DISC	240,000
2006	Con Edison	PORT	15,000
2006	Copart, Inc.	HACK	43,764

2006	CS Stars, subsidiary of insurance company Marsh Inc.	STAT	722,000
2006	Equifax	PORT	2,500
2006	FedEx	DISC	1,100
2006	Fidelity Investments	PORT	196,000
2006	General Electric (GE)	PORT	50,000
2006	Group 1 Automotive Inc	PORT	14,000
2006	Hilb, Rogal & Hobbs, Villanova University	PORT	1,243
2006	ING U.S. Financial Services	PORT	13,000
2006	Ingersoll Rand	PORT	1,510
2006	KeyCorp	PORT	9,300
2006	Movie Gallery US	PHYS	3,800
2006	National Financial Partners (NFP)	INSD	4,327
2006	Nelnet Inc.	PORT	188,000
2006	OfficeMax	HACK	200,000
2006	Paetec Communications	PORT	1,095
2006	Starbucks Corp.	PORT	60,080
2006	Toyota	PORT	1,500
2006	Union Pacific	PORT	30,000
2006	Verizon Wireless	DISC	5,210
2006	Weyerhaeuser Company	PHYS	1,597
2006	Williams-Sonoma	PORT	1,200
2007	ADC Telecommunications Inc.	PORT	63,400
2007	Administaff Inc.	PORT	159,000
2007	Affiliated Computer Services (ACS), Kraft Foods	PORT	1,446
2007	Brunswick Corp.	HACK	5,100
2007	Celgene Corporation	PORT	1,951
2007	Chase Bank and the former Bank One, now merged	PHYS	4,100
2007	Credit Suisse	DISC	3,000
2007	Gap Inc.	PORT	800,000
2007	Hartford Financial Services Group	PORT	230,000
2007	Home Depot	PORT	5,563
2007	IBM	PORT	2,226
2007	KB Home	STAT	2,700
2007	MoneyGram International	HACK	79,000
2007	Pfizer	DISC	17,000
2007	Prudential Financial	INSD	44,023
2007	Sprint Nextel	PORT	1,608
2007	TJ stores (TJX)	HACK	100,000,000
2007	UBS Financial Services	PORT	3,212
2007	Wal-Mart Stores, Inc.	INSD	48,686
2007	Wendy's International	PORT	1,092
2007	Western Union	HACK	20,000
2008	Advance Auto Parts	HACK	56,000

2008	Agilent Technologies	PORT	51,000
2008	Aon Consulting	PORT	57,160
2008	Bank of New York Mellon	PORT	12,500,000
2008	Bristol-Myers Squibb	PORT	42,000
2008	Charter Communications	PORT	9,000
2008	Compass Bank	INSD	1,000,000
2008	Countrywide Financial Corp.	INSD	17,000,000
2008	Dave & Buster's	HACK	80,000
2008	Facebook	DISC	80,000,000
2008	Harley-Davidson, Inc.	PORT	60,000
2008	Kraft Foods	PORT	20,000
2008	LPL Financial (formerly Linsco Private Ledger)	HACK	10,219
2008	Luxottica Group	HACK	59,419
2008	MTV Networks	HACK	5,000
2008	Pulte Homes Las Vegas Division	PHYS	16,000
2008	RBS WorldPay	HACK	1,100,000
2008	State Street Corp	STAT	45,500
2008	Wells Fargo	HACK	5,000
2009	Blackbaud Inc.	PORT	84,000
2009	CheckFree Corp.	HACK	5,000,000
2009	Comcast	DISC	4,000
2009	FairPoint Communications Inc.	PORT	4,400
2009	Heartland Payment Systems	HACK	130,000,000
2009	Williams Cos. Inc.	PORT	4,400
2009	Wyndham Hotels & Resorts	HACK	21,000
2010	Aetna	PHYS	6,372
2010	American Honda Motor Company	HACK	4,900,000
2010	AMR Corporation	STAT	79,000
2010	Apple Inc.	HACK	120,000
2010	Arrow Electronics	PORT	4,044
2010	Concur Technologies Inc.	STAT	1,017
2010	Digital River Inc.	HACK	200,000
2010	ESB Financial	DISC	3,097
2010	Humana Inc, Matrix Imaging	PHYS	2,631
2010	Lincoln National Corporation (Lincoln Financial)	INSD	1,200,000
2010	Lorillard Tobacco	PORT	1,874
2010	Nuance Communications Inc.	PORT	1,191
2011	Aaron's	STAT	1,008
2011	Anthem Blue Cross	DISC	31,125
2011	Huntington National Bank	INSD	2,000
2011	Medassets Inc.	PORT	82,265
2011	Shell	CARD	3,600
2011	Sony	HACK	101,600,000
2012	Coca-Cola Company Family Federal Credit Union	PORT	13,800

2012	CVS Caremark	DISC	3,482
2012	First Data Corporation	DISC	15,399
2012	Global Payments Inc.	CARD	7,000,000
2012	LinkedIn.com	HACK	167,000,000
2012	Nvidia	HACK	400,000
2012	Pinnacle Foods Group, LLC	PORT	1,818
2012	Rite Aid Corporation	PHYS	2,900
2012	TD Bank	PORT	260,000
2012	Yahoo! Voices	HACK	453,492
2013	Adobe, Washington Administrative Office of the Courts	HACK	160,000
2013	Morningstar Document Research	HACK	182,000
2013	Northrop Grunman	HACK	70,000
2013	Republic Services	PORT	82,160
2013	Target Corp.	HACK	40,000,000
2013	Twitter	HACK	250,000
2013	US Airways	DISC	40,000
2014	Dominion Resources Inc.	HACK	1,700
2014	Ebay	HACK	145,000,000
2014	Lowe's Corporation	DISC	35,000
2014	Safety First	DISC	35,000
2014	Staples Inc.	HACK	1,200,000
2015	E-Trade	HACK	31,000
2015	Microsoft/Xbox One	HACK	11,266
2015	Morgan Stanley	INSD	350,000
2015	Web.com	HACK	93,000
2016	Centene	PORT	950,000
2016	Disney Consumer Products and Interactive Media	HACK	365,000
2016	Google Android	HACK	1,000,000
2016	Hewitt Associates	HACK	2,892
2016	Hewlett Packard Enterprise Services	HACK	134,386
2016	Seagate	HACK	10,000
2016	Time Warner Cable	HACK	320,000
2017	Ancestry's RootsWeb.com	DISC	300,000
2017	BroadSoft	DISC	4,000,000
2017	Gannett Co	HACK	18,000
2017	MongoDB	HACK	26,000
2017	Sabre Corporation	HACK	32,000
2017	T-Mobile	HACK	69,600,000
2018	1st Mariner Bank	HACK	1,500
2018	Delta Air Lines, Inc.	HACK	200,000
2018	MindBody - FitMetrix	DISC	113,500,000
2018	OneMain Financial	HACK	1,253
2018	Orbitz	HACK	880,000

2018	Panera Bread	DISC	37,000,000
2018	PetSmart, Inc.	HACK	1,434
2018	Sears	HACK	90,000
2018	Southern National Bancorp of Virginia, Inc. d/b/a/ Sonabank	HACK	24,999
2018	SunTrust Banks, Inc.	HACK	1,500,000
2018	The UPS Store	HACK	2,395
2018	Under Armour	HACK	150,000,000
2019	Magellan Healthcare	HACK	55,637

4.B Examples of types of data breaches and the description of the incidents from the PRC website

CARD (Payment card fraud; Global Payments Inc.)

Global Payments discovered a massive breach of their systems in early March 2012. Global Payments processes credit and debit cards for banks and merchants and a number of credit and debit cards issued to businesses were determined to be compromised. The breach was discovered when Global Payments' security systems detected unusual activity.

DISC (Unintended disclosure; Lowe's Corporation)

Lowe's Corporation had to issue a data breach notice to current and former drivers for the company due to a security breach with one of the third party vendors they use. Information breached included names, addresses, birthdays, Social Security numbers, driver's license numbers, and other driving record information with a company called E-DriverFile, an online database provided by SafetyFirst, a driver safety firm headquartered in New Jersey. The third party vendor unintentionally backed up the data to an unsecure server that was accessible via the Internet. The information may have been exposed from July 2013 through April 2014 before it was discovered. Lowe's is offering their current and former employees one year free of AllClearID.

HACK (Hacking or malware; Apple Inc.)

A security breach has exposed iPad owner information. Dozens of CEOs, military officials, and top politicians may have been affected. They—and every other buyer of the cellular-enabled tablet—could be vulnerable to spam marketing and malicious hacking.

The breach exposed the most exclusive email list on the planet, a collection of early-adopter iPad 3G subscribers that includes thousands of A-listers in finance, politics and media, from New York Times Co. CEO Janet Robinson to Diane Sawyer of ABC News to film mogul Harvey Weinstein to Mayor Michael Bloomberg. It even appears that White House Chief of Staff Rahm Emanuel's information was compromised. It doesn't stop there. According to the data given by the web security group that exploited vulnerabilities on the AT&T network, 114,000 user accounts have been compromised, although it's possible that confidential information about every iPad 3G owner in the US has been exposed.

INSD (Insider; Wal-Mart Stores, Inc.)

A Wal-Mart associate took confidential information relating to a group of associates. The former associate was not authorized to retain the information after ending his employment with Wal-Mart. Associate names, Social Security numbers, Wal-Mart job codes and compensation information were exposed.

PHYS (Physical loss; Rite Aid Corporation)

The misplacement of paper documents resulted in the exposure of health and/or other personal information.

PORT (Portable device; Starbucks Corp.)

Starbucks lost track of four laptop computers. Two held employee names, addresses, and Social Security numbers. Current and former US employees and about 80 Canadian workers and contractors were affected.

STAT (Stationary device; AMR Corporation)

Retirees, current, and former employees who participated in AMR's pension plan may have had their names, Social Security numbers, addresses, dates of birth, and other personal information stolen by the theft of a hard drive containing microfilm files. Employees and beneficiaries of employees who were enrolled between 1960 and 1995 are at risk.

4.C The ESG measures

MSCI ESG KLD

Following Albuquerque, Koskinen, and Zhang (2019), the performance indicators for three major categories (E/S/G) are broken down into five subcategories (Community, Human Rights, Employee Relations, Diversity, and Product). Each subcategory has both positive (strength) and negative (concern) indicators. Two different measures are defined as follows:

1. *(Number of strengths − Number of concerns) / (Maximum possible number of strengths and concerns), each year*
2. *(Number of strengths / Maximum possible number of strengths) − (Number of concerns / Maximum possible number of concerns), each year*

Bloomberg

Using the already existing measures of environmental, social, corporate governance, and combined performance, the standardized measures are defined as follows:

*ESG=(ESG_Raw − ESG_Min)/(ESG_Max − ESG_Min)*2 − 1*

*ENV=(ENV_Raw − ENV_Min)/(ENV_Max − ENV_Min)*2 − 1*

*SOC=(SOC_Raw − SOC_Min)/(SOC_Max − SOC_Min)*2 − 1*

*CGOV=(CGOV_Raw − CGOV_Min)/(CGOV_Max − CGOV_Min)*2 − 1*

4.D Supplementary results

Table 4.D1: This table reports the results of cumulative average abnormal returns (CAARs) for five event windows relative to the announcement date. Cumulative abnormal returns for event windows are calculated from the market model; the estimation period is (−150, −51) days relative to the data breach announcement date. Panel A shows the results for the whole sample. Panel B shows the quartile analysis. Quartile partitions are based on the size of affected populations in a data breach. Panels C, D, E, and F show the results for the "High ESG" and "Low ESG" groups based on whether the actual ESG1 score or ESG2 score of the firm is above zero or not. For each CAAR, the test statistic in the parentheses is based on the Patell test. *, **, and *** are statistically significant at the 0.10, 0.05, and 0.01 levels, respectively.

Panel A: Market Model

	Equally Weighted	Value Weighted
(−1, +1) CAAR	−0.59%**	−0.51%**
	(−2.345)	(−2.216)
(−2, +2) CAAR	−1.00%***	−0.84%***
	(−2.782)	(−2.582)
(−3, +3) CAAR	−0.69%**	−0.52%**
	(−2.247)	(−2.220)
(−5, +5) CAAR	−0.88%***	−0.60%**
	(−2.684)	(−2.555)
(−10, +10) CAAR	−1.92%***	−1.48%***
	(−2.904)	(−2.869)
Number	110	110

Table 4.D1 (continued)

Panel B: Quartile analysis

Event Window	Breach Quartile	Equally Weighted CAAR	Value Weighted CAAR	Number
(−1, +1)	1 (low)	0.18%	0.64%	27
	2	−0.63%	−0.51%	28
	3	−0.67%	−0.87%	28
	4 (high)	−1.22%	−1.30%	27
(−2, +2)	1 (low)	−0.34%	0.42%	27
	2	−0.27%	−0.07%	28
	3	−1.08%	−1.33%	28
	4 (high)	−2.35%	−2.39%	27
(−3, +3)	1 (low)	−0.06%	0.72%	27
	2	−0.40%	−0.06%	28
	3	−0.55%	−0.91%	28
	4 (high)	−1.76%	−1.84%	27
(−5, +5)	1 (low)	−0.06%	0.88%	27
	2	−1.15%	−0.35%	28
	3	−1.00%	−1.44%	28
	4 (high)	−1.32%	−1.47%	27
(−10, +10)	1 (low)	−3.37%	−1.90%	27
	2	−2.48%	−1.87%	28
	3	−0.24%	−0.60%	28
	4 (high)	−1.65%	−1.56%	27

Table 4.D1 (continued)

Panel C: ESG1 category

	Equally Weighted		Value Weighted	
	High ESG1	Low ESG1	High ESG1	Low ESG1
(−1, +1) CAAR	−0.06%	−1.38%***	0.08%	−1.41%***
	(−0.511)	(−3.082)	(−0.265)	(−3.178)
(−2, +2) CAAR	−0.20%	−2.22%***	0.08%	−2.23%***
	(−0.665)	(−3.584)	(−0.301)	(−3.714)
(−3, +3) CAAR	0.20%	−2.03%***	0.45%	−1.99%***
	(−0.554)	(−2.875)	(−0.350)	(−3.081)
(−5, +5) CAAR	0.34%	−2.72%***	0.66%	−2.50%***
	(−0.831)	(−3.226)	(−0.593)	(−3.312)
(−10, +10) CAAR	−0.35%	−4.28%***	0.28%	−4.12%***
	(−0.877)	(−3.518)	(−0.551)	(−3.861)
Number	66	44	66	44

Panel D: ESG1 Difference T-test

	L−H, Equally Weighted	L−H, Value Weighted
(−1, +1) CAAR	−1.33%**	−1.50%**
(−2, +2) CAAR	−2.02%	−2.31%
(−3, +3) CAAR	−2.23%	−2.44%
(−5, +5) CAAR	−3.05%*	−3.16%*
(−10, +10) CAAR	−3.93%	−4.40%*

Table 4.D1 (continued)

Panel E: ESG2 category

	Equally Weighted		Value Weighted	
	High ESG2	Low ESG2	High ESG2	Low ESG2
(−1, +1) CAAR	0.01%	−1.30%***	0.15%	−1.31%***
	(−0.433)	(−3.004)	(−0.241)	(−3.022)
(−2, +2) CAAR	0.09%	−2.31%***	0.37%	−2.30%***
	(−0.453)	(−3.631)	(−0.112)	(−3.707)
(−3, +3) CAAR	0.71%	−2.37%***	0.99%	−2.34%***
	(−0.303)	(−3.002)	(−0.072)	(−3.214)
(−5, +5) CAAR	0.67%	−2.75%***	1.03%	−2.56%***
	(−0.990)	(−2.897)	(−0.717)	(−3.003)
(−10, +10) CAAR	0.61%	−4.97%***	1.18%	−4.67%***
	(−0.516)	(−3.743)	(−0.299)	(−3.927)
Number	60	50	60	50

Panel F: ESG2 Difference T-test

	L−H, Equally Weighted	L−H, Value Weighted
(−1, +1) CAAR	−1.31%**	−1.45%**
(−2, +2) CAAR	−2.40%*	−2.67%**
(−3, +3) CAAR	−3.07%**	−3.33%**
(−5, +5) CAAR	−3.41%**	−3.58%**
(−10, +10) CAAR	−5.58%***	−5.84%***

Table 4.D2: This table reports the results of cumulative average abnormal returns (CAARs) for five event windows for the alternative sample that includes multiple events of a firm. Cumulative abnormal returns for event windows are calculated from the market model; the estimation period is (−150, −51) days relative to the data breach announcement date. Panel A shows the results for the whole sample. Panel B shows the quartile analysis. Quartile partitions are based on the size of affected populations in a data breach. Panels C, D, E, and F show the results for two groups, "High ESG" and "Low ESG," based on whether the ESG1 score or ESG2 score of the firm is above zero or not, respectively. For each CAAR, the test statistic in the parentheses is based on the Patell test. *, **, and *** are statistically significant at the 0.10, 0.05, and 0.01 levels, respectively.

Panel A: Market Model

	Equally Weighted	Value Weighted
(−1, +1) CAAR	−0.50%***	−0.47%***
	(−2.866)	(−2.882)
(−2, +2) CAAR	−0.70%***	−0.63%***
	(−2.801)	(−2.905)
(−3, +3) CAAR	−0.49%**	−0.44%**
	(−2.258)	(−2.562)
(−5, +5) CAAR	−0.73%***	−0.59%***
	(−3.615)	(−3.369)
(−10, +10) CAAR	−1.24%***	−0.95%***
	(−2.780)	(−2.841)
Number	147	147

Table 4.D2 (continued)

Panel B: Quartile Analysis

Event Window	Breach Quartile	Equally Weighted CAAR	Value Weighted CAAR	Number
(−1, +1)	1 (low)	−0.16%	0.19%	36
	2	−0.31%	−0.20%	37
	3	−0.55%	−0.73%	37
	4 (high)	−0.96%	−1.11%	37
(−2, +2)	1 (low)	−0.40%	0.16%	36
	2	0.12%	0.21%	37
	3	−0.58%	−0.83%	37
	4 (high)	−1.93%	−2.02%	37
(−3, +3)	1 (low)	−0.12%	0.43%	36
	2	−0.16%	0.03%	37
	3	−0.10%	−0.46%	37
	4 (high)	−1.57%	−1.73%	37
(−5, +5)	1 (low)	−0.33%	0.30%	36
	2	−0.82%	−0.20%	37
	3	−0.32%	−0.92%	37
	4 (high)	−1.43%	−1.52%	37
(−10, +10)	1 (low)	−2.50%	−1.62%	36
	2	−1.75%	−1.17%	37
	3	−0.01%	−0.46%	37
	4 (high)	−0.74%	−0.57%	37

Table 4.D2 (continued)

Panel C: ESG1 category

	Equally Weighted		Value Weighted	
	High ESG1	Low ESG1	High ESG1	Low ESG1
(−1, +1) CAAR	0.00%	−1.43%***	0.06%	−1.45%***
	(−0.586)	(−4.062)	(−0.514)	(−4.187)
(−2, +2) CAAR	0.14%	−2.28%***	0.26%	−2.30%***
	(0.038)	(−4.807)	(0.063)	(−5.018)
(−3, +3) CAAR	0.34%	−2.06%***	0.41%	−2.05%***
	(−0.058)	(−3.753)	(−0.220)	(−4.048)
(−5, +5) CAAR	0.45%	−2.94%***	0.58%	−2.80%***
	(−0.552)	(−4.617)	(−0.598)	(−4.899)
(−10, +10) CAAR	0.29%	−4.12%***	0.64%	−3.96%***
	(−0.374)	(−4.206)	(−0.202)	(−4.546)
Number	96	51	96	51

Panel D: ESG1 Difference T-test

	L−H, Equally Weighted	L−H, Value Weighted
(−1, +1) CAAR	−1.42%**	−1.51%**
(−2, +2) CAAR	−2.41%*	−2.56%*
(−3, +3) CAAR	−2.40%*	−2.46%*
(−5, +5) CAAR	−3.38%**	−3.38%**
(−10, +10) CAAR	−4.42%*	−4.60%**

Table 4.D2 (continued)

Panel E: ESG2 category

	Equally Weighted		Value Weighted	
	High ESG2	Low ESG2	High ESG2	Low ESG2
(−1, +1) CAAR	0.08%	−1.33%***	0.14%	−1.35%***
	(−0.381)	(−4.028)	(−0.352)	(−4.087)
(−2, +2) CAAR	0.36%	−2.24%***	0.50%	−2.26%***
	(0.265)	(−4.703)	(0.287)	(−4.892)
(−3, +3) CAAR	0.72%	−2.24%***	0.82%	−2.27%***
	(0.209)	(−3.785)	(0.092)	(−4.122)
(−5, +5) CAAR	0.74%	−2.85%***	0.90%	−2.76%***
	(−0.573)	(−4.264)	(−0.585)	(−4.568)
(−10, +10) CAAR	1.05%	−4.56%***	1.35%	−4.29%***
	(0.077)	(−4.444)	(0.127)	(−4.600)
Number	87	60	87	60

Panel F: ESG2 Difference T-test

	L−H, Equally Weighted	L−H, Value Weighted
(−1, +1) CAAR	−1.41%**	−1.49%***
(−2, +2) CAAR	−2.59%**	−2.76%**
(−3, +3) CAAR	−2.96%**	−3.09%***
(−5, +5) CAAR	−3.58%**	−3.66%**
(−10, +10) CAAR	−5.62%***	−5.64%***

Table 4.D3: This table reports the results of cumulative average abnormal returns (CAARs) in five event windows. Panel A shows the results for the whole sample. Panel B shows the results for two groups, "High ESG" and "Low ESG," based on whether the raw ESG score of firms from Bloomberg is above or below the median, respectively. For each CAAR, the test statistic in the parentheses is based on the Patell test. *, **, and *** are statistically significant at the 0.10, 0.05, and 0.01 levels, respectively.

Panel A: Market Model

	Equally Weighted	Value Weighted
(−1, +1) CAAR	−1.07%***	−1.00%**
	(−2.884)	(−2.552)
(−2, +2) CAAR	−1.14%**	−0.94%**
	(−2.469)	(−1.982)
(−3, +3) CAAR	−1.76%***	−1.45%**
	(−2.762)	(−2.295)
(−5, +5) CAAR	−2.30%***	−1.71%**
	(−3.083)	(−2.522)
(−10, +10) CAAR	−2.48%**	−2.01%*
	(−1.970)	(−1.801)
Number	51	51

Panel B: Raw Bloomberg ESG category

	Equally Weighted		Value Weighted	
	High ESG	Low ESG	High ESG	Low ESG
(−1, +1) CAAR	−0.93%*	−1.20%**	−0.81%	−1.17%**
	(−1.783)	(−2.291)	(−1.411)	(−2.190)
(−2, +2) CAAR	−1.19%*	−1.09%*	−0.84%	−1.03%*
	(−1.684)	(−1.806)	(−1.060)	(−1.736)
(−3, +3) CAAR	−2.11%**	−1.43%	−1.57%*	−1.34%
	(−2.397)	(−1.519)	(−1.679)	(−1.568)
(−5, +5) CAAR	−2.66%**	−1.95%**	−1.99%*	−1.43%*
	(−2.393)	(−1.972)	(−1.741)	(−1.825)
(−10, +10) CAAR	−1.84%	−3.10%	−1.36%	−2.63%*
	(−1.155)	(−1.627)	(−0.753)	(−1.784)
Number	25	26	25	26

Chapter 5

Conclusion

This thesis examines three topics of interest in corporate finance, focusing on dividend policy, executive compensation, and corporate social responsibility. My research has policy implications about the makings of dividend policies, CEO compensation designs, and firm CSR engagement. The motivation for adopting consistent dividend payouts, equity-based executive compensation, and CSR activities is worthy of notice and needs reexamination.

The first essay investigates SEO firms' post-issue operating performance and potential overinvestment to examine the role of dividend payouts. I find a beneficial effect of consistent dividend payouts on the business operations of SEO firms, which mitigates the level of overinvestment and improves their operating asset productivity. The findings in the first essay are consistent with the argument of previous studies on SEOs and dividend payouts.

In the second essay, I move to executive compensation and analyze the specific case of a $1 CEO salary. The adoption of a $1 salary has been observed in the modern world and aroused researchers' interest. This essay examines the market's view of the public announcement of the one-dollar salary adoption. From the announcement documents, I investigate the reasons for the decision and the approaches for reducing the base salary to disentangle possible explanations for the reaction. The observed market reaction difference leads to further research on firm operations, including whether *Downturn* CEOs save troubled firms following the salary decision or *Alignment* firms/CEOs increase R&D expenditure to boost innovation and stock prices.

The third essay delves into the topic of CSR and examines its effect on the market's view of a firm's data breach announcement. The market reacts negatively to the news of data breaches, considering that data breaches sabotage public companies' reputations and shareholder wealth. The results no doubt support that CSR ratings are used by the public to value companies from the perspective of non-financial performance, considering the additional costs aside from direct financial loss. However, at the same time, the disagreement with the evaluation tools should not be ignored.

Overall, my results in the three essays are consistent with previous studies in respective fields. Consistent/consecutive dividend payouts reduce the possibility/severity of overinvestment from using new funds and lower the deterioration of operating asset productivity. The need to pay dividends regularly influences firm operations. The research on one-dollar salaries affirms that the public reacts to compensation announcements by discerning the news content, including the reasons and mechanisms that change the composition of CEO compensation. The "one-dollar" compensation is merely a literal metal coin distributed to CEOs of public companies. Instead, the decision could involve CEOs' motives and views on the firms' future. Finally, my third essay supports the positive effect of CSR activities on firm value, like most previous empirical studies. When adverse events hurt the firm value, pre-event CSR ratings are regarded as insurance against the negative impacts.