Essays on Financial Markets

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ABSTRACT

This thesis comprises three essays advancing the literature on financial markets, which play an important role in the economy by facilitating smooth and efficient capital allocation. In particular, the first essay focuses on the relationship between corporate culture and stock liquidity, while the second and third essays examine how changes in the fiduciary duty of loyalty affect stock price crash risk and the implied cost of equity.

The first essay investigates the effects of corporate culture, functioning as an internal governance mechanism, on stock liquidity. The essay finds that firms with stronger cultural values are associated with higher stock liquidity due to reduced information risk, enhanced trust, and greater investor recognition. Corporate culture can also enhance stock price informativeness and future stock returns, decrease the level of default risk, and informed trading. These initiatives contribute to strengthening the firm's value and shareholders' wealth.

The second essay examines how changes in fiduciary duty of loyalty, a fundamental aspect of governance mechanism, affect stock price crash risk. The essay finds that the enactment of the corporate opportunity waiver (COW) law constitutes an exogenous shock that weakens the fiduciary duty of loyalty, increases stock price crash risk by increasing financial reporting opacity, and decreases external monitoring.

The third essay explores the effect of the change in fiduciary duty of loyalty on the implied cost of equity, measuring investor-required returns under risks. The essay shows that the cost of equity capital increases following the reduction in fiduciary duty of loyalty resulting from the enactment of the corporate opportunity waiver law. The evidence in the second and third essays highlights the potential unintended consequences of relaxing the duty of loyalty and underscores the need for effective governance mechanisms.

Overall, this thesis provides contributions to existing literature on governance mechanisms and financial markets. The thesis highlights how both internal governance mechanisms (corporate culture) and external governance mechanisms (legal framework) influence financial market outcomes, including stock liquidity, stock price crash risk, and investors' required rate of returns. Findings from this thesis offer valuable insights for investors, corporate managers, financial professionals, regulators, and other financial market participants.

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CHAPTER 1 INTRODUCTION

This chapter provides an overview of the content covered in this thesis. It explores the motivation behind examining how both internal and external governance mechanisms affect key financial market outcomes. This chapter summarizes the contributions made by each of the three essays included in this thesis. The chapter concludes by outlining the structure of the thesis.

1.1. Introduction

Governance mechanisms play a crucial role in shaping financial market outcomes. Effective governance mechanisms – whether internal structures such as corporate culture or external frameworks such as fiduciary duty laws – could mitigate agency problems and enhance the information environment, thereby strengthening shareholders' wealth and stabilizing market operations. Conversely, weak governance mechanisms may heighten information risks, impair investors' ability to assess firm values, and destabilize financial markets.

This thesis develops a unified analytical perspective in which governance mechanisms – ranging from internal structures such as corporate culture or external frameworks such as fiduciary duty laws - shape how capital market participants perceive and price firm-level risk through their impact on the information environment and agency conflicts. Specifically, both internal governance (e.g., corporate culture) and external governance (e.g., fiduciary duty laws) influence managerial behavior, transparency, and the effectiveness of monitoring. Improvements in governance (enhancing corporate culture) reduce information risk and agency problems, leading to more efficient pricing and better market outcomes, whereas deteriorations in governance (reducing the fiduciary duty of loyalty) have the opposite effect - amplifying opacity, weakening monitoring, and increasing perceived risk. This common mechanism provides a coherent framework linking all three essays: governance mechanisms → information environment and agency conflicts → financial market outcomes, investor perceptions, and pricing.

This thesis consists of three essays and contributes to the literature on governance mechanisms and financial markets. The first essay investigates the role of corporate culture, an internal governance mechanism, in shaping ethical norms and managerial behavior, and its impact on stock liquidity in financial markets by reducing information risk, strengthening

investor trust, and increasing investor recognition. The second essay examines how changes in the fiduciary duty of loyalty, which raise agency conflicts and weaken external governance mechanisms, affect stock price crash risk by exacerbating financial reporting opacity and weakening external monitoring, thereby intensifying agency problems and harming financial market stability and investor confidence. The final essay expands on the consequences of the change in fiduciary duty of loyalty by focusing on its effect on the implied cost of equity, which reflects how investors price risk and require returns on their investments, as increased firm risk and information asymmetry raise the returns investors require. While the second and third essays both investigate the impact of the COW law, they focus on distinct underlying mechanisms. The second essay captures the managerial perceptions, whereby increased managerial discretion, agency conflicts and weaker external monitoring affect the disclosure behavior of managers, leading to higher crash risk. In contrast, the third essay captures shareholder perceptions, whereby increased information asymmetry and firm risks affect how investors perceive and price the company risks, leading to higher implied cost of equity. Taken together, the three essays provide consistent evidence that governance mechanisms systematically shape financial market outcomes, investor perceptions, and pricing through their effects on information quality, monitoring, and agency conflicts.

The remainder of this chapter is organized as follows. The following three sections, namely Sections 1.2, 1.3, and 1.4 present related literature, and a summary, containing the significant contribution to the extant literature, of each of the three essays. Research outputs from the thesis are outlined in Section 1.5. Subsequently, Section 1.6 describes the structure of the remainder of the thesis.

1.2. The first essay

The first essay investigates an internal governance mechanism – corporate culture – and evaluates its role in financial markets, especially in shaping stock liquidity. Stock liquidity, defined as the ability to trade shares in large volumes with minimal price impact, is a crucial factor for firms and investors, yet prior research has primarily focused on accounting and market-wide determinants and offers limited evidence on how capital market participants incorporate value-relevant soft information into liquidity assessments. While corporate culture, as value-relevant information including beliefs, values, knowledge, or a set of shared norms and values throughout the company (Crémer, 1993; O'Reilly and Chatman, 1996) and functioning as an important internal governance mechanism by shaping ethical norms and managerial behavior, remains one of the most under-researched fields in literature (Graham *et al.,* 2022a). Therefore, these considerations motivate an empirical investigation into the relationship between corporate culture and stock liquidity.

Utilizing firm-level corporate culture measures derived from the earnings conference call transcripts for a large sample of over 6,000 firms during the period of 2001 to 2018, this essay provides empirical evidence that a positive corporate culture enhances stock liquidity. The impact of corporate culture on stock liquidity is more pronounced for firms with higher financial distress and firms with higher financial constraints. We identify three channels through which corporate culture affects stock liquidity: reducing information risk, enhancing trust, and increasing investor recognition. In addition, we find that stronger corporate culture is significantly associated with higher stock price informativeness and future stock returns, and lower level of default risk and informed trading. This finding remains robust after employing alternative measures and model specifications, and several identification strategies.

The first essay contributes to contemporary literature in several ways. *First*, this essay is the first to examine the impact of firm-level corporate culture on financial market quality and providing additional insights into how capital markets incorporate value-relevant information into their investment decisions. *Second*, this essay contributes to a growing body of research that examines how cultural norms shape individual and corporate behavior (e.g., Bloom, Sadun, and VanReenen, 2012; Gibbons and Kaplan, 2015; Pacelli, 2019; Pham *et al.,* 2024). Our findings suggest that corporate culture matters for a firm's cost of liquidity in particular and the overall financial market quality in general.

1.3. The second essay

The second essay examines how changes in fiduciary duty of loyalty affect stock price crash risk. The fiduciary duty of loyalty, as a central pillar of external governance mechanism, mitigates agency problems by legally constraining managers from acting in their own interests at the expense of shareholders. However, the corporate opportunities waiver (COW) law, adopted in several U.S. states since 2000, weakens the fiduciary duty of loyalty by allowing corporate fiduciaries to waive the traditional fiduciary duty of loyalty and undertake new business opportunities without first disclosing them to their respective companies (Rauterberg and Talley, 2017), thereby intensifying agency conflicts and undermining the effectiveness of external governance mechanisms. Despite the substantive shift in loyalty requirements and legal framework in governance mechanisms (Fich, Harford, and Tran, 2023), few literatures focus on its impacts on financial markets, especially stock price crash risk, a critical financial concern due to its consequences in market stability and investor confidence.

By employing the difference-in-difference model (DiD) for the staggered adoption of the corporate opportunity waiver (COW) law, an exogenous shock that reduces the

fiduciary duty of loyalty, across 84,000 firm-year observations covering 9,297 unique firms from 1990 to 2019, we document a significant increase in stock price crash risk after the COW law enactment. This effect is more pronounced for firms with more financial distresses and more competition. We identify two channels through which COW law affects stock price crash risk: an increase in financial reporting opacity and a deterioration in external monitoring, leading to higher agency problems. In addition, we find that COW law is significantly associated with higher illiquidity, informed trading, stock price informativeness, stock mispricing, and audit pricing. Our results are robust to several alternative measures, model specifications, and endogeneity concerns.

This essay contributes to existing literature in several ways. *First*, this study is the first to investigate the effects of the COW law on the stock price crash risk, thereby contributing to a limited body of literature on the consequences of the COW law, a state-level law that reduces the fiduciary duty of loyalty and raises the agency problems (e.g., Fich *et al.*, 2023). *Second*, this essay contributes to the growing literature on the determinants of stock price crash risk. Overall, the main findings offers deeper insights into the relationship between agency problems and corporate outcomes by analyzing the consequences of the change in the fiduciary duty of loyalty. This essay also fills an important gap by linking legal governance mechanisms to financial market outcomes, a connection that existing crash-risk research has yet to examine directly.

1.4. The third essay

The third essay examines the broader financing implications of the significant change in the fiduciary duty of loyalty under the COW law, particularly the implied cost of equity – an investor-required returns under risk. The implied cost of equity is closely tied to financial market conditions, as it captures how investors price risk and allocate funds across

competing investment opportunities. From a theoretical standpoint, firms may gain greater flexibility in accessing capital by waiving the restrictions of the corporate opportunity doctrine, enabling them to raise funds from individuals and venture capitalists with diverse interests and potentially overlapping duties of loyalty (Fich *et al.,* 2023). However, according to the information acquisition framework (e.g., Samuelson, 1938; Grossman and Stiglitz, 1980), changes in the fiduciary duty of loyalty can influence the flow and credibility of information, thereby shaping investors' assessment of firm risk and valuation, which impacts their required rate of returns (e.g., Easley and O'hara, 2004; Drake, Johnson, Roulstone, and Thornock, 2020). In addition, by waiving a key component of the fiduciary duty of loyalty, the COW law may heighten agency conflicts (Boyd, Li, Wang, and Wang, 2025), thereby weaken corporate governance and increase the implied cost of equity. Thus, the impact of the COW law on financing costs remains inconclusive, thereby motivating a comprehensive empirical investigation.

Exploiting the staggered adoption of the corporate opportunity waiver (COW) law as an exogenous shock that weakens the fiduciary duty of loyalty for a sample of 22,022 firm-year observations covering 2,626 unique firms from 1983 to 2018, we find that the cost of equity capital increases after the enactment of the COW law. The effect is more pronounced among firms that are less financially constrained, operate in less competitive product markets, and have weaker corporate governance. We identify two mechanisms through which the COW law affects the implied cost of equity: an increase in firm risk and information asymmetries following its adoption, leading to higher financing costs. Our results are robust across additional analyses addressing endogeneity concerns, alternative measures, and research models.

This essay contributes to literature in several ways. *First*, this research is the first to examine the effect of corporate opportunity waiver (COW) laws, which waive the duty of

loyalty under the corporate opportunities doctrine, on firms' implied cost of equity, thereby contributing to the emerging literature on the economic consequences of adopting COW laws (e.g., Fich *et al.*, 2023; Eldar and Grennan, 2024; Boyd *et al.,* 2025). *Second*, this study contributes to the growing body of research that examines the determinants of a firm's implied cost of equity. Existing literature on this topic has focused on firm-specific characteristics in explaining the implied cost of equity, including information asymmetry, top managers' attributes, corporate governance, accounting, and disclosure activities. Our study contributes to the literature by showing that corporate opportunity waivers have a significant effect on a firm's implied cost of equity. Overall, our finding provides more insights into agency problems and corporate outcomes by examining the economic consequences of waivers of the duty of loyalty.

1.5. Research outputs from the thesis

- The first essay, "Do Financial Markets Value Corporate Culture?", was published in the following journal:

Tran, T., Nguyen, H., & Pham, M. H. (2025). Do financial markets value corporate culture?. International Review of Financial Analysis, 98, 103823. https://doi.org/10.1016/j.irfa.2024.103823 (ABDC Rank: A; ABS Rank: 3*)

Also, this essay has been presented at: The New Zealand Finance Colloquium (2024)

- The second essay, "Change in agency environment and stock price crash risk: Effect of the corporate opportunity waiver law", is a working paper at the time of submitting the thesis.

- The third essay, "The Price of Disloyalty: The Effect of Corporate Opportunities Waiver Law on Implied Cost of Equity", is a working paper at the time of submitting the thesis.

1.6. Structure of the thesis

The remainder of the thesis proceeds as follows. Chapter two presents the first essay, investigating the effect of corporate culture on stock liquidity. Chapter three introduces the second essay, examining how change in the fiduciary duty of loyalty affects the stock price crash risk. Chapter four presents the third essay, which explores the relationship between the significant shift in fiduciary duty and the implied cost of equity. Chapter five concludes the thesis by presenting the major findings and implications of each of the three essays.

CHAPTER 2

DO FINANCIAL MARKETS VALUE CORPORATE CULTURE?

This chapter presents the first essay, which investigates the effect of corporate culture on the financial markets, especially stock liquidity, utilizing a large sample of 48,785 firm-year observations covering 6,630 unique firms in the US. Section 2.1 presents a summary of the essay and the contribution of the essay to literature. Section 2.2 discusses the relevant literature and develop the hypothesis. Section 2.3 presents the data and sample. Section 2.4 discusses the results of baseline results and the mechanisms through which corporate culture affects stock liquidity. Section 2.5 discusses additional analyses. Section 2.6 concludes the chapter. An appendix to this chapter and the reference list are provided at the end of the thesis.

DO FINANCIAL MARKETS VALUE CORPORATE CULTURE?

Abstract of Chapter 2

This chapter examines how financial market participants incorporate corporate culture, important value-relevant information, into their investment decisions. Utilizing firm-level corporate culture measures derived from the earnings conference call transcripts, we find that firms with stronger cultural values are associated with higher stock liquidity. We identify three channels through which corporate culture affects stock liquidity: reducing information risk, enhancing trust, and increasing investor recognition. In addition, we find that stronger corporate culture is significantly associated with higher stock price informativeness and future stock returns, and lower level of default risk and informed trading. Overall, our findings highlight the importance of corporate culture in enhancing financial market quality.

Keywords: Corporate culture; market liquidity; information risk; investor recognition.

2.1. Introduction

Stock liquidity, defined as the ease of buying or selling shares in large volumes without significant price impact or increased transaction costs, is an important consideration for companies, investors, and other stakeholders (e.g., Chordia, Roll, and Subrahmanyam, 2000; Fang, Noe, and Tice, 2009). Given the importance of liquidity costs in various economic decisions, existing literature has been dedicated to uncovering the determinants of stock liquidity (e.g., Chung, Elder, and Kim, 2010; Balakrishnan, Billings, Kelly, and Ljungqvist, 2014). While the literature has highlighted several accounting and market-wide factors in understanding the cost of liquidity,[1] far less is known about how capital market participants incorporate other value-relevant information (e.g., soft information as suggested in Bertomeu and Marinovic (2016) and Liberti and Petersen (2019)) into their decisions. This chapter contributes to the literature by examining how capital market participants value corporate culture, important soft information that shapes the way businesses operate, when assessing their firms' cost of liquidity.

Corporate culture includes beliefs, values, knowledge, and assumptions shared within an organization (Schein, 1984; Gordon and DiTomaso, 1992; Crémer, 1993), as well as principles and their applications in the organization (Kreps, 1990), or a set of shared norms and values throughout the company (O'Reilly and Chatman, 1996). As corporate culture shapes the values that employees care about and the daily actions they take (e.g., Robinson and Shaver, 1973), it influences various economic behavior and outcomes (e.g., Sørensen, 2002; Pan, Siegel, and Wang, 2017, 2020; Nguyen, Hagendorff, and Eshraghi, 2018; Graham, Grennan, Harvey, and Rajgopal, 2022a).

Given the significance of corporate culture, we anticipate that capital market participants will factor it into their decision-making processes. *First*, companies with a

[1] Pástor and Stambaugh (2019) and Marks and Shang (2024) provide excellent reviews of the literature.

positive corporate culture and reputation can enhance firm value and future trading prospects (Kreps, 1990), potentially reduce information acquisition costs associated with mistrust. *Second*, a positive culture can enhance a firm's decision-making processes and operational efficiency, improving overall efficiency and risk assessment of the firm (e.g., Crémer, 1993). Firm risks harm liquidity creation and increase the costs of illiquidity (e.g., Chordia et al., 2000; Diamond and Rajan, 2001; Hasbrouck and Seppi, 2001; Amihud, Hameed, Kang, and Zhang, 2015a; Pástor and Stambaugh, 2019). *Third*, companies with strong corporate cultures and reputations are deemed more attractive to investors and cost-conscious stakeholders (e.g., Guiso, Sapienza, and Zingales, 2015a). These companies can attract talented individuals, bolster their competitive advantages, and establish standard systems to discourage misconduct behavior (Guiso et al., 2015a). Investors are sensitive to wrongdoing and often factor corporate misconduct into their investment decisions (e.g., Murphy, Shrieves, and Tibbs, 2009; Paruchuri and Misangyi, 2015; Christensen, 2016; Liu, 2016; Ohlrogge, Hardies, and Claeys, 2023). Consequently, the quality of corporate culture holds significant weight in the eyes of investors.

While corporate culture plays a crucial role in various economic decisions, it remains one of the most under-researched fields in literature (Graham *et al.,* 2022a). The lack of large-scale empirical studies on corporate culture is primarily attributed to several challenges, such as the complexity of the concept of culture and the difficulty in capturing it accurately (e.g., Liu, 2016; Nguyen *et al.,* 2018; Li, Mai, Shen, and Yan, 2021; Graham *et al.,* 2022a). Recognizing the importance of extensive, large-scale data in corporate culture, we utilize a firm-level corporate culture measure, derived from textual analysis in Li *et al.* (2021), and construct a comprehensive measure based on five cultural values. Using a large sample of over 6,000 firms during the period of 2001 to 2018, we find that firms with stronger cultural values are associated with higher stock liquidity. The impact of corporate

culture on liquidity costs is economically considerable, with one standard deviation increase in corporate culture value associated with a 6.76% increase in the Amihud liquidity ratio. The findings are robust after accounting for alternative stock liquidity measures, alternative measures of corporate culture, and various model estimations. In addition, we find that the effect of corporate culture on stock liquidity is more pronounced for financially constrained and financially distressed firms.

To address potential endogeneity concerns, we employ four identification approaches. *First*, we use propensity score matching to assess the effect of corporate culture on stock liquidity after accounting for differences in firm characteristics. By matching the treated group and the control group based on firm characteristics, propensity score matching corroborates the findings from the baseline regressions. *Second,* we use the entropy balancing method to reinforce the results of propensity score matching. Consistent results are found after employing the entropy balancing method. *Third*, we employ an instrumental variable approach. *Finally*, we consider the possibility that the effects of corporate culture on stock liquidity are driven by changes in the top managers of firms. We find that the effect of corporate culture on stock liquidity is not entirely driven by CEO turnovers. Overall, the results from the baseline regression remain consistent after conducting endogeneity tests.

We investigate the possible channels through which corporate culture influences stock liquidity. Our analysis suggests that firms with stronger culture exhibit greater information transparency and higher levels of trust. In addition, corporate culture contributes to enhanced stock liquidity by elevating the level of investor recognition. Thus, our channel analysis suggests that corporate culture affects stock liquidity by reducing information risk, enhancing trust, and increasing investor recognition.

We further examine the economic consequences of corporate culture. Our findings indicate that corporate culture is significantly associated with stock price informativeness,

default risk, and the probability of informed trading. Furthermore, to assess the impact of corporate culture on future stock returns, we conduct portfolio analysis and compare the value-weighted stock returns of the long portfolios (i.e., the portfolios with the highest corporate culture scores) and short portfolios (i.e., the portfolios with the lowest corporate culture scores). We find that the stock returns of firms with higher corporate culture values outperform those of firms with lower corporate culture values. It suggests that a strong corporate culture can contribute to an increase in shareholder value.

Our study provides several contributions to literature. *First*, our study is the first to examine the impact of firm-level corporate culture on financial market quality. We contribute to the literature by providing additional insights into how capital markets incorporate value-relevant information into their investment decisions. Roulstone (2003) and Grullon, Kanatas, and Weston, (2004), for example, suggest that analyst following and advertising information affects liquidity costs. Marshall *et al.* (2018) and Nagar *et al*. (2019) show that politics matter for corporate information environments. Pham (2020) documents the impact of corporate managers on the stock liquidity of the firms that they manage. More recently, Marks and Shang (2024) show that business seasonality affects stock market liquidity. Given the increased importance of value-relevant information in understanding capital market outcomes (e.g., Bertomeu and Marinovic, 2016; Liberti and Petersen, 2019; Knauer and Wöhrmann, 2016; Versano, 2021), our study extends the literature by highlighting the importance of corporate culture in enhancing financial market quality.

Second, this study contributes to a growing body of research that examines how cultural norms shape individual and corporate behavior (e.g., Bloom, Sadun, and VanReenen, 2012; Gibbons and Kaplan, 2015; Guiso, Sapienza, and Zingales, 2015a,b; Martinez, Beaulieu, Gibbons, Pronovost, and Wang, 2015; Pacelli, 2019; Pham *et al.,* 2024). Our findings suggest that corporate culture matters for a firm's cost of liquidity in particular

and the overall financial market quality in general. In doing so, we respond to the call of Graham *et al.* (2022a) to conduct more research on the multidimensions and externalities of corporate culture.

The rest of the chapter is organized as follows. In Section 2.2, we review the relevant literature and develop our hypothesis. Section 2.3 presents the data and sample. Section 2.4 discusses the results of baseline results and the mechanisms through which corporate culture affects stock liquidity. Section 2.5 discusses additional analyses. Section 2.6 concludes the chapter.

2.2. Literature review and Hypothesis development

Stock liquidity, defined as the ease of buying or selling shares in large volumes without significant price impact or increased transaction costs, is an important consideration for companies, investors, and other stakeholders (e.g., Chordia, Roll, and Subrahmanyam, 2000; Fang, Noe, and Tice, 2009; Goyenko, Holden, and Trzcinka, 2009; Edmans, Fang, and Zur, 2013). Given the importance of liquidity costs in various economic decisions and outcomes, existing literature has been dedicated to uncovering the determinants of stock liquidity (e.g., Chordia *et al.,* 2000; Chung, Elder, and Kim, 2010; Balakrishnan, Billings, Kelly, and Ljungqvist, 2014; Nagar, Schoenfeld, and Wellman, 2019). While several accounting and market-wide factors are reported to have an association with the cost of liquidity, only a few research examine the relations of other value-relevant information to stock liquidity. Specifically, the role of corporate culture in stock liquidity is under-investigated.

Corporate culture is a comprehensive term encompassing norms, values, knowledge, and customs pertinent to a firm (Gorton *et al.*, 2022). Camerer and Vepsalainen (1988, p. 1) provide a more specific definition of corporate culture as "the set of the board, tacitly

understood rules which tell employees what to do under a wide variety of unknown circumstances". The ambiguity of the definition leads to difficulty in measuring corporate culture (Li *et al.*, 2021). Moreover, the effect of corporate culture on firms or financial markets is still inconclusive.

On the one hand, theoretically, robust corporate cultures mitigate conflicts, reduce haphazard actions, minimize belief heterogeneity, and enhance organizational reliability through consistent standards (Sørensen, 2002). This may reduce the probability of harmful risks that can increase illiquidity (Chordia *et al.*, 2000). In addition, due to the appearance of integrity, corporate culture can improve the transparency of the information environment, which is an important determinant of stock liquidity (Brockman and Chung, 2003). Several studies demonstrate a positive correlation between corporate culture and firm performance. Strong cultures typically yield favorable effects on operations and firm value. Crémer (1993) examines the relationship between corporate culture to firm efficiency and shows that firms with good culture improve the decision-making process of a firm and operation efficiency. Edmans (2011) observes significantly higher abnormal stock returns in the future for firms with positive cultures. Li *et al.* (2021) show that corporate culture is associated with improved business outcomes, particularly pronounced during crises. Consistently, Li, Liu, Mai, and Zhang (2021) find that firms with strong cultures outperform those without during the COVID-19 pandemic.

Corporate culture has a first-order effect on stock liquidity because it shapes the firm's information environment through internal governance. By influencing managerial behavior, disclosure quality, and monitoring effectiveness, culture determines the degree of information asymmetry faced by investors. Lower information asymmetry reduces adverse selection costs and trading uncertainty, facilitating more efficient trading and thereby improving stock liquidity.

In this study, corporate culture functions as an internal governance mechanism by shaping managerial norms and acceptable behavior within the firm. Core cultural values - such as integrity, quality, respect, teamwork, and innovation - promote ethical conduct, cooperation, and long-term orientation, thereby constraining opportunistic managerial actions and encouraging transparent disclosure practices. Through this governance role, corporate culture influences capital market outcomes via several channels. Specifically, integrity and respect reinforce ethical governance by discouraging opportunistic behavior, reducing information risk and misreporting; quality and innovation foster a long-term orientation and disciplined decision-making, improving information quality and reducing uncertainty; while teamwork enhances internal coordination and trust, supporting more effective information sharing and strengthening investor recognition. Together, these culture dimensions improve the firm's information environment and mitigate agency conflicts, leading to more favorable market outcomes.

Building on this framework, the effect of corporate culture on stock liquidity operates through three key channels. *First*, by improving the quality and consistency of disclosures, corporate culture reduces information risk and information asymmetry. *Second*, by promoting ethical conduct and credible managerial behavior, it enhances investor trust in the firm. *Third*, by strengthening transparency and communication, it increases investor recognition and participation. Through these channels, corporate culture lowers trading frictions and uncertainty, thereby facilitating more active trading and improving stock liquidity.

More recently, Fang *et al.* (2023) show that corporate culture has a positive impact on firm performance during a financial crisis. Our study differs from Fang *et al.* (2023) in several significant ways. *First*, our study and that of Fang *et al.* (2023) have different research focuses. Specifically, we examine how corporate culture influences external

parties, particularly how stock market participants perceive and value a company's culture, which can lead to different assessments of liquidity costs. In contrast, Fang *et al.* (2023) explores the effects of culture on the internal implications of organizational culture, including its influence on risk management practices and a company's stability. Our focus on stock liquidity is both economically and financially significant because, as Amihud and Levi (2023) note, liquidity is a critical characteristic for investors, firms, and regulators, impacting both real and financial outcomes. Additionally, we investigate the effect of corporate culture on other important market outcomes, such as stock price informativeness, the probability of informed trading, and corporate default risk. *Second*, Fang *et al.* (2023) and our study have different research settings. Specifically, we utilise the largest possible sample to examine our research questions for the period from 2001, when the culture data becomes available, to 2018, the latest of available data at the time of our writing. Fang *et al.* (2023) focusses only on the global finance crisis of 2008 to 2009. We believe that corporate culture plays a crucial role in a firm's operations during both crisis and non-crisis periods. A longer timeframe is more appropriate for our research, as it enables us to examine how the market and its participants respond to corporate culture over the long term, including during difficult times. *Third*, regarding the data source, while Fang *et al.* (2023) relies on 10-K reports, our study utilizes the Q&A sections of earnings call transcripts to measure corporate culture scores.[2] These Q&A sections provide insights into the interactions between top managers and stakeholders, aligning with our research focus on corporate culture and the reactions of market participants, particularly investors. *Finally*, regarding the key variable construction approach, while Fang *et al.* (2003) employs the traditional bag-of-words

[2] The Q&A sections, comprising the questions and answers between top managers and other call participant, offer two significant advantages. First, it could reflect the prevailing values in the organization through top mangers' talks. Second and more importantly, it could mitigate the excessive self-promotion and probability that top managers prepare the answers.

method, our corporate culture analysis utilizes state-of-the-art machine learning techniques, such as word2vec, as implemented by Li *et al.* (2021).[3] This feature is especially beneficial for measuring corporate culture, as CEOs often discuss cultural values in depth during their speeches, particularly in the Q&A sections. Collectively, our research differs from *Fang et al.* (2023) in terms of main research questions, research design, data sources, key variable construction, and main findings.

In general, several prior papers show a positive relation between corporate culture and firm performance. Besides, literature also shows there are positive relationships between stock liquidity and firm performance or firm value (Fang *et al.*, 2009). Therefore, we can expect that a strong corporate culture can be positively associated with an increase in stock liquidity.

However, firms do not always gain advantages from a strong corporate culture. For instance, Sørensen (2002) explores the impact of corporate culture on performance in diverse environments and suggests that firms with strong cultures perform better in stable environments. However, this positive effect diminishes when the environment changes. In addition, firms with strong cultural environments may struggle to adapt to market changes. Several strong cultural corporations, for example, tend to have a stronger commitment to a particular standard, which leads to slower recognition and adaptation when the external environment changes (Sørensen, 2002). In line with Sørensen (2002), Marker (2009) indicates that an organization with a strong culture can resist change even when it is facing a threat or an urgent need for change. The fact is that it is difficult for firms with strong cultures to remove the old culture and establish a new one (Marker, 2009). Moreover, big-

[3] The word2vec deeply analyses the immediate context of words, particularly in business applications, rather than in isolation. This approach has been recently adopted in literature and top academic outlets such as Bonsall *et al.* (2021), Lee (2021), Li *et al.* (2021), and Li and Yu (2022). As a results, this technique is better suited for our research, which draws on data from Q&A sections that capture various emotions and contexts in top managers' discussions.

old firms with strong cultures, which are sometimes too rigid, prefer stability to creativity and innovation (Dougherty and Heller, 1994). Being slow in adaptation or innovation, the firm can lose its competitive advantages, which may affect the firm's performance, especially in highly competitive industries (Agarwal, Krishna Erramilli, and Dev, 2003; Weerawardena, O'cass, and Julian, 2006). In the case of mergers and acquisitions, firms with strong corporate cultures may also face challenges because of the conflicts in corporate culture, leading to talent loss and benefits inadequacy within firms (O'Reilly, 2008), and strongly affecting operating efficiency and firm performance.

In this study, we argue that corporate culture has significant impacts on stock market liquidity because it may reduce information acquisition costs associated with mistrust, decrease firm risks that can hinder liquidity creation, and appear more attractive to investors and cost-conscious stakeholders. Therefore, our first and sole hypothesis is as follows:

Hypothesis: *Firms with stronger cultural values are associated with higher stock liquidity.*

2.3. Data and Sample

This section discusses our data and sample. We first describe the measures for corporate culture, stock liquidity, and control variables. We then provide data and sample selection. Finally, we present the descriptive statistics of the variables.

2.3.1. Measures of corporate culture

To test the effect of corporate culture on stock liquidity, we employ the corporate culture measure developed by Li *et al.* (2021), who propose a semi-supervised machine learning approach. The data to construct the corporate culture are collected from Q&A sections in the earnings call transcripts.[4] Q&A sections can reflect the prevailing values in

[4] Q&A sections are the question-and-answer sections between top managers, analysts, potential investors,

the organization through the talks of corporate managers, providing valuable information regarding the culture of firms. Earning calls can serve as one of primary avenues for measuring corporate culture in literature (Graham, Grennan, Harvey, and Rajgopal, 2022b).

The data construction procedure can be summarized as follows. *First*, it begins with the nine categories of corporate culture developed by Guiso *et al.* (2015a), which examine how S&P 500 companies identify their core values. Among these, five core cultural values, including innovation, integrity, quality, respect, and teamwork, are the most frequently mentioned.[5] *Second*, Li *et al.* (2021) compile a list of seed words based on these core values, including additional words that cluster around them. The words most strongly associated with the core values are added to this seed list.[6] *Third*, the authors create average vectors for each of the five core values by calculating the mean vectors of all seed words related to those values. Using the word2vec machine learning technique developed by Mikolov *et al.* (2013) and the Stanford CoreNLP package, they parse the Q&A sections of earnings call transcripts to understand the meanings of words and phrases in context. This allows them to calculate the similarity between each unique word and the average vectors of the core values.[7] *Next*, the authors expand the culture dictionary by selecting the top words that have the highest similarity to the core values. *Finally*, they score each cultural value at the firm-year level by calculating the weighted frequency of words associated with each value, divided by the total number of words in the transcript.[8]

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shareholders, and other call participants.

[5] Specifically, innovation appeared in 80% of the S&P 500 firms, following by integrity and respect (70%), quality (60%), and teamwork (50%) (Guiso *et al.*, 2015a).

[6] For example, "ethics" associated to "integrity" has appeared in 34% companies, so it will be added in seed word list for integrity (Li *et al.*, 2021).

[7] The CoreNLP package is available at https://stanfordnlp.github.io/CoreNLP (Li *et al.*, 2021).

[8] There are several advantages to the text-based measure of corporate culture. First, traditional approaches like bag-of-words face challenges in generating a dictionary for corporate culture and identifying related words with cultural values (Bonsall, Mammadov, and Vakilzadeh, 2021). Machine learning technique (i.e., word2vec) addresses this challenge by analyzing word context and providing similar vectors for words (Bonsall *et al.*, 2021; Lee, 2021; Li *et al.*, 2021). Second, the primary data source in this approach is earnings call transcripts, which serve as a crucial communication channel for corporate managers to convey values to

We construct comprehensive measures of corporate culture based on five cultural values (e.g., innovation, integrity, quality, respect, and teamwork). Specifically, the first measure, denoted *Corp_Culture*, is the average value of five categories. The second measure, the indicator variable *Strong_Culture*[9], takes a value of one if the average of a firm's five cultural values is in the top quartile of the sample mean in each year, and zero otherwise. As corporate norms and values can vary across industries (e.g., Graham *et al.*, 2022a), our last measure is the industry-adjusted culture value, *Culture_Ind_Adj*, which is measured as the difference between the firm-level culture value and the average culture value of the industry to which the firm belongs. Higher values of these measures indicate a stronger corporate culture.

Although, these corporate culture measures reflect more articulated culture rather than behavioral culture, they also reflect underlying organizational norms. In addition, capital market participants primarily observe managerial communication rather than internal organizational practices. The literature also shows that earnings call transcripts are an appropriate source of culture (Graham *et al.*, 2022b).

2.3.2. Measures of stock liquidity

To analyze the effect of corporate culture on stock liquidity, we use two main stock liquidity measures as suggested in the literature. The first measure is Amihud's illiquidity ratio, developed by Amihud (2002), which is the ratio of the absolute stock return divided by the trading volume (Amihud, 2002). Fong, Holden, and Trzcinka (2017) find that the

analysts and other stakeholders of firms. (e.g., Matsumoto, Pronk, and Roelofsen, 2011; Bochkay, Hales, and Chava, 2020). Finally, the validity of the measure is confirmed through various validation tests, establishing its comprehensive nature in capturing a firm's corporate culture (Li *et al.*, 2021).

[9] *Strong_Culture* refers to the intensity and consistency with which core organizational values are emphasized within the firm. Consistent with prior literature, culture strength captures the degree to which shared values are widely reinforced and coherent, making them more likely to influence managerial behaviour and the firm's information environment. The study adopts a strong-versus-weak framing because the research question focuses on the effectiveness of shared values as an internal governance mechanism.

Amihud illiquidity measure (2002) is the best low-frequency price impact measure. In addition, Hasbrouck (2009) finds that the Amihud illiquidity measure correlates highly with high-frequency measures.

We measure the annual Amihud's illiquidity ratio as an average daily Amihud's illiquidity ratio and multiply the value by 10^5. We then take the natural logarithm of Amihud's illiquidity ratio to mitigate the effect of any outliers, consistent with the market microstructure literature (e.g., Kamara, Lou, and Sadka, 2008; Cheung, Chung, and Fung, 2015; Edmans *et al.*, 2013; Pham, 2020). To avoid confusion, we multiply the natural logarithm of Amihud's illiquidity ratio by −1 so that a higher value indicates higher liquidity and vice versa. The formula of the inverse of the natural logarithm of Amihud's illiquidity ratio (*Liq_Amihud*) of stock *i* in year *y* is defined as:

$$Liq\_Amihud_{i,y} = -log\left(T_y^{-1}\Sigma\frac{|r_{i,t,y}|}{vol_{i,t,y}}\right), \quad (1)$$

where $r_{i,t,y}$ and $vol_{i,t,y}$ are the return and the dollar volume of stock *i* on day *t* in year *y*, and *T* is the total number of trading days of stock *i* in year *y*.

The second liquidity measure is the *FHT* measure, developed by Fong *et al.* (2017). *FHT* is a percentage-cost of trade proxy and simplifies the LOT model, developed by Lesmond, Ogden, and Trzcinka (1999), using zero-return days. The *FHT* measure is more accurate than LOT and considered one of the best percent-cost proxies for stock liquidity (Fong *et al.*, 2017).[10] Consistent with Amihud's illiquidity ratio, we multiply the natural logarithm of *FHT* by −1 so that a higher value indicates higher liquidity and vice versa. The formula of the inverse of the natural logarithm of *FHT* measure (*Liq_FHT*) of stock *i* in year *y* is defined as:

[10] Various papers use the FHT proxy as a liquidity measure, include, among others, Marshall, Nguyen, and Visaltanachoti (2012), Roy, Rao, and Zhu (2022), and Marks and Shang (2024).

$$Liq\_FHT_{i,y} = -log\left(2\sigma_{i,y}N^{-1}\left(\frac{1+z_{i,y}}{2}\right)\right), \quad (2)$$

where $\sigma_{i,y}$ is the standard deviation of the return of stock *i* over year *y*, $z_{i,y}$ is the proportion of zero returns of stock i in year *y*, and $N^{-1}(.)$ is the inverse function of the cumulative normal distribution.

We also consider four alternative measures of stock market liquidity, including high-low spread (Corwin and Schultz, 2012), close-high-low spread (Abdi and Ranaldo, 2017), zero trading days (Lesmond *et al.*, 1999), and low-frequency effective spread (Chen and Velikov, 2023). We discuss these alternative measures in Section 2.5.1- Sensitivity Analysis.

2.3.3. Control variables

We include several additional control variables based on previous studies to capture firm characteristics that can affect stock liquidity. They are firm size, leverage, advertising, research and development, analyst coverage, institution ownership, and firm age (e.g., Gopalan, Kadan, and Pevzner, 2012; Kahraman and Tookes, 2017; Atawnah, Balachandran, Duong, and Podolski, 2018; Grullon, *et al.*, 2004; Chung *et al.*, 2010; Kale and Loon, 2011; Agarwal, 2007; Cao and Petrasek, 2014). We use the natural logarithm of total assets (*Size*) to control for firm size, the ratio of total debt to book assets (*Leverage*), a dummy variable for advertising expense (*Advertising_dummy*), a dummy variable for research and development expense (*RD_dummy*), the natural logarithm of the number of analysts (*Analysts*), the institutional ownership ratio (*Institution*), and firm age (*Age*).

We further include the inverse of stock price (*Price_Inv*), the idiosyncratic volatility (*Ivol*), and the dollar trading volume (*Dollar_vol*) to capture the effect of stock-specific

characteristics on stock liquidity (e.g., Brockman and Chung, 2003; Chung *et al.*, 2010). We provide a detailed description of the variables in Appendix A.1.

2.3.4. Data and sample

Our sample includes all common stocks listed on the NYSE, AMEX, and Nasdaq. We collect data on price, return, trading volume, and idiosyncratic volatility from the Center for Research in Security Prices (CRSP) to calculate stock liquidity measures, inverse of stock price, stock return, and dollar trading volume. Specifically, for information on analysts and institutional ownership, we obtain data from the Institutional Brokers' Estimate System (I/B/E/S) database and Thompson Reuters Institutional (13F) Holdings database. We use corporate culture data from Li *et al.* (2021). Compustat is our source to collect data on firm-specific characteristics, including firm size, leverage ratio, advertising expenses, research and development expenses, and firm age. To mitigate the effects of microcaps and outliers, following common practice in the literature (e.g., Chung *et al.*, 2010; Kale and Loon, 2011; Pham, 2020), we exclude stock prices below $5 and winsorize all continuous variables at the 1st and 99th percentiles. Our final sample includes 48,785 firm-year observations covering 6,630 unique firms for the period from 2001 to 2018. We provide a detailed description of the variables in Appendix A.1.

2.3.5. Descriptive statistics

Table 2.1 shows the descriptive statistics for the variables included in the models. For each variable, we report the number of observations (*N*), mean, standard deviation (*STD*), and the 25th, 50th, and 75th percentile values.

The mean value of corporate culture is 1.103. The firms with strong cultures in our sample account for 23.4% of the total number of firms (below 25%). The mean value of

Culture_Ind_Adj is −0.039. That means the proportion of the firms having culture values below the average culture values in the industry that firms belong to is larger than the proportion of the firms having culture values above the average culture values in the industry. The mean value of *Liq_Amihud* and *Liq_FHT* are 8.198 and 7.003, respectively. The descriptive statistics of liquidity measures in our sample are consistent with previous studies (e.g., Cheung *et al.*, 2015; Pham, 2020; Nguyen *et al.*, 2021).

For firm characteristics, the average value of firm size and firm age are 7.392 and 17.719, respectively. The average leverage ratio is 0.242 (approximately 25%). In our sample, more than 50% of the total firms spend on research and development, and approximately 40% of the total firms spend on advertising. The average value of *Analysts* is 1.860. More than 66% of stocks in firms are owned by large entities that manage funds on behalf of others, on average. The average values of firm characteristics in our sample are in line with those in the previous papers, such as Chung *et al.* (2010), Cheung *et al.* (2015), Fang *et al.* (2009), and Fang, Tian, and Tice (2014). For stock characteristics, the mean value of *Price_Inv*, *Dollar_vol*, and *Ivol* are 0.063, 42.017, and 0.023, respectively.

Table 2.1: Descriptive statistics

This table presents the descriptive statistics for the sample of 48,785 firm-year observations spanning 2001 to 2018. For each variable, we report the number of observations (N), mean, standard deviation (STD), and the 25th, 50th and 75th percentile value. We winsorize all variables at the 1st and 99th percentiles to mitigate the impact of outliers. Appendix A.1 provides a detailed description of the variables.

Variables	N	Mean	STD	25th Pctl	50th Pctl	75th Pctl
Stock liquidity measures						
Liq_Amihud	48,785	8.198	2.451	6.639	8.377	9.960
Liq_FHT	43,912	7.003	1.035	6.270	7.047	7.765
Corporate culture measures						
Corp_Culture	48,785	1.103	0.515	0.725	1.001	1.377
Strong_Culture	48,785	0.234	0.423	0.000	0.000	0.000
Culture_Ind_Adj	48,785	-0.039	0.933	-0.715	-0.165	0.512
Firm-specific characteristics						
Size	48,785	7.392	1.964	5.970	7.299	8.654
Leverage	48,785	0.242	0.218	0.044	0.206	0.379
Advertising_dummy	48,785	0.399	0.490	0.000	0.000	1.000
RD_dummy	48,785	0.556	0.497	0.000	1.000	1.000
Price_Inv	48,785	0.063	0.049	0.025	0.045	0.087
Dollar_vol	48,785	42.017	90.351	2.451	9.229	35.738
Ivol	48,785	0.023	0.013	0.014	0.020	0.028
Analysts	48,785	1.860	0.859	1.386	1.946	2.485
Institution	48,785	0.662	0.285	0.480	0.723	0.880
Age	48,785	17.719	13.584	7.000	14.000	24.000

2.4. Empirical Findings

2.4.1. Baseline regression results

In this subsection, we use regression models to examine the effect of corporate culture on stock liquidity. The dependent variables are *Liq_Amihud* and *Liq_FHT*. The independent variables are *Corp_Culture*, *Strong_Culture*, and *Culture_Ind_Adj*. We include ten control variables, as discussed in the previous section, in the regression models. Following the literature (e.g., Chung *et al.*, 2010; Edmans *et al.*, 2013; Marks and Shang, 2024), we control for year-fixed effects and industry-fixed effects in all regression models to control for time-invariant and industry-invariant factors that could affect stock liquidity. In addition, to correct cross-sectional and time-series dependence, we use robust standard errors clustered simultaneously by firm and year dimensions (e.g., Petersen, 2009; Gow, Ormazabal, and Taylor, 2010; Thompson, 2011). Our regression model is as follows:

$$Liquidity_{i,y} = \beta_0 + \beta_1 Culture_{i,y} + \beta_2 Control_{i,y} + \beta_3 Industry_i + \beta_4 Year_y + \epsilon_{i,y}\,, \quad (3)$$

where $Liquidity_{i,y}$ is one of the liquidity measures, $Culture_{i,y}$ is one of the corporate culture measures, $Control_{i,y}$ is the vector of the control variables, and $Industry_i$ and $Year_y$ are industry- and year-fixed effect variables, respectively. β_1 captures the impact of corporate culture on stock liquidity.

Table 2.2 presents the baseline results of the study. We find that all estimated coefficients in the models for *Corp_Culture, Strong_Culture,* and *Culture_Ind_Adj* on *Liq_Amihud* and *Liq_FHT* are positive and significant at a 1% level. All three measures of corporate culture have significantly positive effects on all measures of stock liquidity. This finding indicates that firms with a higher value of corporate culture have more liquid stocks than firms with a lower value of corporate culture. This result is consistent with our expectations. For example, the coefficient of *Corp_Culture* in the model of *Liq_Amihud* is 0.1313 and significant at a 1% level. The impact of corporate culture is also economically

significant. Specifically, one standard deviation increase in corporate culture value is associated with a 6.76% (i.e., 0.1313 x 0.515) increase in the Amihud liquidity ratio. In addition, moving from the 25th to 75th percentile of *Corp_Culture* results in 8.56% (i.e., 0.1313 x (1.377 - 0.725)) increase in Amihud liquidity ratio.

Regarding control variables for firm characteristics, we find that stock liquidity is higher for larger and older firms, firms spending on research and development, firms with higher stock prices and trading volumes, and firms with a higher number of analysts and ratio of institutional ownerships. We also observe that firms with higher leverage ratios and higher stock return volatilities have less liquid stocks. These findings are consistent with the previous studies on stock liquidity's determinants (e.g., Atawnah *et al.* (2018), Brockman and Chung (2003), and Chung *et al.* (2010)).

Table 2.2: Corporate Culture and Stock Liquidity - Baseline results

This table presents the effect of corporate culture on stock liquidity. The dependent variables are stock liquidity measures, including the Amihud (2002) measure and the FHT measure. The main independent variables are *Corp_Culture, Strong_Culture*, and *Culture_Ind_Adj*. Constant term, year-fixed effects, and industry-fixed effects based on two-digit SIC are included. *t*-statistics computed using standard errors clustered at the firm and year level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions are in Appendix A1.

	Liq_Amihud			*Liq_FHT*		
	(1)	(2)	(3)	(4)	(5)	(6)
Corp_Culture	0.1313***			0.0370***		
	(6.50)			(4.77)		
Strong_Culture		0.1145***			0.0312***	
		(6.08)			(4.61)	
Culture_Ind_Adj			0.0561***			0.0174***
			(6.20)			(4.84)
Size	0.5308***	0.5289***	0.5300***	0.0721***	0.0715***	0.0720***
	(21.77)	(21.68)	(21.75)	(9.38)	(9.33)	(9.35)
Leverage	-0.2906***	-0.3050***	-0.2928***	-0.1171***	-0.1213***	-0.1169***
	(-4.56)	(-4.80)	(-4.58)	(-5.15)	(-5.33)	(-5.12)
Advertising_dummy	0.0582**	0.0606**	0.0595**	-0.0138	-0.0131	-0.0135
	(2.32)	(2.40)	(2.37)	(-1.49)	(-1.43)	(-1.47)
RD_dummy	0.2225***	0.2264***	0.2243***	0.0570***	0.0580***	0.0573***
	(7.49)	(7.61)	(7.53)	(5.93)	(6.01)	(5.91)
Price_Inv	-11.1328***	-11.1280***	-11.1348**	-11.3003**	-11.2973***	-11.3018**
	(-27.75)	(-27.84)	(-27.74)	(-43.73)	(-43.71)	(-43.79)
Dollar_vol	0.0033***	0.0033***	0.0033***	-0.0001	-0.0000	-0.0001
	(9.75)	(9.91)	(9.78)	(-0.43)	(-0.33)	(-0.43)
Ivol	-11.1776***	-11.0249***	-11.1458**	-18.3046**	-18.2618***	-18.3070**
	(-3.28)	(-3.22)	(-3.28)	(-32.62)	(-32.46)	(-32.64)
Analysts	0.9058***	0.9079***	0.9063***	0.0869***	0.0876***	0.0870***
	(28.53)	(28.67)	(28.59)	(10.65)	(10.66)	(10.67)
Institution	0.8711***	0.8732***	0.8716***	0.0765***	0.0770***	0.0766***
	(9.07)	(9.07)	(9.09)	(3.81)	(3.84)	(3.82)
Age	0.0060***	0.0059***	0.0060***	0.0016***	0.0016***	0.0016***
	(5.06)	(4.95)	(5.04)	(4.08)	(4.02)	(4.11)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
S.E. clustered	Firm, Year	Firm, Year	Firm, Year	Firm, Year	Firm, Year	Firm, Year
Observations	48,785	48,785	48,785	43,912	43,912	43,912
Adj R-squared	0.8508	0.8506	0.8507	0.6740	0.6739	0.6740

2.4.2. Endogeneity

There is a potential endogeneity concern that might drive the effect of the corporate culture on stock liquidity. An endogeneity problem occurs when there is an unknown or omitted factor that affects both corporate culture and stock liquidity at the same time. Therefore, we conduct four identification strategies to mitigate the effect of potential endogeneity problems on the regression results in baseline models. *First*, we use propensity score matching to compare the stock liquidity of firms with higher culture values and the stock liquidity of otherwise comparable firms. *Second*, we use entropy balancing to confirm the results of propensity score matching. *Third*, we use an instrumental variable approach to reinforce our findings in the baseline models. *Finally*, we conduct the CEO change test to consider the possibility that the effects of corporate culture on stock liquidity are entirely driven by the change in top managers of firms.

2.4.2.1. Propensity score matching

To test for the possibility that the effect of corporate culture on stock liquidity comes from systematic differences, we use the propensity score matching approach to reduce the effect of the endogeneity issue on our results. In doing so, we can compare the effect of corporate culture on the stock liquidity of firms with higher corporate culture values and firms with lower culture values after eliminating the differences in firm characteristics. Firms with strong cultural values are in the treatment group, and firms without strong cultural values are in the control group.

The process of the propensity score matching method is as follows. *First*, we use the probability of strong culture value calculated from the logit model as the propensity score. We then create the matched sample by matching firms with strong cultural values with firms without strong cultural values, with a similar propensity score, to make a comparable

sample. We use nearest-neighbor matching with a level of less than 1% and a non-replacement method.

The results are presented in Panel A of Table 2.3. Columns (1) and (2) report the logit model results with *Strong_Culture* as the dependent variable and firm characteristics as independent variables before and after matching, respectively. The result of the logit model in column (1) shows that most firm characteristics have significant effects on the probability of having a strong culture. For example, smaller and younger firms with lower leverage ratios have a higher probability of having a strong culture. Firms spending on advertising, R&D, and higher numbers of analysts also enhance the probability of having a strong culture. After matching treated firms with control firms, the result of the logit model becomes insignificant. We also report the test for differences in means of matching characteristics between the treated and control groups in Panel B of Table 2.3. The results show no significant differences in means of matching characteristics after matching. The results also confirm no significant difference in firm-characteristics variables between the two groups. In the final step, we formally test the impact of culture on stock liquidity by running the baseline models using the propensity score matched sample and report the results in Panel C of Table 2.3.

The results show a significantly positive relationship between corporate culture and stock liquidity with relatively similar coefficients (0.1123 vs. 0.1145 and 0.0269 vs. 0.0312) compared to the results in the baseline models. The coefficients are significant at a 1% level across different model specifications. These results consistently suggest that firms with strong corporate cultures are associated with higher stock liquidity.

Table 2.3: Corporate Culture and Stock Liquidity - Propensity score matching

This table presents propensity matching results of stock liquidity on corporate cultures and control variables. Panel A reports the estimation results of the probability of having a strong culture on firm characteristics using the logit model. The dependent variable, *Strong_Culture*, equals one if the average of a firm's five cultural values is in the top quartile across all Compustat firms in a year, and zero otherwise. Panel B reports the difference in means of firm characteristics between firms having strong culture and their counterparts before and after matching. We use the nearest neighbor matching with a level less than 1% and the non-replacement method to create a matched sample based on the propensity score estimated from the logit model in Panel A. Panel C reports the estimation results of corporate culture effect on stock liquidity in the matched sample. Constant term, year-fixed effects, and industry-fixed effects based on two-digit SIC are included. *t*-statistics computed using standard errors clustered at the firm and year level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions are in Appendix A1.

Panel A: Logit model before and after matching

	Strong_Culture	*Strong_Culture*
	(1)	(2)
Size	-0.2041***	-0.0004
	(-16.11)	(-0.03)
Leverage	-1.0734***	-0.0178
	(-14.87)	(-0.22)
Advertising_dummy	0.1308***	-0.0067
	(4.70)	(-0.21)
RD_dummy	0.1982***	-0.0089
	(5.64)	(-0.22)
Price_Inv	1.9718***	0.1600
	(5.98)	(0.42)
Dollar_vol	0.0034***	0.0000
	(19.58)	(0.13)
Ivol	12.8524***	-0.8485
	(9.28)	(-0.53)
Analysts	0.1226***	0.0150
	(5.89)	(0.64)
Institution	0.0264	0.0194
	(0.52)	(0.32)
Age	-0.0089***	0.0012
	(-7.92)	(0.83)
Industry and Year Fixed Effects	Yes	Yes
S.E. clustered	Firm, Year	Firm, Year
Observations	48,783	19,258
Pseudo R-squared	0.2077	0.0017

Panel B: Differences in characteristics

	Before matching		After matching	
	Difference	*t*-stats	Difference	*t*-stats
Size	1.0397	(50.79)	0.0168	(0.61)
Leverage	0.0936	(40.78)	-0.0011	(-0.37)
Advertising_dummy	-0.1394	(-26.83)	-0.0050	(-0.69)
RD_dummy	-0.1574	(-29.91)	-0.0023	(-0.33)
Price_Inv	-0.0143	(-27.44)	-0.0003	(-0.38)
Dollar_vol	-2.6864	(-2.78)	0.7236	(0.52)
Ivol	-0.0047	(-35.53)	-0.0001	(-0.76)
Analysts	-0.0095	(-1.04)	0.0118	(0.94)
Institution	0.0260	(8.55)	0.0035	(0.83)
Age	4.2124	(29.25)	0.1748	(1.01)

Panel C: Regression results based on the matched sample

	Liq_Amihud	*Liq_FHT*
	(1)	(2)
Strong_Culture	0.1123***	0.0269***
	(5.07)	(3.54)
Size	0.5122***	0.0581***
	(22.16)	(8.63)
Leverage	-0.3819***	-0.0679*
	(-4.35)	(-1.89)
Advertising_dummy	0.0839***	-0.0200*
	(2.99)	(-1.84)
RD_dummy	0.2257***	0.0533***
	(5.78)	(3.41)
Price_Inv	-11.7236***	-10.8392***
	(-27.22)	(-45.87)
Dollar_vol	0.0029***	0.0001
	(7.28)	(0.56)
Ivol	-8.0388**	-19.9324***
	(-2.18)	(-27.07)
Analysts	0.9978***	0.1103***
	(26.63)	(12.24)
Institution	0.8493***	0.0369
	(8.29)	(1.00)
Age	0.0054***	0.0015*
	(3.80)	(2.06)
Industry and Year Fixed Effects	Yes	Yes
S.E. clustered	Firm, Year	Firm, Year
Observations	19,258	17,519
Adj R-squared	0.8629	0.6957

2.4.2.2. Entropy matching

The second approach uses the entropy matching method, developed by Hainmueller (2012). The advantage of entropy balancing, compared to propensity score matching, is that it reweights each control observation (Hainmueller, 2012) and the post-weighting properties of the matched treatment and control samples are virtually identical (e.g., Cumming, Ji, Peter, and Tarsalewska, 2020). Entropy balancing is widely employed in literature (e.g., Glendening, Mauldin, and Shaw, (2019); McMullin and Schonberger (2020)).

In Panel A of Table 2.4, we present the mean value of other characteristics. There is no difference in mean values of matching characteristics between the treatment and control groups. In Panel B of Table 2.4, we present the regression results using the entropy matching method. The results show a significantly positive relationship between corporate culture and stock liquidity with relatively similar coefficients (0.0874 vs. 0.1145 and 0.0219 vs. 0.0312). The coefficients are significant at the 1% level. These results support the results from propensity score matching that the findings in the baseline are not pushed by the systematic differences. For example, the coefficients of *Strong_Culture* in the model of *Liq_Amihud* and *Liq_FHT* are 0.0874 and 0.0219, respectively, and significant at a 1% level. The results consistently confirm the impact of corporate culture on stock liquidity.

Table 2.4: Corporate Culture and Stock Liquidity - Entropy matching

This table presents entropy balancing regression results of stock liquidity on corporate cultures and control variables. The dependent variables are stock liquidity measures, including the Amihud (2002) measure and the FHT measure. We choose firms in the top quartile of culture values as our treatment group. The remaining sample is the control group. We use the entropy balancing method to match treated firms and control firms by firm characteristics. Panel A reports the difference in means of firm characteristics between firms having strong culture and their counterparts before and after balancing. Panel B reports the estimation results of corporate culture effect on stock liquidity in the balanced sample. Constant term, year-fixed effects, and industry-fixed effects based on two-digit SIC are included. *t*-statistics computed using standard errors clustered at the firm and year level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions are in Appendix A1.

Panel A: Differences in characteristics

	Before balancing		After balancing	
	Difference	*t*-stats	Difference	*t*-stats
Size	1.0397	(50.79)	0.0004	(0.00)
Leverage	0.0936	(40.78)	-0.0000	(-0.00)
Advertising_dummy	-0.1394	(-26.83)	0.0000	(0.00)
RD_dummy	-0.1574	(-29.91)	0.0000	(0.00)
Price_Inv	-0.0143	(-27.44)	0.0000	(0.00)
Dollar_vol	-2.6864	(-2.78)	-0.0009	(-0.00)
Ivol	-0.0047	(-35.53)	0.0000	(0.00)
Analysts	-0.0095	(-1.04)	0.0000	(0.00)
Institution	0.0260	(8.55)	0.0000	(0.00)
Age	4.2124	(29.25)	-0.0004	(-0.00)

Panel B: Regression results based on the matched sample

	Liq_Amihud	*Liq_FHT*
	(1)	(2)
Strong_Culture	0.0874***	0.0219***
	(6.69)	(2.78)
Size	0.5364***	0.0633***
	(74.57)	(16.93)
Leverage	-0.3005***	-0.0990***
	(-7.91)	(-4.74)
Advertising_dummy	0.0600***	-0.0084
	(4.24)	(-0.99)
RD_dummy	0.2541***	0.0487***
	(14.36)	(4.67)
Price_Inv	-11.7911***	-10.7177***
	(-62.78)	(-111.24)
Dollar_vol	0.0029***	-0.0000
	(32.66)	(-0.48)
Ivol	-6.0430***	-18.3282***
	(-7.00)	(-41.97)
Analysts	0.9639***	0.1131***
	(79.02)	(18.40)
Institution	0.8944***	0.0799***
	(31.62)	(5.01)
Age	0.0045***	0.0011***
	(7.82)	(3.12)
Industry and Year Fixed Effects	Yes	Yes
S.E. clustered	Firm, Year	Firm, Year
Observations	48,785	43,912
Adj R-squared	0.8692	0.7008

2.4.2.3. Instrumental variable approach

This section discusses the instrumental variable approach to mitigate the endogeneity from omitted variables and reverse causality (Wooldridge, 2002). Our instrumental variable approach is motivated by the growing literature suggesting that firms in the same geographic area exhibit similar local norms and values.[11] Jha and Chen (2015), for example, argue that a firm's culture reflects the culture in its location because main employees usually reside near the firm's head offices. In addition, Hasan, Hoi, Wu, and Zhang (2017) indicate that the differences in cultures can be isolated by geographic areas. Therefore, we choose the instrumental variable (*IV_Culture*) as the average value of *Corp_Culture* of all firms in the same geographic area excluding the focal firm using fips-code.[12] This instrumental variable is correlated with the cultural value of a firm. In addition, there is no direct link between stock liquidity and the geographic dimension. Our instrumental variable, therefore, satisfies the exclusion and relevance conditions according to Roberts and Whited (2013). We apply the two-stages least square method. In the first stage, we estimate the *Corp_Culture* as follows:

$$Corp\_Culture_{i,y} = \beta_0 + \beta_1 IV\_Culture_{i,y} + \beta_2 Control_{i,y} + \beta_3 Industry_i + \beta_4 Year_y + \epsilon_{i,y}\,, \quad (4)$$

In the second stage of the procedure, we run the regression as in baseline models with the estimated value of *Corp_Culture_IV* from the first stage as follows:

$$Liquidity_{i,y} = \beta_0 + \beta_1 Corp\_Culture\_IV_{i,y} + \beta_2 Control_{i,y} + \beta_3 Industry_i + \beta_4 Year_y + \epsilon_{i,y}\,, \quad (5)$$

Table 2.5 presents the result of the instrumental variable approach. Column (1) reports the first stage regression with *Corp_Culture* as the dependent variable and

[11] While motivated by prior literature on geographic clustering of corporate culture (e.g., Jha and Chen, 2015; Hasan *et al.,* 2017), a limitation of this approach is that the use of group-level averages may violate the exclusion restriction (Gormley and Matsa, 2014), and the IV results should therefore be interpreted as supporting rather than causal evidence.

[12] Fips-code is a five-digit Federal Information Processing Standards Code, which identifies counties and county-equivalents in the U.S. We exclude observations with only two firms or below in the same county area (same fips-code), which accounts about 2% of the total observations.

IV_Culture as the independent variable. The result shows that the average cultural value of the area has a positive relationship with the cultural value of companies. Furthermore, the coefficient is significant at the 1% level. This result confirms that *IV_Culture* correlates with the firm's cultural values. To test the significance of the instrumental variable, we report the *F*-statistics from the first-stage regressions. Following Angrist and Pischke (2009) and Stock, Yogo, and Wright (2002), an instrumental variable is significant when the *F*-statistic should be greater than 10. The *F*-statistics in our model (i.e., 62.39), therefore, pass the Stock and Yogo (2005) weak identification tests.

In the second stage, the coefficients of *Corp_Culture_IV* are positive and significant for both *Liq_Amihud* and *Liq_FHT*, with values of 1.5022 and 0.1878, respectively. The results support the findings of our baseline models. The significant positive coefficients suggest a positive relation between corporate culture and stock liquidity. It indicates that firms with good corporate culture have more liquid stocks, confirming the findings from the baseline regressions.

Table 2.5: Corporate Culture and Stock Liquidity - Instrumental variable approach

This table presents the regression results of stock liquidity on corporate cultures using an instrumental variable approach. We report the results of the regressions in the two-stage least-squares procedure (2SLS). We use *IV_Culture* as an instrumental variable that is the average cultural values of all firms located in the same fips-code, excluding firm *i*. Column (1) is the first stage regression of corporate culture on instrumental variables. Columns (2) and (3) are the second-stage regression of liquidity measures on the estimated value of cultural value from Column (1). Constant term, year-fixed effects, and industry-fixed effects based on two-digit SIC are included. *t*-statistics computed using standard errors clustered at the firm and year level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions are in Appendix A1.

	First stage	Second stage	
	Corp_Culture	*Liq_Amihud*	*Liq_FHT*
	(1)	(2)	(3)
IV_Culture	0.2127***		
	(8.94)		
Corp_Culture_IV		1.5022***	0.1878*
		(6.00)	(1.89)
Size	-0.0378***	0.5767***	0.0784***
	(-10.40)	(23.46)	(9.56)
Leverage	-0.2615***	0.0940	-0.0712**
	(-10.38)	(1.04)	(-2.54)
Advertising_dummy	0.0408***	-0.0025	-0.0217**
	(3.24)	(-0.09)	(-2.13)
RD_dummy	0.0605***	0.1342***	0.0480***
	(4.38)	(3.85)	(4.35)
Price_Inv	0.2400**	-11.5846***	-11.3142***
	(2.28)	(-27.97)	(-43.07)
Dollar_vol	0.0007***	0.0023***	-0.0002
	(8.02)	(6.74)	(-0.93)
Ivol	3.1373***	-15.6442***	-18.9243***
	(6.45)	(-4.31)	(-38.32)
Analysts	0.0245***	0.8662***	0.0811***
	(3.76)	(26.04)	(9.22)
Institution	0.0015	0.8548***	0.0747***
	(0.10)	(8.98)	(3.73)
Age	-0.0017***	0.0089***	0.0019***
	(-4.66)	(6.76)	(3.81)
Industry and Year Fixed Effects	Yes	Yes	Yes
S.E. clustered	Firm, Year	Firm, Year	Firm, Year
Observations	45,327	45,327	40,724
Adj R-squared	0.3576	0.8498	0.6761
F-statistics	**62.39**	1924.09	3993.99

2.4.2.4. CEO turnover test

The fourth test to address the endogeneity problem is the CEO turnover test. There is a possibility that the effects of corporate culture on stock liquidity may be driven by the change in top managers of firms. For example, when top managers are changed, policies, decisions, and strategies of firms may be changed, even policies relating to culture. Consequently, the changes in CEOs, especially forced CEOs, may have effects on investors' reactions to firms' stocks or stock liquidity. Therefore, we conduct the CEO turnover test to ensure that the effect of CEOs does not drive the effect of corporate culture on stock liquidity. The regression is as follows:

$$Liquidity_{i,y} = \beta_0 + \beta_1 Corp\_Culture_{i,y} + \beta_2 Corp\_Culture \times Post_{i,y} + \beta_3 Post_{i,y} + \beta_4 Control_{i,y} + \beta_5 Industry_i + \beta_6 Year_y + \epsilon_{i,y}, \quad (6)$$

where $Liquidity_{i,y}$ is one of the liquidity measures; $Corp\_Culture_{i,y}$ is corporate culture measure; $Post_{i,y}$ is the dummy variable that takes 1 if the firm is in or after CEO turnover and 0 otherwise; $Corp\_Culture \times Post_{i,y}$ is the interaction term of $Corp\_Culture_{i,y}$ and $Post_{i,y}$; $Control_{i,y}$ is the vector of the control variables; and $Industry_i$ and $Year_y$ are industry and year-fixed effect variables, respectively. We collect the data of forced CEOs from Peters and Wagner (2014). It contains information on forced CEO turnovers (excluding all voluntary turnover) of all firms in the Execucomp database.

We consider both one year or two years before or after the CEO turnover. *β2* captures the impact of corporate culture on stock liquidity if the firm is in or after CEO turnover. The result is presented in Table 2.6. The coefficients of *Corp_Culture* in all models are positive and statistically significant. It implies the significantly positive relationship between corporate culture and stock liquidity. Coefficients of *Corp_Culture* x *Post* in all models are insignificant, suggesting that CEO turnover does not have a significant effect on the corporate culture's impact on stock liquidity. These results reinforce the findings in the

baseline models that the effect of corporate culture on stock liquidity is significantly positive and not driven by CEO turnover.

Table 2.6: Corporate Culture and Stock Liquidity - CEO change test

This table presents the regression of stock liquidity on corporate cultures using CEO turnover variable. We use the dummy variable *Post* which equals 1 if the firm is during or after 1 year (2 years) of CEO forced event, 0 if the firm is for 1 year (2 years) before CEO forced event. We use the interaction *Corp_Culture* x *Post* to capture the difference in the culture values effects between before or after the CEO forced event. Constant term, year-fixed effects, and industry-fixed effects based on two-digit SIC are included. *t*-statistics computed using standard errors clustered at the firm and year level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions are in Appendix A1.

	1 year		2 years	
	Liq_Amihud	*Liq_FHT*	*Liq_Amihud*	*Liq_FHT*
	(1)	(2)	(3)	(4)
Corp_Culture	0.2804***	0.0773*	0.2130***	0.0632**
	(4.25)	(1.96)	(3.56)	(2.37)
Corp_Culture x *Post*	-0.0781	-0.0238	-0.0615	-0.0274
	(-1.15)	(-0.41)	(-1.39)	(-1.20)
Post	0.0634	0.0266	0.0739	0.0048
	(0.82)	(0.36)	(1.37)	(0.13)
Size	0.5366***	0.0359**	0.5250***	0.0299**
	(22.18)	(2.24)	(21.81)	(2.29)
Leverage	-0.0615	0.0492	-0.0021	0.0306
	(-0.39)	(0.57)	(-0.01)	(0.39)
Advertising_dummy	0.1332**	0.0052	0.1347**	0.0262
	(2.77)	(0.15)	(2.79)	(0.77)
RD_dummy	0.1631**	0.0664	0.1702**	0.0555
	(2.57)	(1.25)	(2.77)	(1.13)
Price_Inv	-8.7869***	-10.7291***	-9.1660***	-10.7150***
	(-10.68)	(-23.13)	(-11.76)	(-26.20)
Dollar_vol	0.0025***	0.0001	0.0026***	0.0001
	(7.06)	(0.40)	(8.07)	(0.41)
Ivol	-20.7269***	-21.2801***	-19.2815***	-21.8500***
	(-6.95)	(-14.97)	(-5.47)	(-13.80)
Analysts	0.7496***	0.1078***	0.7768***	0.1090***
	(18.20)	(4.67)	(20.10)	(6.74)
Institution	0.3879***	0.0984	0.3892***	0.1045*
	(3.31)	(1.47)	(3.54)	(1.95)
Age	-0.0021	0.0009	-0.0018	0.0005
	(-1.28)	(0.70)	(-1.11)	(0.49)
Industry and Year FE	Yes	Yes	Yes	Yes
S.E. clustered	Firm, Year	Firm, Year	Firm, Year	Firm, Year
Observations	2,245	2,030	3,511	3,167
Adj R-squared	0.8948	0.6804	0.8929	0.6601

2.4.3. Possible channels

In this section, we discuss the possible channels through which corporate culture affects stock liquidity: the effects of corporate culture on information risk, firm reputation through the informativeness of corporate announcements, and investor recognition. To test the effect of corporate culture on these channels, we conduct regression models with dependent variables are measures of these channels, and the independent variable is *Corp_Culture* measuring corporate culture. We include firm size, leverage ratio, advertising dummy variable, R&D dummy variable, analyst coverage, and institutional ownership as control variables having effects on these channels. We also control industry and year-fixed effects as in the baseline regression. The results are presented in Table 2.7.

2.4.3.1. Information risk

The first possible channel is information risk. Firms with higher stock liquidity often have less information asymmetry between insiders and outsiders. Chung *et al.* (2010), for example, show that firms can enhance stock liquidity by applying corporate governance standards, which can reduce information asymmetry. In addition, Lang and Maffett (2011) find that firms with greater transparency (less information asymmetry) have less volatility of stock liquidity and less extreme illiquidity events. Therefore, with the integrity component included in corporate culture measurement, we expect that good culture firms can enhance information transparency in trading firms' stocks, which results in higher stock liquidity.

To measure the information risk, we use three measures which are abnormal accrual (*Abs_Accruals*), financial reporting opacity (*Opacity*), and accounting reporting complexity (*ARC*). The first measure is abnormal accrual (*Abs_Accruals*), which is based on discretionary accruals estimated following the model of Jones (1991). The second measure is financial reporting opacity (*Opacity*) developed by Hutton, Marcus, and Tehranian (2009).

Opacity is measured as a three-year moving sum of absolute discretionary accruals, following Dechow, Sloan, and Sweeney (1995). These two indicators show irregularities and uncertainties in the accounting of companies. Discretionary accruals are associated with manipulation actions (Dechow *et al.*, 1995), and consistently higher discretionary accruals (higher Opacity) are associated with a higher probability of earnings manipulation (Hutton *et al.*, 2009). Therefore, higher values of abnormal accrual (*Abs_Accruals*) and financial reporting opacity (*Opacity*) refer to lower transparency of companies. The third measure of transparency is accounting reporting complexity (*ARC*), developed by Hoitash and Hoitash (2018). *ARC* reflects the complexity of accounting and can serve as a proxy for disclosure quality (Hoitash and Hoitash, 2018) and information asymmetry (Dao and Xu, 2024; Bushee, Gow, and Taylor, 2018).

Panel A of Table 2.7 reports the results of corporate culture's effects on information transparency measured by abnormal accrual (*Abs_Accruals*), financial reporting opacity *(Opacity)*, and accounting reporting complexity (*ARC*). The coefficients are -0.0183, -0.0578, and -0.0163, respectively. These coefficients are significant at the 1% and 10% levels. The results suggest that a higher value of culture reduces the opacity in accounting and improves the information transparency in the company, leading to the higher liquidity of firms' stocks.

2.4.3.2. Reputation and Trust

The second possible channel is the reputation and trust of the firm. Firm reputation is defined as an intangible asset that can help a corporation maintain a sustainable competitive advantage against other competitors (Bharadwaj, Varadarajan, and Fahy, 1993; Cao, Myers, and Omer, 2012). Guiso, Sapienza, and Zingales (2008) report that with less trust, investors are less likely to buy stocks or buy less than those with more trust, which

results in the positive effect of trust on stock market participation. Extension to Guiso *et al.* (2008), Blau (2017) shows evidence that trust can directly improve stock liquidity. Particularly, trust can be a function to monitor the information asymmetry between insiders and outsiders, and reduce transaction costs and agency problems, which consequently increases the stock market liquidity (Jha, 2019; Zadeh, 2023). Therefore, we argue that corporate culture can affect a firm's stock liquidity by affecting its reputation and trust.

We use two measures for firm trust and reputation. The first measure is CSR activities. Lins, Servaes, and Tamayo (2017) and Gong and Grundy (2019) emphasize that firms can enhance trust by engaging in CSR activities. Previous literature shows the relationship between stock liquidity and corporate social responsibility (CSR). For example, Roy *et al.* (2022) find that firms engaging in CSR activities have higher stock liquidity than non-CSR firms, especially firms with more expenses on education activities and healthcare projects. They also state that engaging in CSR activities can reduce information asymmetry and improve reputation, which results in higher stock liquidity in stock markets. With the positive effects on the information environment and stock liquidity, we expect that firms with good cultures have more engagement in CSR activities. To measure CSR activities, we construct two firm-level CSR ratings based on five and six categories (i.e., community, diversity, employee relations, human rights, product, and environment) in the MSCI/KLD database.[13] Specifically, for each of the categories, we follow Lins *et al.* (2017) and consider the data on both strengths and concerns and construct a net CSR measure. Following Servaes and Tamayo (2013), we scale the strengths (concerns) for each category by dividing the number of strengths (concerns) for each firm-year by the maximum number of strengths (concerns) possible for each category year because the number of strengths and concerns for

[13] Lins *et al.* (2017) use five CSR categories to derive their CSR measures, while Cronqvist and Yu (2017) consider all six categories in their setting. Therefore, we construct both CSR measures based on the five and six dimensions in our channel analyses.

each CSR category varies over time. The net CSR index for each category, measured by subtracting the concerns index from the strength index, ranges from -1 to +1. Consistent with Cronqvist and Yu (2017) and Lins *et al.* (2017), *CSR5* and *CSR6* are our two firm-level CSR ratings based on five and six categories, respectively.

The second measure is the abnormal return surrounding corporate earnings announcements. This measure is motivated by a strand of literature suggesting that investors react more quickly to earning announcements of firms with higher trust than firms with lower trust. Pevzner, Xie, and Xin (2015), for example, document that in a more trusting environment, investors notice that the released disclosures are more reliable and respond more vigorously to these corporate earnings announcements and show a significant increase in abnormal trading volume and stock return. In line with Pevzner *et al.* (2015), Pfarrer, Pollock, and Rindova, (2010) present that firms with higher reputations gain greater investor reactions, which is calculated by the abnormal return surrounding earning announcements, compared to firms with lower reputations. To calculate abnormal returns around an earnings announcement, we first collect earnings announcement dates from Compustat. We consider a 2-day window, 3-day window, and 5-day window surrounding earnings announcement dates and use the absolute value of abnormal returns to capture both investors' positive and negative reactions (e.g., Brown and Warner, 1985; Pham, 2020).[14] We expect that firms with better corporate culture can have stronger investors' reactions.

To test this possibility, we conduct the regression models with firm reputation and trust as the dependent variable and corporate culture as the main independent variable of interest. We also add firm size, leverage, advertising, research and development, analysts, institutional ownership, and firm age as control variables. For the models of earnings

[14] We follow the literature to consider different window periods surrounding earnings announcement dates to mitigate the impacts of pre-announcement leakage or post-announcement delayed price response, if there are any (e.g., Brown and Warner, 1985; Nguyen and Truong, 2018; Pham, 2020).

announcements, we add two more control variables which are standardized unexpected earnings (*Sue*) and a dummy variable for the fourth quarter (*Q4*), following the earnings announcement literature (e.g., Bernard and Thomas, 1989; Nguyen and Truong, 2018). *Sue* is seasonally adjusted quarterly earnings per share divided by the share price at the end of the quarter (Livnat and Mendenhall, 2006).

Panel B of Table 2.7 reports the results of corporate culture's effects on the trust of companies measured by corporate social responsibility activities ratings *(CSR5 and CSR6)*. The coefficients are 0.1046 and 0.1225, respectively, and are significant at the 1% level. The results suggest that corporate culture has a significant positive effect on firm trust measured by CSR rating. This effect is economically considerable. Moving from the 25^{th} to 75^{th} percentile of *Corp_Culture* leads to an increase in CSR ratings by 6.82% (i.e., 6.82% = 0.1046 x (1.377 - 0.725)).

Panel C of Table 2.7 reports the results of corporate culture's effects on the trust of companies measured by the abnormal returns with 2-day, 3-day, and 5-day windows around earnings announcements *(Abs_Car2, Abs_Car3, and Abs_Car5).* The coefficients are 0.0024, 0.0047, and 0.0047, respectively, and are significant at the 1% level. It suggests that firms with higher corporate culture scores receive stronger reactions from investors and markets for their announcements than firms with lower corporate culture scores. These results indicate that a stronger culture can improve trust and firm reputation, which increases stock liquidity in financial markets.

2.4.3.3. Investor recognition

The last possible channel is investor recognition. Previous literature documents a link between investor recognition and stock liquidity. By developing a model to test the investor recognition hypothesis, Merton (1987) finds that firms with lower investor

recognition have lower stock liquidity. As a result, their stocks are expected to bring higher stock returns for investors to compensate for lower liquidity. In line with Merton (1987), Grullon *et al.* (2004) also find that firms familiar with investors have higher stock liquidity. In addition, firms with strong corporate cultures can become more familiar to investors because of their strong reputation, which means that good corporate culture may increase investor recognition. Therefore, we expect that culture can enhance stock liquidity by enhancing investor recognition of the firm's stock.

We use four measurements to capture investor recognition. *First*, we use the breadth of institutional investors (*IO_breadth*) measured by the natural logarithm of the total number of institutional investors owning the firm's stocks from 13F fillings. Previous studies have used the number or the fraction of shareholders or the number of institutional investors to measure investor recognition (e.g., Chen, Hong, and Stein (2002), Truong, Nguyen, and Huynh (2021), Ding and Hou (2015), Lehavy and Sloan (2008), and Grullon *et al.* (2004)). We expect that a firm with a good corporate culture environment can attract more investors and other stakeholders, especially institutional investors.

The investor recognition hypothesis implies that media can increase investor recognition by spreading the firm's reputation to many audiences (Merton, 1987; Fang and Peress, 2009). Mass media is also an efficient channel to attract potential investors (individuals or institutions), which leads to an increase in investor recognition. Grullon *et al.* (2004) report that firms with higher expenses in advertising can attract more investors and can result in higher stock liquidity. Bushee, Core, Guay, and Hamm (2010) also find that media can improve the information environment and liquidity of a firm's stock. Therefore, we expect that firms with higher corporate cultural scores can have better stock liquidity by enhancing their popularity in the media. Therefore, our second and third measures of investor recognition are *Media_coverage* and *Media_tone. Media_coverage* is

the natural logarithm of the number of stories in articles related to a firm, and *Media_tone* is the difference between weighted-average positive and negative stories related to a firm (Hendershott, Livdan, and Schürhoff, 2015; Truong *et al.*, 2021). Data on media is collected from Thomson Reuters News Analytics (TRNA).[15]

The last measure for investor recognition is analyst coverage (denoted *Analysts*), calculated by the natural logarithm of one plus the number of analysts in a firm. Higher analyst coverage leads to a higher level of investor recognition (Alhomaidi, Hassan, Hippler, and Mamun, 2019). Other papers that also employ this measure include, for example, Jain and Kim (2006). In addition, Roulstone (2003) shows that firms with a higher value of analyst coverage have more liquid stocks. Therefore, we expect that firms with a better corporate culture can increase their stock liquidity by increasing the number of analysts following.

To examine if corporate culture is associated with investor recognition, we run the regressions with investor recognition as the dependent variable and corporate culture as the main independent variable of interest. Panel D of Table 2.7 reports the results of corporate culture's effects on investor recognition. The coefficients of the breadth of institutional investors, media coverage, media tone, and analyst coverage are 0.0736, 0.2505, 0.2089, and 0.1174, respectively. All coefficients in the models are significant at the 1% level, suggesting that corporate culture can increase investor recognition. Therefore, corporate culture can help increase stock liquidity by enhancing investor recognition.[16]

In general, these results emphasize that the positive effect of corporate culture on stock liquidity is via reducing information risk (enhancing transparency), improving trust

[15] TRNA database classifies the released news relating to firms into three statuses (i.e., positive, negative, and neutral) based on the content and emotion of news (Cahan, Cahan, Lee, and Nguyen, 2017).

[16] Future research could further explore these heterogeneous effects by examining the role of individual cultural dimensions in greater detail.

and informative corporate announcements, and increasing the level of investor recognition. Thus, firms with good corporate culture experience higher liquidity of the stocks through enhancing their transparency, reputation, and investor recognition.

Table 2.7: Possible Channels

Panel A presents the results of the effect of cultural values on information risk, measured by abnormal accruals (*Ab_Accruals*), financial reporting opacity (*Opacity*), and accounting reporting complexity (*ARC*). Panel B reports the results of the effect of cultural values on investors' trading decisions, measured by corporate social responsibility rating based on 5 and 6 categories (*CSR5 and CSR6*). Panel C reports the results of the effect of cultural values on informative corporate announcements, measured by absolute cumulative abnormal return during 2, 3, and 5-day surround earnings announcements (*Abs_Car2, Abs_Car3, Abs_Car5*). Control variables include firm size, leverage, advertising, R&D, analyst coverage, institutional ownership, and firm age. In Panel C, we add *Sue* (standardized unexpected earnings) and *Q4* (indicator for the fourth quarter) as additional control variables. Panel D reports the effects of corporate culture on investor recognition measured by the breadth of institutional investors *(IO_breadth)*, media tone *(Media_tone)*, media coverage *(Media_coverage)*, and analysts (*Analysts*). Constant term, year-fixed effects, and industry-fixed effects based on two-digit SIC are included. *t*-statistics computed using standard errors robust to heteroscedasticity are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions are in Appendix A1.

	Panel A: Information risk			Panel B: CSR rating	
	Ab_Accruals	*Opacity*	*ARC*	*CSR5*	*CSR6*
	(1)	(2)	(3)	(1)	(2)
Corp_Culture	-0.0183***	-0.0578***	-0.0163*	0.1046***	0.1225***
	(-3.73)	(-4.33)	(-2.07)	(7.23)	(6.83)
Size	-0.0023	-0.0191***	0.1616***	0.1288***	0.1252***
	(-1.46)	(-4.40)	(16.73)	(6.07)	(4.43)
Leverage	0.0388***	0.0980***	0.1844***	-0.1542***	-0.1716***
	(3.49)	(2.91)	(4.98)	(-4.08)	(-3.59)
Advertising_dummy	-0.0107***	-0.0345***	0.0076	0.0322**	0.0391**
	(-3.19)	(-3.16)	(0.80)	(2.15)	(2.28)
RD_dummy	-0.0343***	-0.0907***	0.0322**	0.0544***	0.0836***
	(-6.18)	(-4.81)	(2.47)	(3.10)	(3.78)
Analysts	-0.0076***	-0.0036	-0.0727***	0.0377*	0.0461*
	(-3.64)	(-0.48)	(-3.36)	(1.89)	(2.04)
Institution	-0.0250***	-0.1169***	-0.0436	-0.0737**	-0.0797**
	(-4.82)	(-5.04)	(-1.68)	(-2.21)	(-2.22)
Age	-0.0008***	-0.0037***	-0.0012**	0.0037***	0.0035***
	(-5.61)	(-8.62)	(-2.99)	(4.80)	(4.26)
Industry and Year FE	Yes	Yes	Yes	Yes	Yes
S.E. clustered	Firm, Year	Firm, Year	Firm, Year	Firm, Year	Firm, Year
Observations	44,074	42,074	23,273	28,735	28,735
Adj R-squared	0.1861	0.2511	0.6465	0.3619	0.3562

Panel C: Informativeness of earning announcement

	Abs_Car2	*Abs_Car3*	*Abs_Car5*
	(1)	(2)	(3)
Corp_Culture	0.0024***	0.0047***	0.0047***
	(4.92)	(7.01)	(6.75)
Size	-0.0024***	-0.0055***	-0.0063***
	(-13.91)	(-28.15)	(-31.04)
Leverage	0.0107***	0.0117***	0.0156***
	(5.98)	(5.34)	(5.49)
Advertising_dummy	0.0014**	0.0038***	0.0036***
	(2.52)	(5.92)	(5.31)
RD_dummy	-0.0004	0.0027**	0.0026**
	(-0.52)	(2.80)	(2.42)
Analysts	-0.0013***	0.0020***	0.0013*
	(-3.15)	(3.60)	(2.05)
Institution	-0.0029***	0.0017	-0.0010
	(-3.02)	(1.14)	(-0.67)
Age	-0.0001***	-0.0003***	-0.0003***
	(-4.82)	(-11.20)	(-12.16)
Sue	-0.0114	-0.0139	-0.0144
	(-1.36)	(-1.10)	(-0.95)
Q4	0.0016	0.0024	0.0027
	(0.72)	(0.84)	(0.76)
Industry and Year FE	Yes	Yes	Yes
S.E. clustered	Firm, Year	Firm, Year	Firm, Year
Observations	163,609	163,609	16,3609
Adj R-squared	0.0742	0.1059	0.1066

Panel D: Investor recognition

	IO_breadth	*Media_coverage*	*Media_tone*	*Analysts*
	(1)	(2)	(3)	(4)
Corp_Culture	0.0736***	0.2505***	0.2089***	0.1174***
	(4.92)	(13.17)	(3.90)	(5.94)
Size	0.3750***	0.4311***	-0.0627***	0.2440***
	(45.48)	(22.48)	(-3.02)	(28.47)
Leverage	-0.4932***	-0.1769***	-0.5178***	-0.2495***
	(-10.11)	(-3.16)	(-5.13)	(-3.92)
Advertising_dummy	0.0896***	0.1235***	0.0482	0.1323***
	(4.50)	(6.40)	(0.90)	(6.28)
RD_dummy	0.1126***	0.1948***	0.1881**	0.0451*
	(4.83)	(8.06)	(2.78)	(1.87)
Age	0.0122***	-0.0005	0.0069***	-0.0012
	(12.80)	(-0.46)	(3.61)	(-1.42)
Industry and Year FE	Yes	Yes	Yes	Yes
S.E. clustered	Firm, Year	Firm, Year	Firm, Year	Firm, Year
Observations	47,926	36,688	36,688	48,785
Adj R-squared	0.5277	0.6156	0.1476	0.2926

2.4.4. Corporate culture and financial difficulties

In this section, we examine whether corporate culture's effect on stock liquidity differs among firms with different financial situations. Firms with higher financial constraints may face difficulty in obtaining the sufficient capital required for their investment activities, both in the short and long term. Since one of the benefits of improving stock liquidity is the increase in opportunities to access external finance sources by reducing the cost of capital (Amihud, Hameed, Kang, and Zhang, 2015b; Belkhir *et al.*, 2020) and increase in investment and production (Amihud and Levi, 2023), the firms with higher financial constraints may be more willing and have more incentives to improve their corporate culture. Therefore, we expect that firms with higher financial constraints may get more benefits from enhancing their culture. It means that the effect of corporate culture on stock liquidity is more pronounced for firms with higher levels of financial constraints.

We use the KZ Index to measure financial constraints. A higher level of the KZ index means a higher financial constraint. To examine the different effects of corporate culture on stock liquidity between firms with more and less financial constraints, we add two more variables into the baseline regression. The first is *Fin_Constraint*, which equals one if the firm has a KZ index above the average value of the KZ index of firms in the industry and zero otherwise. The second is *Corp_Culture* x *Fin_Constraint*, the interaction term of corporate culture and financial constraint indicator. We then run the following model:

$$Liquidity_{i,y} = \beta_0 + \beta_1 Corp\_Culture_{i,y} + \beta_2 Corp\_Culture \times Fin\_Contraint_{i,y} + \beta_3 Fin\_Contraint_{i,y} + \beta_4 Control_{i,y} + \beta_5 Industry_i + \beta_6 Year_y + \epsilon_{i,y}, \quad (7)$$

where $Liquidity_{i,y}$ is one of liquidity measures, $Corp\_Culture_{i,y}$ is one of corporate culture measures, $Control_{i,y}$ is the vector of the control variables, and $Industry_i$ and $Year_y$ are industry and year-fixed effect variables, respectively. A positive value of β_2 in

this model means the positive impact of corporate culture on stock liquidity is more pronounced for more financially constrained firms.

To test this possibility, we use Altman's Z-score to measure the financial distress condition of firms and test the effect of corporate culture on stock liquidity among firms with different situations of financial distress. Similar to financial constraint, we include a dummy variable, *Fin_Distress*, which equals one if the firm has Altman's Z-score below the average value of Altman's Z-score of firms in the industry and zero otherwise. We also add the interaction term of corporate culture and financial distress indicator (*Corp_Culture* x *Fin_Distress*) and then run the following regression:

$$Liquidity_{i,y} = \beta_0 + \beta_1 Corp\_Culture_{i,y} + \beta_2 Corp\_Culture \times Fin\_Distress_{i,y} + \beta_3 Fin\_Distress_{i,y} + \beta_4 Control_{i,y} + \beta_5 Industry_i + \beta_6 Year_y + \epsilon_{i,y}\,, \quad (8)$$

A positive value of β_2 in this model means the positive impact of corporate culture on stock liquidity is more pronounced for more financially distressed firms.

Table 2.8 reports the results. The coefficients of *Corp_Culture* are positive and significant for all model specifications, suggesting that the higher culture value increases the stock's liquidity. This result is consistent with the baseline models. The coefficients of the interaction terms (i.e., *Corp*_Culture x *Fin_Constraint* and *Corp_Culture* x *Fin_Distress*) are positive and significant in all models. These results imply that the effect of corporate culture is more pronounced for firms with higher financial constraints and higher financial distress.

Table 2.8: Financial difficulties and the effect of corporate culture

This table reports the effects of corporate culture *Corp_Culture* on stock liquidity with financial constraints and financial distress. We use the KZ Index to measure the financial constraints and the inverse of Altman's Z-score to measure financial distress. *Fin_Constraint* is a dummy variable that equals one if the firm is in a financial constraint situation that has the KZ Index above the average value of the firm's industry, zero otherwise. *Fin_Distress* is a dummy variable that equals one if the firm is in a financial distress situation that has Altman's Z-score below the average value of the firm's industry, zero otherwise. *Corp_Culture* x *Fin_Constraint* and *Corp_Culture* x *Fin_Distress* are the interaction terms to capture the difference in the corporate culture effects between more and less financially constrained firms or financially distressed firms. Constant term, year-fixed effect, and industry-fixed effect based on two-digit SIC are included. *t*-statistics computed using standard errors clustered at firm and year level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions are in Appendix A1.

	Liq_Amihud	*Liq_FHT*	*Liq_Amihud*	*Liq_FHT*
	(1)	(2)	(3)	(4)
Corp_Culture	0.0841***	0.0177*	0.1039***	0.0195*
	(3.53)	(1.74)	(4.24)	(1.77)
Corp_Culture x *Fin_Constraint*	0.1263***	0.0439***		
	(5.11)	(3.75)		
Fin_Constraint	-0.1034**	-0.0492**		
	(-2.75)	(-2.69)		
Corp_Culture x *Fin_Distress*			0.0913**	0.0347**
			(2.19)	(2.32)
Fin_Distress			-0.3415***	-0.0939***
			(-6.27)	(-4.62)
Controls	Yes	Yes	Yes	Yes
Industry and Year FE	Yes	Yes	Yes	Yes
S.E. clustered	Firm, Year	Firm, Year	Firm, Year	Firm, Year
Observations	43,427	39,106	39,657	35,535
Adj R-squared	0.8518	0.6764	0.8598	0.6892

2.4.5. Economic consequences

In this section, we discuss the economic consequences of corporate culture, and the results are reported in Table 2.9. Prior studies find that some corporate culture elements have effects on stock price informativeness, default risk, and informed trading. Therefore, we conduct additional analyses to test the effect of corporate culture on economic consequences factors which are stock price informativeness, default risk, and informed trading.

2.4.5.1. Stock price informativeness

First, we study the effect of corporate culture on stock price informativeness. As Roll (1988) discussed, return variation is affected by private or noise information. However, when a large portion of the return is not explained by information about the market or industry, the price of that stock includes more specific information (Frésard, 2012). Stock price combines a lot of information through trading in the stock market, which may include specific information that managers have not known yet. The stock price can reflect the demand for products, competition in industries or markets, and issues in strategies (Chen, Goldstein, and Jiang, 2007). Therefore, stock price informativeness can guide managers to make decisions, such as savings or investment decisions (Chen *et al.*, 2007; Frésard, 2012).

In addition, as discussed above corporate culture can enhance the transparency of firms and information environment which can improve the firm-specific information (stock price informativeness). Dasgupta, Gan, and Gao (2010) show that with less information asymmetry, the stock price can reflect more information about future events, which leads to the less surprises in the future. Some papers show the significant relationship between corporate culture components and stock price informativeness, such as Ng and Rezaee (2020), Ben-Nasr and Cosset (2014), and Kim, Pantzalis, and Wang (2018). Therefore, we

suppose that firms with good culture, which have a higher level of transparency, may have more informative stock prices and be less affected by the external environment.

We follow Durnev, Morck, and Yeung (2004) and calculate the return variation (*Non_sync*), which measures the stock price informativeness, following the approach of Roll (1988). A higher value of return variation indicates that the stock is less associated with market and industry returns, reflecting that the stock is more informative than a stock with a lower value of return variation. Previous studies also use this calculation include, for example, Frésard (2012) and Bui *et al.* (2022). The return variation is calculated as follows:

$$Non\_sync_{i,y} = log\left(\frac{1 - R^2_{i,y}}{R^2_{i,y}}\right), \tag{9}$$

$$r_i = \beta_0 + \beta_1 r_m + \beta_2 r_j + \epsilon_i \tag{10}$$

where $Non\_sync_{i,y}$ is the return variation is the firm, and $R^2_{i,y}$ is the R-squared from the regression of weekly returns of firm *i* on market return and industry return in year *y* (Equation 10), r_i is the weekly return of firm *i*, r_m is the market return, and r_j is the industry return.

Column (1) in Table 2.9 shows the regression of *Corp_Culture* and stock price informativeness (*Non_sync*). The coefficient on *Corp_Culture* is 0.0800 and significant at a 1% level. A 1% increase in the value of the corporate culture score is associated with an 8% increase in the stock price informativeness. One standard deviation increase in corporate culture value can improve growth by 4.12% (0.0800 x 0.515) level in the stock price informativeness. The coefficient demonstrates that moving from the 25th to 75th percentile of *Corp_Culture* increases stock price informativeness *Non_sync* by 5.22%. (i.e., 5.22%. = 0.0800 x (1.377 - 0.725)). The result implies that firms with good corporate culture can enhance the stock price informativeness of the firms.

2.4.5.2. Default risk

Second, we examine whether corporate culture relates to the firm's default risk. Corporate defaults are terrifying events within the lifecycle of corporations that happen when a firm cannot cover debts and maintain a normal operation, which leads to adverse effects on stakeholders. Brogaard *et al.* (2017) show that firms with more liquid stocks have lower default risk. Nadarajah, Duong, Ali, Liu, and Huang (2021) report similar findings for the international markets. With more liquid and easier trading stocks, firms can have more equity issuance with lower costs and less effect on stock prices. Consequently, it results in the stability of cashflows and reduces default risk. In addition, Brogaard *et al.* (2017) also show that stock liquidity can reduce default risk by improving information asymmetry. Therefore, from the positive relationship between corporate culture and stock liquidity and information environment, we explore the possibility that a good corporate culture can reduce the probability of default.

Following the previous literature on default risk, we use the expected default frequency (*Edf*) to measure the firm's default risk (Bharath and Shumway, 2008; Brogaard *et al.*, 2017; Tang and Yan, 2010; Garlappi, Shu, and Yan, 2008). We follow Bharath and Shumway (2008) to estimate (*Edf*):

$$\sigma_D = 0.05 + 0.25 \times \sigma_E \,, \;\; \sigma_V = \frac{E}{E+D} \times \sigma_E + \frac{D}{E+D} \times \sigma_D \,, \tag{11}$$

$$DD = \frac{log\big((E+D)/D\big) + (\mu_V - 0.5\sigma_V^2)T}{\sigma_V\sqrt{T}}, Edf = 1 - N(DD) \,, \tag{12}$$

where E is the market value of the company's equity, D is the face value of debt, σ_E is the equity volatility, σ_D is the debt volatility, σ_V is the firm asset volatility, μ_V to be equal to the stock return over the past 12 months, DD is the distance-of-default, Edf is the expected default frequency, $N(.)$ is the cumulative standard normal distribution function, and T is one year.

Column (2) in Table 2.9 shows the regression of *Corp_Culture* and *Edf*. The coefficient of *Corp_Culture* is negative and significant at a 1% level. The result implies that firms with good corporate culture can reduce the default risk of the firm. This result is in line with Hsu, Lee, Liu, and Zhang (2015) examining the impact of innovation, one of corporate culture's elements, on the default risk, and report that firms with higher levels of patent' quantity, impact, originality, and generality have higher trustworthiness and lower the probabilities of default.

2.4.5.3. Informed trading

The final economic consequence of good corporate culture is decreasing the probability of informed trading. As discussed in the channel analyses, good corporate culture can enhance the transparency of the environment in firms and reduce information asymmetry. Informed traders trade stock based on their analysis from public or private information (Fox, Glosten, and Rauterberg, 2017). We expect that a good culture can reduce the probability of informed trading by improving information transparency.

To measure informed trading, we use the generalized informed trading probability (*Gpin*) ratio of the expected informed order flow to the expected total order flow (Duarte, Hu, and Young, 2020).[17] Duarte *et al.* (2020) show that *Gpin* better captures the probability of informed trading than the previous measures. Column (3) in Table 2.9 shows the regression of *Corp_Culture* and *Gpin*. The coefficient on *Corp_Culture* is negative and statistically significant, suggesting that firms with good corporate culture can reduce the probability of informed trading of the firm.

[17] We thank Duarte *et al.* (2020) for providing the data on the parameters to estimate *Gpin*.

Table 2.9: Economic consequences

This table reports the effects of corporate culture *Corp_Culture* on stock price informativeness *Non_sync*, the expected default frequency *Edf*, and the probability of informed trading *Gpin* with control variables. Constant term, year-fixed effects, and industry-fixed effects based on two-digit SIC are included. *t*-statistics computed using standard errors clustered at firm and year level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions are in Appendix A1.

	Non_sync	*Edf*	*Gpin*
	(1)	(2)	(3)
Corp_Culture	0.0800***	-0.0083***	-0.0015*
	(3.80)	(-4.13)	(-1.80)
Size	-0.1979***	0.0257***	-0.0051***
	(-16.90)	(4.98)	(-8.14)
Leverage	0.1412**	0.1185***	-0.0010
	(2.41)	(5.13)	(-0.43)
Advertising_dummy	0.0744***	0.0022	0.0006
	(4.70)	(1.58)	(0.78)
RD_dummy	-0.0491	-0.0049*	-0.0037***
	(-1.63)	(-1.78)	(-3.70)
Price_Inv	-0.1956***	-0.0132***	0.1484***
	(-8.79)	(-3.60)	(10.16)
Dollar_vol	-0.3616***	0.0050	0.0000**
	(-8.08)	(0.89)	(2.23)
Ivol	-0.0075***	0.0002***	-0.0769
	(-8.22)	(3.87)	(-0.61)
Analysts	0.9525**	0.3590***	-0.0113***
	(2.50)	(6.11)	(-7.21)
Institution	0.0008***	-0.0001***	-0.0131***
	(5.48)	(-5.38)	(-6.30)
Age	15.7480***	4.7342***	-0.0001**
	(6.53)	(4.67)	(-2.50)
Industry and Year FE	Yes	Yes	Yes
S.E. clustered	Firm, Year	Firm, Year	Firm, Year
Observations	42,029	34,092	18,295
Adj R-squared	0.4576	0.3238	0.2516

2.5. Further Analyses

2.5.1. Sensitivity analyses

To ensure that our results are not sensitive to variable measures and model specifications, we conduct additional tests with alternative liquidity measures, culture classifications, and other model specifications. Table 2.10 presents the results. Panels A, B, and C report the results of alternative liquidity measures, alternative culture classifications, and other model specifications, respectively.

First, we use four alternative measures for stock liquidity. The *first measure* is high-low spread, which is a measure of bid-ask spread using high and low stock prices developed by Corwin and Schultz (2012). By using daily high and low prices, this measure can reflect both stock volatility and bid-ask spread of stock price. The *second measure* is the close-high-low spread developed by Abdi and Ranaldo (2017). This ratio measures stock liquidity based on wider information compared to Corwin and Schultz's (2012) measure (closed stock price and the midpoint of high - low stock prices) and it is suitable for less liquid stocks. The *third measure* is zero trading days developed by Lesmond *et al.* (1999), which is calculated as the ratio of the number of zero-return days divided by the total number of observable days. Lesmond *et al.* (1999) argue that less liquid stocks can be more difficult to trade which leads to a higher frequency of days having zero return and zero volume; so, zero trading days could reflect stock liquidity. The *final alternative* measure is low-frequency effective spread developed by Chen and Velikov (2023). This measure is the average of four other low-frequency proxies used in the literature, including (i) Corwin and Schultz's (2012) measure, (ii) Abdi and Ranaldo's (2017) measure, (iii) Gibbs's estimate from Hasbrouck's (2009) based on the daily closing stock prices, and (iv) Kyle and Obizhaeva (2016)'s measure as the ratio of the standard deviation of daily stock returns multiplied by eight and divided by the average of real daily dollar volume. We run the regression with *Corp_Culture*

as the independent variable and control variables as in the baseline model. We report the results for these tests in rows (1) to (4) of Table 2.10. All coefficients are positive and significant at 1% and 5% levels. These results again reinforce our findings in the baseline models.

Second, we use five alternative measures of corporate culture. The *first* measure is the average culture percentile ranking. This composite index goes across five dimensions of culture and avoid noise from individual ones (Anderson, Duru, and Reeb, 2009). In addition, the use of percentile ranks is to minimize the effects of outliers or potential measurement errors. This approach is widely used in the literature (e.g., Bushee and Noe (2000), Lang, Lins, and Maffett (2012), and Glaum, Schmidt, Street, and Vogel (2013)). The *second* and *third* measures use the total culture score based on both the raw values (Li *et al.*, 2021; Li *et al*., 2021) and based on their percentile rankings. Similar to the average score, the sum culture score presents the cultural value of the firm in total. The *fourth* measure is the weak culture, which is a dummy variable taking the value of 1 if the average culture score is in the bottom quartile across all firms in a particular year. The *fifth* measure is the abnormal average culture, which is the difference between the yearly level of the average cultural values of the firm and the average yearly culture of all firms in the sample. This measure reflects the abnormal cultural richness of the firm compared to the average value of culture in the sample in the specific year.[18] This abnormal calculation is widely employed in literature, such as Ottonello and Winberry (2020). We report the results for these tests in Rows (5) to (9) of Table 10. Overall, the results show that firms with high (low) culture values have higher (lower) liquidity in their stocks. These results further confirm the main findings of the baseline models.

[18] We thank the referee for suggesting this measure.

Finally, we conduct several alternative model specifications used in the regression. *First*, we use the median regression model to reduce the effect of outliers. *Second*, we use industry fixed effects by 3-digit and 4-digit instead of by 2-digit of Standard Industrial Classification (SIC) code as in the baseline models. *Finally*, we use fixed effects by county and state and year fixed effects to control for time-invariant and geographic-invariant factors that could affect stock liquidity. We report the results for these tests in rows (10) to (14) of Table 2.10. We find our main findings are robust.

Table 2.10: Corporate Culture and Stock Liquidity: Robustness tests

This table presents the robustness tests for regression results of stock liquidity on corporate cultures and control variables. Panel A reports the coefficients and R-squared for the regressions of other liquidity measures (high-low spread, close-high-low spread, zero trading days, and low-frequency effective spread) on *Corp_Culture*. Panel B reports the coefficients and R-squared for the regressions of *Liq_Amihud* and *Liq_FHT* on other corporate culture measures (average culture score in ranking, total culture score in raw value and in ranking, and weak culture score). Panel C reports the coefficients and R-squared for the regressions of *Liq_Amihud* and *Liq_FHT* on *Corp_Culture* using other models (median regression model, using 3-digit (4-digit) SIC for industry fixed effect, county, and state fixed effects. *t*-statistics computed using standard errors clustered at the firm and year level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions are in Appendix A1.

Panel A: Other liquidity measures

	Corp_Culture	
	Coefficient	R-squared
(1) High-low spread	0.0198***	0.7998
(2) Closes-high-low spread	0.0122**	0.8451
(3) Zero trading days	0.0328***	0.4954
(4) Low-frequency effective spread	0.0161***	0.8658

Panel B: Other corporate culture measures

	Liq_Amihud		*Liq_FHT*	
	Coefficient	R-squared	Coefficient	R-squared
(5) Average culture percentile rank	0.0039***	0.8509	0.0011***	0.6741
(6) Total culture score (raw value)	0.0242***	0.8507	0.0068***	0.6740
(7) Total culture score (percentile rank)	0.0008***	0.8509	0.0002***	0.6741
(8) Weak culture dummy variable	-0.1067***	0.8506	-0.0337***	0.6739
(9) Abnormal average culture	0.1210***	0.8507	0.0342***	0.6740

Panel C: Other models

	Liq_Amihud		*Liq_FHT*	
	Coefficient	R-squared	Coefficient	R-squared
(10) Median regression model	0.2085***	0.5682	0.0489***	0.4556
(11) Using 3-digit SIC for industry FE	0.0895***	0.8580	0.0328***	0.6776
(12) Using 4-digit SIC for industry FE	0.0935***	0.8621	0.0351***	0.6800
(13) County fixed effect	0.1242***	0.8737	0.0183**	0.6812
(14) State fixed effect	0.1590***	0.8630	0.0192**	0.6747

2.5.2. The effects of different cultural dimensions

In this section, we consider the impacts of different cultural dimensions on stock liquidity. Specifically, we consider the effects of five cultural dimensions, including teamwork, innovation, respect, integrity, and quality. We report the results for these analyses in Table 2.11.

Panel A and Panel B of Table 2.11 report the results for Amihud and FHT as the liquidity measures, respectively. Overall, Table 2.11's results suggest that among five cultural dimensions, the values of teamwork, innovation, and quality place greater impacts on the liquidity costs of the firms than other cultural dimensions.

When decomposed into different dimensions, corporate culture reflects distinct aspects of internal governance that affect stock liquidity through the information environment. Dimensions such as teamwork, innovation, and quality are more closely linked to governance mechanisms that enhance internal coordination, information production, and disclosure quality, thereby reducing information asymmetry and improving liquidity. In contrast, integrity and respect capture broader governance norms that are less directly related to market-facing outcomes. Integrity may act as a baseline constraint on opportunistic behavior with limited cross-sectional variation, while respect mainly influences internal organizational climate rather than disclosure. Overall, the results suggest that cultural dimensions most directly tied to information and disclosure channels play a more important role in shaping stock liquidity.

Table 2.11: The Effects of Different Cultural Dimensions

This table presents the effect of five corporate cultural dimensions on stock liquidity. The cultural dimensions include teamwork, innovation, respect, integrity, and quality. The dependent variables are stock liquidity measures, including the Amihud (2002) measure and the FHT measure. Constant term, year-fixed effects, and industry-fixed effects based on two-digit SIC are included. *t*-statistics computed using standard errors clustered at the firm and year level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions are in Appendix A1.

Panel A: Amihud as liquidity measure

	Liq_Amihud (1)	*Liq_Amihud* (2)	*Liq_Amihud* (3)	*Liq_Amihud* (4)	*Liq_Amihud* (5)
Teamwork	0.0926***				
	(5.46)				
Innovation		0.0762***			
		(8.69)			
Respect			0.0108		
			(1.06)		
Integrity				0.0010	
				(0.05)	
Quality					0.0329**
					(2.88)
All controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
S.E. clustered	Firm, Year	Firm, Year	Firm, Year	Firm, Year	Firm, Year
Observations	48,785	48,785	48,785	48,785	48,785
Adj R-squared	0.8507	0.8511	0.8503	0.8503	0.8503

Panel B: FHT as liquidity measure

	Liq_FHT (1)	*Liq_FHT* (2)	*Liq_FHT* (3)	*Liq_FHT* (4)	*Liq_FHT* (5)
Teamwork	0.0236***				
	(4.60)				
Innovation		0.0200***			
		(5.64)			
Respect			0.0025		
			(0.58)		
Integrity				-0.0032	
				(-0.44)	
Quality					0.0143**
					(2.65)
All controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
S.E. clustered	Firm, Year	Firm, Year	Firm, Year	Firm, Year	Firm, Year
Observations	43,912	43,912	43,912	43,912	43,912
Adj R-squared	0.6740	0.6741	0.6738	0.6738	0.6739

2.5.3. Portfolio performance

We further examine whether firms with higher corporate cultures can enhance the benefit of shareholders. From the baseline and other supporting results, we find that firms with better corporate culture have more liquid stocks. More and more potential investors can be interested in and buy these stocks, causing an increase in share prices in the future. The stock returns can also increase. In addition, shareholders' value is measured by stock returns (Welch and Yoon, 2023). Therefore, we predict that better corporate culture can increase the future returns for investors.

We construct a decile-sorted portfolio based on the corporate culture value. *First*, we take the firms with corporate culture value in the highest decile as our long portfolio and those with corporate culture value in the lowest decile as our short portfolio. We then calculate portfolio returns based on value-weighted returns by market capitalization. To test the prediction, we test the difference in stock returns between long and short portfolios using Newey and West (1987) adjusted standard errors. We validate the results using the three-factor Fama-French, the four-factor Fama-French-Carhart, and the five-factor Fama and French.

$$R_{10,y} - R_{1,y} = \alpha + \beta_1\left(R_{m,y} - R_{f,y}\right) + \beta_2 SMB_y + \beta_3 HML_y + \epsilon_y, \tag{13}$$

$$R_{10,y} - R_{1,y} = \alpha + \beta_1\left(R_{m,y} - R_{f,y}\right) + \beta_2 SMB_y + \beta_3 HML_y + \beta_4 WML_y + \epsilon_{i,y}, \tag{14}$$

$$R_{10,y} - R_{1,y} = \alpha + \beta_1\left(R_{m,y} - R_{f,y}\right) + \beta_2 SMB_y + \beta_3 HML_y + \beta_4 RMW_y + \beta_5 CMA_y + \epsilon_{i,y}\,, \tag{15}$$

where $R_{10,y}$, $R_{1,y}$, $R_{m,y}$, and $R_{f,y}$ are returns of long portfolio, short portfolio, return of the market, and risk-free rate. SMB_y, HML_y, WML_y, RMW_y, and CMA_y are size, book-to-market, winner-minus-loser, profitability, and investment factors, respectively. We use Newey and West (1987) estimator for standard errors. α is the constant that captures the abnormal return, or the difference of returns between long and short portfolios.

Table 2.12 reports the results for these tests. Panel A presents the value-weighted average annual returns of decile portfolios formed by sorting based on the corporate culture *Corp_Culture*. Among low corporate culture portfolios (from deciles 1 to 5), there is no clear pattern of the value-weighted returns. However, returns increase from decile 6 to decile 10. The value-weighted return of decile 10 is significantly higher than that of the other portfolios.

Panel B reports the results of the hedge returns between the top and bottom portfolios. The value-weighted average annual return difference between the long and short portfolios is 0.49% per year, with Newey and West's (1987) *t*-statistic of 3.16. The result is reinforced by the three-factor Fama-French, the four-factor Fama-French- Carhart, and the five-factor Fama and French, with the value of α, are 0.53%[19], 0.40%, and 0.63%, respectively; and Newey and West (1987) *t*-statistic are 3.15, 3.28, and 2.25, respectively. All alphas are significant at 5% levels or stronger. These results suggest that the portfolio of stocks from firms with higher corporate culture value significantly outperforms those with lower corporate culture value. Firms with high corporate culture value can increase shareholders' value compared to those with low corporate culture value.

[19] A culture alpha of 0.53% per year is economically meaningful, as it represents approximately 9–10% of the typical equity risk premium (5–6% annually), indicating a non-trivial effect from an investor's perspective.

Table 2.12: Returns on Portfolios Sorted by Corporate Culture

This table presents the results of the portfolios analysis. Panel A reports the average corporate culture value and value-weighted returns of the following year of the decile-sorted portfolios based on corporate culture values. Panel B reports the α, which is the difference in returns between portfolios with high corporate culture and low corporate culture. *t*-statistics computed using Newey and West (1987) standard errors are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions are in Appendix A1.

Panel A: Univariate portfolio sorted by *Corp_Culture*

Portfolio	Average Culture	Value-weighted return
1 (Low *Corp_Culture*)	0.433	0.010
2	0.603	0.011
3	0.719	0.012
4	0.827	0.010
5	0.937	0.013
6	1.057	0.009
7	1.201	0.012
8	1.373	0.012
9	1.624	0.013
10 (High *Corp_Culture*)	2.142	0.015

Panel B: The difference in returns between the long and short portfolios

	Alpha	*t*-stats
High - Low	0.0049***	(3.16)
3 factors alpha (FF3)	0.0053***	(3.15)
4 factors alpha (FF3+Carhart)	0.0040***	(3.28)
5 factors alpha (FF5)	0.0063**	(2.25)

2.6. Conclusion

This study provides empirical evidence that a positive corporate culture enhances stock liquidity. This finding remains robust after employing alternative liquidity measures, corporate culture metrics, and different regression models with additional fixed effects. In addition, the effect of corporate culture holds after accounting for several identification strategies, such as, the propensity score matching, entropy balancing, instrumental variable approach, and CEO turnover test.

In addition, we find that the impact of corporate culture on stock liquidity is more pronounced for firms with higher financial distress and firms with higher financial constraints. We document three channels through which corporate culture affects stock liquidity, including reducing information risk, enhancing firm reputation, and increasing the degree of investor recognition. We further examine the economic consequences of corporate culture and find that firms with higher cultural values can enhance stock price informativeness, reduce default risk, and decrease the probability of informed trading. Finally, portfolio analyses suggest that firms with high corporate culture value can increase shareholders' value compared to those with low corporate culture value.

CHAPTER 3

CHANGE IN AGENCY ENVIRONMENT AND STOCK PRICE CRASH RISK: EFFECT OF THE CORPORATE OPPORTUNITY WAIVER LAW

This chapter presents the second essay, which examines the effect of the change in fiduciary duty of loyalty on the stock price crash risk, employing difference-in-difference methodology for staggered adoption of the corporate opportunities waiver (COW) law to a sample of 84,000 firm-years observations covering 9,297 unique firms from 1990 to 2019. Section 3.2 discusses related literature and develops hypotheses. Section 3.3 shows variables construction, data collection, sample selection, summary statistics, and univariate test. Section 3.4 reports empirical findings, including baseline results, endogeneity tests, channel mechanism, and cross-sectional analysis. Section 3.5 presents the robustness tests. Section 3.6 shows additional analysis. Section 3.7 concludes. An appendix and reference of this chapter are provided at the end of the thesis.

CHANGE IN AGENCY ENVIRONMENT AND STOCK PRICE CRASH RISK: EFFECT OF THE CORPORATE OPPORTUNITY WAIVER LAW

Abstract of Chapter 3

This study examines the effect of the fiduciary duty of loyalty on the stock price crash risk. By employing the difference-in-difference model for the staggered adoption of the corporate opportunity waiver (COW) law, an exogenous shock that reduces the fiduciary duty of loyalty, we find that the stock price crash risk increases after the COW law enactment. This effect is more pronounced for firms with more financial distresses and more competition. We identify two channels through which COW law affects stock price crash risk: an increase in financial reporting opacity and a deterioration in external monitoring, leading to higher agency problems. In addition, we find that COW law is significantly associated with higher illiquidity, informed trading, stock price informativeness, stock mispricing, and audit pricing. Our results are robust to several alternative measures, model specifications, and endogeneity concerns. Our study contributes to the understanding of the importance of the fiduciary duty of loyalty in agency perspective and corporate crash risk.

Keywords: Corporate opportunities waiver; agency problems; stock price crash risk, difference-in-difference method.

3.1. Introduction

Under U.S. corporate governance, directors and officers are expected to run the corporation to maximize shareholder value, in line with the duty of good faith (Fama and Jensen, 1983), and to minimize agency problems (Becker and Strömberg, 2012). Consequently, corporate fiduciaries are bound by their fiduciary duty of loyalty to be prohibited from pursuing new business opportunities without first offering them to the organization (Talley, 2018). However, the corporate opportunities waiver (COW hereafter) law, adopted in several U.S. states since 2000, allows corporate fiduciaries to waive the traditional fiduciary duty of loyalty and undertake new business opportunities without first disclosing them to their respective companies (Rauterberg and Talley, 2017). Despite the substantive shift in loyalty requirements and legal framework in corporate governance (Fich, Harford, and Tran, 2023), few literatures focus on its impacts on financial markets, using the stock price crash risk as the measure. This study intends to contribute to closing this gap by examining how changes in the agency environment following the corporate opportunity waiver law (COW Law), which results in a decrease in the fiduciary duty of loyalty, affect stock price crash risk.

A stock price crash refers to an extreme and sudden drop in the stock price over a short period. The typical attribute to stock price crashes is the increase in information asymmetry. Especially, due to the information asymmetry between managers and investors, managers can hide the bad news (Hsu, Wang, and Whipple, 2022). Once the accumulation of negative information reaches a certain threshold and releases at once, leading to a stock price crash (Jin and Myers, 2006; Hutton, Marcus, and Tehranian, 2009). Given the significance of the stock price crash risk (hereafter, crash risk), existing literature has focused on the determinants of crash risk (e.g., Chen, Hong, and Stein, 2001; DeFond, Hung, Li, and Li, 2015; Ertugrul, Lei, Qiu, and Wan, 2017; Andreou, Antoniou, Horton, and Louca, 2016).

However, this body of literature predominantly focused on capital market transactions, information quality, bad news hoardings, managerial characteristics, and governance mechanisms in general, while overlooking a critical characteristic, i.e., the fiduciary duty of loyalty, which shapes managerial duties and agency problems. Any legal rule that changes this duty may meaningfully affect managers' incentives to withhold negative information, a key driver of future crash prone. Thus, investigating the relationship between the duty of loyalty and crash risk is essential to understanding how managerial duties affect information transparency and investor protection.

The actual impact of the change in fiduciary duty of loyalty due to the COW law on stock price crash risk is unclear ex ante. On the one hand, after adopting the waiver, firms can have more flexibility in raising funds without violating the fiduciary duty of loyalty (Fich *et al*., 2023) and experience the lower litigation risk from overlapping duties of loyalty (Rauterberg and Talley, 2017), resulting in a decrease in crash risks (Obaydin, Zurbruegg, Hossain, Adhikari, and Elnahas, 2021). On the other hand, the COW law adoption may have negative effects on the stock price crash risk through several ways. *First*, fiduciary duties, particularly the duty of loyalty, serve as an important governance constraint that limits managerial opportunism and conflicts of interest. Through this waiver, managers face weaker legal accountability and may have stronger incentives to withhold unfavorable information or delay the disclosure of negative news, increasing the likelihood of bad news hoarding. This can accumulate over time and be released abruptly, thereby increasing the risk of a stock price crash. In addition, such behaviors may cause an increased information asymmetry, greater reporting opacity, which leads to a higher probability of future crashes (Hirshleifer, 1993; Kim and Zhang, 2014; Jin and Myers, 2006; Hutton *et al.,* 2009). *Second*, by allowing managers to undertake new business opportunities without first offering them to corporations and engage in board overlapping activities, COW law can raise agency conflicts

between managers and shareholders (Rauterberg and Talley, 2017), weaken corporate governance and monitoring (Hu, Jiang, John, and Ju, 2022; Fich and Shivdasani, 2006; Foroughi, 2025), consequently increase stock price crash risk. *Third*, the COW law, which allows managers to pursue new contracts without presenting them to companies first, could reduce firms' innovation activities, thereby increasing crash risks (Fich *et al.*, 2023; Andreou *et al.,* 2016). Thus, the effect of the COW law on the stock price crash risks remains inconclusive and requires an extensive empirical analysis.

In this study, we investigate the effect of the change in fiduciary duty of loyalty due to the staggered adoption of the COW law on the stock price crash risk. We focus on the COW law for the following reasons. *First*, as an exogenous shock reducing the fiduciary duty of loyalty, this waiver is independent to firms' internal strategies and policies, allowing us to investigate causal effects of the changes in fiduciary duty of loyalty on stock price crash risk. *Second*, the COW law is adopted across several states with varying adoption dates, enabling us to employ the difference-in-differences approach to investigate the differences in stock price crash risk between firms affected by the change in fiduciary duty of loyalty and their counterparts.

By using the difference-in-difference approach with the staggered adoption of COW law for a large sample of 84,000 firm-year observations covering 9,297 unique firms from 1990 to 2019, we find that firms incorporated in states that adopted COW law have higher stock price crash risk after COW law adoption compared to firms incorporated in states that did not adopt COW law. [20] The impact of COW law on the stock price crash risk is economically significant. After the enactment of the COW law, a firm's stock price crash

[20] Following Fich *et al.* (2023), while firms may differ in whether they formally adopt waiver provisions, COW adoption represents an exogenous change in the legal regime that alters the governance environment for all firms incorporated in the state. Accordingly, the analysis captures an intention-to-treat effect of the legal reform rather than firm-level voluntary adoption. To the extent that not all firms implement waivers, the estimated effects should be interpreted as conservative lower-bound estimates.

risk rises by 400 or 277 basis points (depending on the crash risk measures), which are 85.11% and 57.71% of the variables' mean. The positive effect of COW law on stock price crash risk is more pronounced for firms facing higher financial distress situation and higher level of product market competition. The result is robust after using alternative measures of stock price crash risk, alternative model specifications and estimators, including two-ways clustering of standard errors, the stacked regression, and the Callaway and Sant'Anna (2021).

We use several endogeneity tests to robust our findings in baseline regressions. *First*, we apply propensity score matching and entropy balancing to confirm the effect of COW law on stock price crash risk is not impacted by the systematic differences and firm characteristics among firms. *Second*, we test the effect of Delaware firms because we address that a majority of our observations come from firms incorporated in Delaware, the first state adopted COW law in 2000. *Third*, we examine whether the effect of COW law on stock price crash risk is affected by other state-level laws adopted within the research period including control share acquisition law, business combination law, fair price law, directors' duties law, and poison pill law. *Fourth*, we test whether the effect of shock violates the parallel trend assumption by employing parallel trend test. *Finally*, we conduct the placebo test to address the concern that our findings from baseline regressions are driven by unobserved factors and omitted variables. The results of endogeneity tests are consistent with the findings from our baseline.

We further examine the mechanism through which COW law affects stock price crash risk. Our channel tests suggest that firms incorporated in states that have adopted COW law exhibit higher levels of financial reporting opacity and lower levels of external monitoring, leading to higher levels of stock price crash risks. We further analysis the effect of the COW law on other economic aspects, including stock liquidity and audit pricing. We

find that the firms in states that adopted COW law experience higher levels of stock illiquidity and higher audit pricing.

This study contributes to existing literature in several ways. *First*, this study is the first to investigate the effects of the COW law on the stock price crash risk, thereby contributing to a limited body of literature on the consequences of the COW law, a state-level law that reduces the fiduciary duty of loyalty and raises the agency problems (e.g., Fich *et al*., 2023; Boyd, Li, Wang, and Wang, 2025). *Second*, this study contributes to the growing literature on the determinants of stock price crash risk. Overall, our main findings offer deeper insights into the relationship between agency problems and corporate outcomes by analyzing the consequences of the change in the fiduciary duty of loyalty. This study also fills an important gap by linking legal governance mechanisms to financial market outcomes, a connection that existing crash-risk research has yet to examine directly.

The rest of the chapter is organized as follows. Section 3.2 discusses related literature and hypothesis development. Section 3.3 presents variable construction, data and sample, descriptive statistics, and univariate tests. Section 3.4 reports the results, endogeneity tests, channels through which COW law affects the stock price crash risk, and cross-sectional analysis. Section 3.5 presents the robustness tests. Section 3.6 discusses further analysis. Section 3.7 concludes the chapter.

3.2. Related Literature and Hypothesis Development

Stock price crash risk or the likelihood of extreme and sudden drops in stock prices, is a topic that has drawn increasing attention from academics, practitioners, and policy makers, occurs when withholding bad news is released to the market (Jia, 2018), which can substantially endanger shareholders' wealth (Habib, Hasan, and Jiang, 2018). Given the importance of stock price crash risk, literature has extensively focused on investigating

various internal and external determinants of crash risk, for example, capital market transactions, bad news hoarding, information transparency, corporate governance, managerial characteristics, legal regulations, and other factors, and methods to predict stock price crash risk.

Recent studies advocate an agency perspective as an explanation for firm-specific crash risk. Agency theory framework indicates that due to the information advantages over investors, managers can control the timing of information disclosure. Especially, managers tend to disclose favorable news promptly but strategically delay the release of adverse information, causing negative news to emerge gradually (Chen et al., 2001), However, once the accumulation of negative information reaches a certain threshold and is released at once, it leads to a stock price crash (Jin and Myers, 2006; Hutton et al., 2009). Anecdotal evidence from high-profile corporate scandals as well as empirical findings in the literature suggest that management wrongdoings are the main causes in the cases of corporate deception and stock price crash. Former Enron CEO Jeffrey Skilling and former WorldCom CEO Bernard Ebbers are two infamous examples where top executive misconduct and fraud led to the collapse of security prices. Managers tend to hoard negative news to conceal their myopic or opportunistic behaviors (Benmelech, Kandel, and Veronesi, 2010), and to benefit from incentives, compensation, and career promotions (Kothari, Shu, and Wysocki, 2009). By concealing negative information and misleading investors, managers are accused of breaching their fiduciary duty to the corporation and its shareholders.

Under U.S. corporate governance, directors and officers are expected to run the corporation to maximize shareholder value, in line with the duty of good faith (Fama and Jensen, 1983), and to minimize agency problems (Becker and Strömberg, 2012). Consequently, the fiduciary duty of loyalty, required by the corporate opportunity doctrine, forbids corporate fiduciaries (i.e., directors, officers, and dominant shareholders) from

appropriating new business prospects for themselves without first offering them to their company (Rauterberg and Talley, 2017). This fiduciary duty is designed to increase the managers' commitment to prioritize the corporations' interests instead of their own interests. This duty plays an important role in ethical standards in governance mechanisms.

However, the Corporate Opportunity Waiver (COW) law, first adopted in Delaware in 2000, allows managers to explore opportunities for their own interests before introducing them to corporations. It results in a significant decrease in the fiduciary duty of loyalty (Rauterberg and Talley, 2017). The COW law was later effective in other eight states, including Kansas, Maryland, Missouri, Nevada, New Jersey, Oklahoma, Texas, and Washington. The rationale behind the introduction of the COW law is rooted in the need to accommodate increasingly complex investment arrangements and organizational structures (Rauterberg & Talley, 2018). *First,* the COW law addresses governance challenges arising from overlapping directorships, particularly in the private equity and the venture capital entities, to attract more capital without being constrained by the corporate opportunity doctrine. *Second,* COW laws enhance contracting flexibility by allowing firms to contract out of the duty of loyalty, thereby expanding the scope for efficient arrangements in increasingly complex organizational structures. *Finally,* the COW law facilitate a more efficient allocation of business opportunities by enabling directors serving on multiple boards to allocate opportunities without being constrained by the corporate opportunity doctrine. By allowing ex ante waivers, the COW law aims to reduce legal uncertainty, facilitate contracting, and promote economic efficiency.

However, this increased flexibility comes at the cost of weakening a core governance mechanism - the fiduciary duty of loyalty. This waiver may affect the governance mechanism in several ways. *First,* by allowing managers to pursue business opportunities without disclosure, the waiver may reduce the information transparency to shareholders. *Second*, it

may weaken external monitoring since shareholders have less ability to observe managerial actions related to these opportunities. *Finally*, by waiving the fiduciary duty of loyalty, the COW law significantly increases agency conflict (Boyd *et al.,* 2025), which is reported to increase the probability of crash risk in the future.

While COW represents a broad governance shock, its impact on crash risk mainly arises through managerial disclosure decisions. Building on these governance effects, weakened constraints and heightened conflicts of interest also alter managerial disclosure incentives. With greater discretion, managers have stronger incentives to conceal adverse information to protect their personal reputation and avoid intensified monitoring when firm performance deteriorates. This leads to more selective disclosure and delays in releasing negative information, resulting in the gradual accumulation of bad news within the firm. When such information is eventually disclosed, it is released in a concentrated manner, triggering sharp stock price declines. Therefore, through the channel of weakened governance, distorted disclosure behavior, and increased information asymmetry, COW laws contribute to higher stock price crash risk.

Despite the critical changes in the governance mechanism following the enactment of the COW law, empirical evidence on its consequences for financial markets remains limited, especially stock price crash risk. Our study contributes to the existing literature by investigating the relationship between the changes in the fiduciary duty of loyalty and the stock price crash risk.

The effect of corporate opportunity waiver (COW) law, which causes the decrease in the fiduciary duty of loyalty, on stock price crash risk has two opposite directions. *First,* the motivation of this waiver is considered to give more opportunities for business operations. By adopting the waiver, corporations can flexibly access capital investments and attract more investors that have specific boundaries of loyalty (Rauterberg and Talley, 2017; Fich *et al.,*

2023). In addition, corporate opportunity doctrine (COD) limits the loyalty duty of managers; thus, it could generate more conflicts and higher litigation risk for firms. Following the adoption of COW law, managers could take actions out of the limits of COD with a little fear of litigation risk (Rauterberg and Talley, 2017), which leads to a decrease in stock price crash risk (Obaydin *et al.,* 2021; Li, Tian, Xing, and Zang, 2023). Specifically, a common example arises in venture capital settings, where investors often serve on multiple boards within the same industry. Prior to the COW adoption, allocating an investment opportunity to one portfolio firm rather than another could trigger shareholder lawsuits alleging a breach of fiduciary duty. The COW provisions allow firms to waive such claims ex ante, thereby making these actions legally permissible and reducing the litigation risk faced by fiduciaries. Therefore, in this context, litigation risk mainly refers to legal disputes arising from overlapping fiduciary duties, especially for directors serving on multiple boards. The COW law clarifies these conflicts ex ante, reducing legal uncertainty. This reduction in legal uncertainty may lower the likelihood of sudden negative legal shocks, thereby reducing crash risk. Thus, enactment of the COW law can potentially decrease the stock price crash risks by reducing the litigation risks. Based on these arguments, our first hypothesis is as follows:

Hypothesis 1a: *The adoption of COW law is associated with lower stock price crash risk.*

On the other hand, because the COW law permits managers to explore new opportunities for their own interests instead of the company's interests first, managers tend to protect their personal reputation by withholding negative news (Hirshleifer, 1993; Kim and Zhang, 2014), which is a key driver leading to the crash risk in the future. This waiver may increase managers' incentives to withhold opportunities from their companies and raise shareholders' concerns about potential information asymmetry regarding the firms' business opportunities (Bu, Ng, Song, and Yan, 2025). The increase in information asymmetry and bad news hoarding later increase the level of reporting opacity and probability of crash risk

in the future (Jin and Myers, 2006; Hutton *et al.,* 2009). In addition, by waiving parts of the duty of loyalty (via COW law), fiduciaries thereby obtain a broader domain within which to pursue self-dealing or to appropriate corporate opportunities, leads to a significant increase in agency conflicts (Rauterberg and Talley, 2017). The COW law can allow managers to serve on multiple boards (board overlap), which results in less efficiency in management and monitoring (Hu *et al.,* 2023), and weaker corporate governance (Fich and Shivdasani, 2006; Foroughi, 2025). An inappropriate governance system can increase future crash risk (Andreou *et al.,* 2016). Managers in poor monitored firms tend to focus on their own interest instead of behaving aligned with shareholders' interests (Ferrell, Liang, and Renneboog, 2016). Shareholders react negatively to directors likely protected by COW provisions, due to concerns of raising agency conflict (Wang, 2022). Therefore, the adoption of COW law may exacerbate agency conflicts, weaken firms' corporate governance, and consequently elevate their stock-price crash risk. Finally, by allowing managers to engage in outside business opportunities without first offering them to the firm, the COW law results in a substantial reduction investment activity and expected returns of firms' innovation (Fich *et al.,* 2023). Ben-Nasr, Bouslimi, and Zhong (2019) find that number of patents (innovation) has negative relation to stock price crash risk. Hirshlelfer (1993) also indicates that because protecting their reputation in the short run, managers sometimes choose investment that is good for their own but bad for shareholders in the long run. With effort to withhold bad news, managers could keep the poor-performing projects, which results in the increase in crash risk (Khurana, Pereira, and Zhang, 2018). Therefore, the adoption of COW law could potentially raise stock price crash risk by reducing innovation activities. Based on these arguments, our second hypothesis is as follows:

Hypothesis 1b: *The adoption of COW law is associated with higher stock price crash risk.*

3.3. Variables construction and data collection

This section presents data, sample selection, and variables construction. We first describe the measures for corporate opportunities waiver (COW) law, stock price crash risks, and control variables. We then discuss data, sample selection, and the descriptive statistics of the variables. Finally, we show a univariate test for the differences in stock price crash risk around the adoption of COW law.

3.3.1. Measures of corporate opportunities waiver (COW)

We focus on the effect of corporate opportunities waiver (COW) law adoption on stock price crash risk. We obtain the dates when the states adopted the COW law from Rauterberg and Talley (2017). Then, we create the indicator of COW law adoption by states (*COW*) that equals 1 for the years in which the waiver from the corporate opportunity doctrine is effective in a firm's state of incorporation, and 0 otherwise (Fich *et al*., 2023). For example, if the first year of COW law adoption in the firm's incorporate state is 2002, *COW* variable takes value of 1 from the year 2002 and value of 0 for the rest of the research period. It indicates this is the time that the firm's incorporated state has enacted the corporate opportunities waiver (COW) law and allows the managers the right to waive the loyalty duty and pursue their own interests.

Appendix B2 shows the date the COW law was enacted in each state. Panels A and B of Appendix B3 report the sample distribution by year and incorporated state, respectively. Panel A shows that the sample size reaches a peak in 1999 and then declines steadily. Panel B reports that Delaware forms the majority of the sample, while other states account for comparatively small proportions. We conduct the Delaware tests and find that our baseline results are not driven by the effect of Delaware firms.

3.3.2. Measures of stock price crash risk

To analyze the effect of adopting corporate opportunities waiver (COW) law on stock price crash risk, we use two measures of stock price crash risk following the literature, including the negative skewness of firm-specific returns (*NSKEW*) and the down-to-up volatility of firm-specific returns (*DUVOL*). These measures are associated with the crash-prone probability or the crash likelihood (Chen *et al.,* 2001; Kim *et al.,* 2011b).

First, following Kim, Li, and Zhang (2011a), we estimate the firm-specific weekly returns for each firm each year. We use firm-specific weekly returns because we focus on the firm specific elements that have effects on firm-specific crash risks (Kim *et al.,* 2011b). It is defined as the natural logarithm of one plus the residual return from the expanded market regression:

$$r_{i,t} = \beta_0 + \beta_1 r_{m,t-2} + \beta_2 r_{m,t-1} + \beta_3 r_{m,t} + \beta_4 r_{m,t+1} + \beta_5 r_{m,t+2} + \epsilon_{i,t}\,, \qquad (1)$$

where $r_{i,t}$ is the return of stock *i* in week *t*, $r_{m,t}$ is the return of the CRSP value-weighted market index in week *t*. We also include the market returns of two weeks before and two weeks after to allow for nonsynchronous trading (Dimson, 1979; Chang *et al.,* 2017). Then, the firm-specific weekly return of stock *i* in week *t* ($R_{i,t}$) is calculated as follows:

$$R_{i,t} = \ln\left(1 + \epsilon_{i,t}\right), \qquad (2)$$

We use the log changes transformation to convert the firm-specific weekly returns to lognormally distributed natural benchmark (Chen *et al.,* 2001).

Based on the estimated firm-specific weekly returns, we calculate the first measure of stock price crash risk – the negative skewness (*NSKEW)* developed by Chen *et al.* (2001). *NSKEW* is the negative ratio of the third moment of stock return distribution over the standard deviation of stock return distribution raised to the third power. We follow Kim *et al.* (2011a) to calculate *NSKEW* from the firm-specific weekly returns as follows:

$$NSKEW_{i,y} = -\left[n(n-1)^{3/2}\sum R_{i,t}^3\right] / \left[(n-1)(n-2)\left(\sum R_{i,t}^3\right)^{3/2}\right], \quad (3)$$

where $R_{i,t}$ is the firm-specific weekly return of stock *i* in week *t*, and *n* is the number of observations of $R_{i,t}$ during year *y*. The negative sign in front of the third moment indicates that the higher value of *NSKEW* has a more left-skewed stock return distribution and higher stock price crash risk.

The second measure of stock price crash risk is *DUVOL*, which refers to the down-to-up volatility of firm-specific weekly returns as constructed by Chen *et al.* (2001). We divide firm-specific weekly returns into two subsamples: the down-week group (firm-specific weekly returns below annual average) and up-week group (firm-specific weekly returns above annual average). Then, we calculate the standard deviation of each group. *DUVOL* measure is defined as the ratio of the standard deviation of the down-week group and the standard deviation of the up-week group. *DUVOL* is calculated as follows:

$$DUVOL_{i,y} = log\left[(n_{up-1})\sum_{DOWN} R_{i,t}^2\right] / \left[(n_{down-1})\sum_{UP} R_{i,t}^2\right], \quad (4)$$

This measure involves the second moment of stock return distribution and is less likely to be excessively affected by extreme trading days (Chen *et al.,* 2001). The higher values of *DUVOL* indicate the more left-skewed return distribution and higher values of stock price crash risk.

These measures of stock price crash risks are largely used in previous studies such as Kim *et al.* (2011a, 2011b), Callen and Fang (2015b), Chang *et al.* (2017), Andreou *et al.* (2016), Kim *et al.* (2016a), Cao *et al.* (2019).

We also consider two alternative measures of stock price crash risk based on the firm-specific weekly returns and discuss in Section 3.5 – Robustness tests. The first measure is *CRASH_below* that is the logarithm of the number of weekly returns that are 3.09 or more

standard deviations below the mean firm-specific weekly returns in a fiscal year (Cheng, Xie, and Zhong, 2023). The second measure is *CRASH_net* calculated based on *CRASH_below* and *CRASH_above* (the logarithm of the number of weekly returns that are 3.09 or more standard deviations above the mean firm-specific weekly returns in a fiscal year) (Cheng *et al.,* 2023).

3.3.3. Control variables

We include several control variables from the literature to capture other factors that affect the stock price crash risk. *First,* we control for firm characteristics: firm size (*Lnsize*), leverage ratio (*Leverage*), market to book value of equity (*Mtbe*), return on assets (*Roa*), the financial reporting opacity (*Accm*), and firm age (*Age*) (Balachandran *et al.*, 2020; Bhargava *et al.*, 2017; Kim *et al.*, 2011a, 2011b; Chang *et al.*, 2017; Callen and Fang, 2015b). *Second*, we also include a lagged value of *NSKEW* to control for the persistence of the dependent variables in the model (Callen and Fang, 2015b). Chen *et al.* (2001) show that a higher return negative skewness in the previous year leads to a higher return negative skewness in the next year. *Third*, we control stock characteristics following literature by including stock returns (*Return*), standard deviation of stock return (*Sigma*), and share turnover (*Dturn*). *Finally*, we further include the high-low spread (*Inv_highlow*), developed by Corwin and Schultz (2012), to measure stock liquidity. Chang *et al.* (2017) find that higher stock liquidity is associated with higher stock price crash risk. The high-low spread reflects both the bid-ask spread of the stock and its variance (Corwin and Schultz, 2012). We provide a detailed description of the variables in Appendix B1.

3.3.4. Data and sample

Our sample includes firms with stocks listed on NYSE, AMEX, or Nasdaq. We exclude financial firms (SIC 6000-6999), utility firms (SIC 4900-4999), and public administration companies (SIC 9000-9999) following Fich *et al.* (2023). To estimate *COW* measure, we use the data of state adoption date of COW law following Rauterberg and Talley (2017).[21] We collect data on price, return, trading volume, and share turnover from the Center for Research in Security Prices (CRSP) to calculate stock liquidity high-low measure, stock price crash risk measures, *Sigma, Return*, and *Dturn*. Merged CRSP-Compustat is the main source to collect data on firm-specific characteristics, including firm size, firm age, leverage ratio, market to book value of equity, return on assets, and abnormal accruals. Data of incorporate state is collected from Compustat and data of headquarter state is collected from Gao, Leung, and Qiu (2021).[22] We winsorize all continuous variables at the 1st and 99th percentiles to mitigate the effect of outliers. Our final sample includes 84,000 firm-year observations covering 9,297 unique firms for the period from 1990 to 2019.[23] We provide a detailed description of the variables in Appendix B.1.

3.3.5. Descriptive statistics

Table 3.1 shows the summary statistics for the variables included in the baseline models. We report the number of observations, mean, standard deviation (STD), and the 25th, 50th, and 75th percentile values for each variable.

[21] Nine states passed the corporate opportunities waiver (COW) law: Delaware in 2000, Oklahoma in 2001, Missouri in 2003, Kansas in 2005, Texas in 2006, Nevada in 2007, New Jersey in 2011, Maryland in 2014, and Washington in 2016. The data of states adopted COW law is also available from the paper of Rauterberg and Talley (2017).

[22] Data of headquarter state is collected from Gao *et al.* (2021) which is available on https://mingze-gao.com/posts/firm-historical-headquarter-state-from-10k/.

[23] Our sample begins is from 1990 to 2019 to ensure non-missing observations for all variables. This also allows us to avoid the effect of the COVID-19 pandemic.

The mean of *COW* is 0.428, indicating that more than 40% of the firm-years observations are impacted by the COW law adoption. This result is relatively similar to Fich *et al.* (2023). For stock price crash risk measures, the mean of *NSKEW* and *DUVOL* are 0.047 and 0.048, respectively. These values are quite similar to the results of Kim *et al.* (2011b), Kim *et al.* (2014), and Kim *et al.* (2016a). The standard deviation of *NSKEW* and *DUVOL* are 0.751 and 0.552, respectively. These values indicate that stock price crash risk varies significantly across firms within the sample.

With respect to the control variables, the average values are consistent to the previous literature. For firm characteristics, the average values of firm size, leverage, book-to-market, and return on assets are 5.552, 0.177, 3.015, -0.048, respectively. These values are similar with those reported in Bhargava *et al.* (2017), Kim *et al*. (2014), Kim *et al.* (2011a), and Hutton *et al.* (2009). Our sample firms, on average, have an opacity ratio of 0.549, which is relatively consistent with Zhang *et al.* (2021). For stock characteristics, the average values of *Sigma, Return*, and *Dturn* are 0.074, -0.351, and 0.003. These values are in line with Kim *et al.* (2019), Chang *et al.* (2017), and Cheng *et al.* (2023). The mean age is 2.461, consistent with Chen *et al.* (2025).

Table 3.1: Descriptive statistics

This table presents the descriptive statistics for the sample of 84,000 firm-year observations spanning 1990 to 2019. For each variable, we report the number of observations, mean, standard deviation (*STD*), and the 25th, 50th and 75th percentile value. We winsorize all variables at the 1st and 99th percentiles to mitigate the impact of outliers. Stock price crash risk is measured by *NSKEW* and *DUVOL*. *COW* equals 1 for firms in adopted COW law state in the post-COW law periods, and 0 otherwise. Appendix B1 provides a detailed description of the variables.

Variables	Observations	Mean	STD	25th Pctl	50th Pctl	75th Pctl
Stock price crash risk measures						
NSKEW	84,000	0.047	0.751	-0.391	0.019	0.443
DUVOL	84,000	0.048	0.552	-0.319	0.028	0.391
Corporate opportunities waiver (COW) law measure						
COW	84,000	0.428	0.495	0.000	0.000	1.000
Firm-specific characteristics						
Inv_highlow	84,000	4.314	0.775	3.831	4.383	4.882
Lnsize	84,000	5.552	2.090	3.988	5.458	7.005
Sigma	84,000	0.074	0.041	0.044	0.064	0.092
Return	84,000	-0.351	0.446	-0.418	-0.199	-0.094
Dturn	84,000	0.003	0.103	-0.025	0.000	0.027
Leverage	84,000	0.177	0.198	0.002	0.121	0.287
Mtbe	84,000	3.015	4.963	1.162	2.012	3.574
Roa	84,000	-0.048	0.271	-0.045	0.031	0.074
Accm	84,000	0.549	0.570	0.184	0.368	0.695
Age	84,000	2.461	0.824	1.792	2.485	3.135

3.3.6. Univariate test

Before conducting the multivariate analysis, we test the existence of the statistical differences in stock price crash risks between the pre-adoption and post-adoption COW law by using independent simple t-testing. We compare the stock price crash risk measures before and after adopting COW law between firms in states adopting COW law (treatment group) and firms in states non-adopting COW law (control group). For the treatment group, the event year is the actual year in which the COW law was adopted in the firms' state of incorporation. For the control group, there are no actual years that COW law adoption since COW law was never enacted in these states. Thus, we assign 2006, the median year of COW law effective dates in the treatment group, as the pseudo-event year for the control group (Glendening, Khurana, and Wang, 2016; Balachandran *et al.,* 2020). Then, we use the t-test for the quality of means to compare the differences in means of crash risk measures *NSKEW* and *DUVOL.*

Table 3.2 presents the result of a univariate DiD test for the differences in stock price crash risk measures before and after adopting COW law between firms in states adopting COW law (treatment group) and those in states with non-adopting COW law (control group). The results show that although having a significantly higher level of crash risk in the pre-COW period, firms in non-adopted COW law states have significantly lower levels of crash risk in both *NSKEW* and *DUVOL* than firms in adopted COW law states in the post-COW period. As the table shows, both the treatment group and control group experience a significant increase in stock price crash risk between pre-COW and post-COW periods. However, the rise of crash risk in both two measures before and after COW law adoption is significantly larger for the treatment group compared to the control group. The result of a univariate DiD test initially supports our hypothesis that COW law adoption leads to a higher future crash risk for firms incorporating in states adopting COW law.

Table 3.2: Univariate test of the change in stock price crash risk

This table reports a univariate difference-in-difference (DiD) analysis of stock price crash risk's differences around the adoption of corporate opportunities waiver (COW) law between adopting and non-adopting states in the U.S. For the adopted COW law state, the event year is the actual year that COW law was adopted. For non-adopted COW law state, we use the pseudo-event year – the median year of COW law adoption among adopted COW law state (Glendening *et al.*, 2016; Balachandran *et al.,* 2020). The DiD estimations are highlighted in bold. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. The results are based on the *T*-test for the quality of means between two groups. Appendix B1 provides a detailed description of the variables.

	Pre-COW periods	Post-COW periods	DiD	*t*-stats
NSKEW				
Adopted COW law state	-0.0345	0.1064	0.1409***	(22.07)
Non-adopted COW law state	-0.0089	0.0868	0.0957***	(9.50)
Difference	-0.0256***	0.0196***	**0.0452*** **	
t-stats	(-3.42)	(2.08)	**(3.76)**	
DUVOL				
Adopted COW law state	-0.0111	0.0926	0.1037***	(22.14)
Non-adopted COW law state	0.0075	0.0707	0.0632***	(8.48)
Difference	-0.0186***	0.0219***	**0.0404*** **	
t-stats	(-3.32)	(3.19)	**(4.57)**	

3.4. Empirical Findings

3.4.1. Baseline regression results

In this section, we employ a difference-in-difference approach (DiD) to examine the effect of adopting the COW law on stock price crash risk. The regression model is as follows:

$$Crash\ Risk_{i,y+1} = \beta_0 + \beta_1 COW_{i,y} + \beta_2 Control_{i,y} + \beta_3 Firm_i + \beta_4 Industry_{i,y} \times Year_y + \beta_5 State_{i,y} \times Year_y + \epsilon_i , \quad (4)$$

where $Crash\ Risk_{i,y+1}$ is one of stock price crash risk measures of firm i in year $y+1$ measured by *NSKEW* or *DUVOL.* Our variable of interest, $COW_{i,y}$, is a dummy variable that equals one if the COW law was passed in states of incorporation, and zero otherwise. $Control_{i,y}$ is the vector of the control variables of firm i in year y. $Firm_i$, $Industry_{i,y} \times Year_y$, and $State_{i,y} \times Year_y$ refer to firm, industry × year and state × year

fixed effect variables, respectively. Firm, industry-year and state-year fixed effect variables control for time-variant omitted firm-level variables, unobservable factors at the industry-level (such as investment opportunities) and at the state-level (local economic conditions), respectively (Bourveau, Lou, and Wang, 2018). State fixed effect is based on the state that firm's headquarters are located (Fich *et al*., 2023).[24] We also cluster the standard errors at the level of the state of incorporation because all firms in the same state of incorporation are affected by the same "shock," namely, the passage of the COW law (Bertrand, Duflo, and Mullainathan, 2004; Giroud and Mueller, 2010; Fich *et al.*, 2023; Keum, 2021). All independent variables are lagged by one year relative to the dependent variable to avoid the potential reverse causality problems. β_1 is the DiD estimator and captures the effect of COW law adoption on stock price crash risk.

Table 3.3 presents the baseline results. We find that the estimated coefficients in the models for *COW* on *NSKEW* and *DUVOL* are positive and significant at a 1% level. This finding indicates that firms incorporating in the states adopted COW law have higher stock price crash risk compared to firms incorporating in the states unadopted COW law by 0.0400, and 0.0277 points of *NSKEW* and *DUVOL*, respectively. In terms of economic significance, the coefficients of *COW* in Column (2) and (4) indicate that after accounting for control variables' effects, the enactment of COW law is associated with an 85.11% and 57.71% (i.e., 0.0400/0.047 and 0.0277/0.048) in stock price crash risk measured by *NSKEW* and *DUVOL.* [25] Lee *et al.* (2025) and Balachandran *et al.* (2020) document comparable magnitudes of

[24] Crash risk is sensitive to industry-level information shocks, so industry-by-year fixed effects are necessary. The model also includes state-year and industry-year fixed effects, which mitigate macro and sector-wide shocks, therefore, the results are unlikely to be driven solely by the dotcom or GFC period. This is consistent with previous literature in stock price crash risk.

[25] In term of standard deviation, *NSKEW* and *DUVOL* of firms in states covered by COW law are higher than others not affected by the waiver by 5.33% and 5.02% (i.e., 0.0400/0.751 and 0.0277/0.552) of one standard deviation of the *NSKEW* and *DUVOL* distributions. Al Mamun, Balachandran, Duong and Gul (2021), Bhargava *et al*. (2017), Chen *et al.* (2025), and Li and Zhang (2020) document comparable magnitudes of effects on firms' stock price crash risk and conclude that these magnitudes are nontrivial and economically significant.

effects on firms' stock price crash risk and conclude that these magnitudes are nontrivial and economically significant. Thus, the results confirm our *Hypothesis 1b* that adoption of COW law, which leads to the decline in managers' fiduciary duty of loyalty in firms, increases the future stock price crash risk of firm's stock.

With respect to stock liquidity, we find similar results with Chang *et al.* (2017) that higher stock liquidity is associated with a higher stock price crash risk. Particularly, the coefficients of *Inv_highlow* in regression on *NSKEW* and *DUVOL* are 0.1120 and 0.0687, respectively. For others control variables, our results are quite similar to the previous studies (Chang *et al.*, 2017; Balachandran *et al.*, 2020). However, our baseline shows that the lagged value of *NSKEW* is negatively associated with stock price crash risk. It implies that a higher return negative skewness in the previous year does not lead to a higher return negative skewness in the next year.

Table 3.3: The effect of COW law on stock price crash risk - Baseline result

This table presents the difference-in-difference (DiD) regression of the stock price crash risk on the adoption of COW law and other firm and stock characteristics. Crash risk is measured by *NSKEW* and *DUVOL*. *COW* is a dummy variable that equals 1 for firms in the adopted COW law state in the post-COW law periods, and 0 otherwise. Firm fixed effects, headquarters-state × year fixed effects, and industry × year fixed effects are included. *T*-statistics computed using standard errors clustered at the state of incorporation level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions and data sources are in Appendix B1.

	NSKEW	*NSKEW*	*DUVOL*	*DUVOL*
	(1)	(2)	(3)	(4)
COW	0.0337***	0.0400***	0.0235***	0.0277***
	(3.76)	(4.71)	(3.08)	(3.84)
Inv_highlow		0.1120***		0.0687***
		(9.42)		(8.38)
Nskew		-0.0983***		-0.0648***
		(-21.02)		(-16.05)
Lnsize		0.0871***		0.0602***
		(28.35)		(16.07)
Sigma		1.1896***		0.7754***
		(4.65)		(4.30)
Return		0.1006***		0.0647***
		(4.70)		(4.44)
Dturn		0.2339***		0.1547***
		(14.18)		(10.61)
Leverage		-0.1078***		-0.0818***
		(-5.13)		(-6.08)
Mtbe		0.0055***		0.0042***
		(6.53)		(5.84)
Roa		0.0863***		0.0440***
		(7.94)		(6.25)
Accm		0.0074		0.0069*
		(0.92)		(1.81)
Age		-0.0387***		-0.0293***
		(-7.06)		(-7.26)
Firm fixed effects	Yes	Yes	Yes	Yes
Industry × Year fixed effects	Yes	Yes	Yes	Yes
State × Year fixed effects	Yes	Yes	Yes	Yes
S.E. clustered	State	State	State	State
Observations	80,980	80,980	80,980	80,980
Adjusted R^2	0.0473	0.0671	0.0430	0.0588

3.4.2. Endogeneity

We acknowledge that there is a potential endogeneity in panel data, which may affect the relationship between COW law and stock price crash risk. Therefore, we conduct several tests to ensure that the results of baseline DiD regression are not driven by the effects of endogeneity concerns.

3.4.2.1. Baseline regression results with matched sample

To examine the possibility that the positive effect of adopting COW law on stock price crash risk is driven by the systematic differences between firms in states adopted COW law (treatment group) and firms in states non-adopted COW law (control group), we apply propensity score matching. In doing so, we compare the effect of COW law on the stock price crash risk after eliminating the differences in systematic characteristics.

First, we match firms in treatment group and firms in control group based on control variables on baseline model and industry by two-digit SIC industry code in the year prior the COW law adopted to eliminate the differences in firms' characteristics, industry, and year. We then apply one-to-one nearest score matching with a level of less than 0.01% and a non-replacement method. *Finally*, we re-estimate the baseline models using the matched sample with control variables and specifications as in baseline regression. To ensure the results of propensity score matching, we follow Hainmueller (2012) to apply the entropy balancing method. Entropy balancing reweights each observation in control group and post-weighting properties of matched observations in both treated and control groups (Hainmueller, 2012). This method can avoid a loss of observations and create a more sufficient balance between treatment and control groups compared to propensity score matching or nearest neighbor matching (Neuenkirch and Neumeier, 2016). Entropy balancing is widely employed in

literature (e.g., Neuenkirch and Neumeier, 2016; Glendening, Mauldin, and Shaw, 2019; Balima, 2020).

We report the result of the propensity score matching and entropy balancing in Panels A and B of Table 3.4. The results show that the coefficients of *COW* on stock price crash risk are positive and statistically significant. This result is consistent with the findings from our baseline models. It refers that firms incorporated in the states adopting the COW law have higher crash risk, and this relation is not affected by the differences in firm-specific characteristics. We also report the differences in the mean values of matching (or balancing) firm characteristics between the treated and control groups, and the logit model results before and after matching (or balancing) in Appendix B4 (or Appendix B5).

Table 3.4: The effect of COW law on stock price crash risk – Matched sample

This table presents the difference-in-difference (DiD) regression of the stock price crash risk on the adoption of COW law with matched sample based on the propensity score matching and the entropy balancing. Crash risk is measured by *NSKEW* and *DUVOL*. *COW* equals 1 for firms in the adopted COW law state in the post-COW law periods, and 0 otherwise. The treated group (i.e., firms incorporating in the states adopting COW law) and the control group (i.e., firms incorporating in the states non-adopting COW law) are matched based on all control variables, industry, and year in one year before COW law adopted. Firm fixed effects, headquarters-state × year fixed effects, and industry × year fixed effects are included. *T*-statistics computed using standard errors clustered at the state of incorporation level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions and data sources are in Appendix B1.

	Panel A: Propensity score matching		Panel B: Entropy balancing	
	NSKEW	*DUVOL*	*NSKEW*	*DUVOL*
	(1)	(2)	(3)	(4)
COW	0.0356***	0.0208***	0.0572***	0.0320**
	(4.12)	(2.94)	(3.25)	(2.28)
Inv_highlow	0.1101***	0.0640***	0.1222***	0.0749***
	(7.08)	(5.90)	(15.03)	(15.58)
Nskew	-0.0638***	-0.0429***	-0.1024***	-0.0692***
	(-12.39)	(-16.13)	(-30.61)	(-34.86)
Lnsize	0.0839***	0.0589***	0.0860***	0.0564***
	(22.47)	(11.21)	(30.67)	(47.63)
Sigma	1.7402***	1.1843***	1.2871***	0.8238***
	(5.79)	(5.75)	(5.87)	(5.71)
Return	0.1384***	0.0914***	0.1095***	0.0676***
	(4.44)	(4.30)	(5.78)	(5.09)
Dturn	0.2610***	0.1744***	0.2293***	0.1511***
	(7.60)	(5.93)	(20.33)	(14.15)
Leverage	-0.1449***	-0.0988***	-0.1032***	-0.0816***
	(-7.36)	(-7.49)	(-6.09)	(-7.06)
Mtbe	0.0058***	0.0043***	0.0053***	0.0038***
	(7.45)	(5.78)	(7.28)	(7.67)
Roa	0.1039***	0.0596***	0.0783***	0.0390***
	(4.95)	(4.60)	(11.40)	(8.91)
Accm	0.0157*	0.0091*	0.0048	0.0069**
	(2.01)	(1.74)	(0.82)	(2.47)
Age	-0.0293**	-0.0238**	-0.0289***	-0.0221***
	(-2.20)	(-2.43)	(-3.61)	(-4.58)
Firm fixed effects	Yes	Yes	Yes	Yes
Industry × Year fixed effects	Yes	Yes	Yes	Yes
State × Year fixed effects	Yes	Yes	Yes	Yes
S.E. clustered	State	State	State	State
Observations	48,276	48,276	80,980	80,980
Adjusted R^2	0.0620	0.0533	0.0845	0.0763

3.4.2.2. Delaware-effect test

Delaware is the first state that adopted COW law in 2000. Delaware-incorporated firms with total firms account for 63.10% of our sample. It raises the concern that the results are driven by the effect of Delaware-incorporated firms. Therefore, we conduct the Delaware-effect test by including two dummy variables, namely *COW_DE* and *COW_nonDE,* that indicate firm years after the adoption of COW law in Delaware state and in other states, respectively. We include a set of control variables and model specifications as in the baseline regressions. The regression model is as follows:

$$Crash\ Risk_{i,y+1} = \beta_0 + \beta_1 COW\_DE_{i,y} + \beta_2 COW\_nonDE_{i,y} + \beta_3 Control_{i,y} + \beta_4 Firm_i + \beta_5 Industry_{i,y} \times Year_y + \beta_6 State_{i,y} \times Year_y + \epsilon_i , \quad (5)$$

Panel A in Table 3.5 reports the result of Delaware-effect test. The result shows the coefficients of *COW_DE* and *COW_nonDE* are positive and significant. It suggests that the effect of COW law adoption on stock price crash risk is statistically significant for firms, regardless of whether they operate in Delaware state.

3.4.2.3. Parallel trend test

Another concern in difference-in-difference (DiD) approach is whether other factors other than COW law might drive the change in stock price crash risk and violate the validity of parallel trend assumptions, which is an important assumption in difference-in-difference (DiD). This assumption indicates that the difference in stock price crash risk between treated group and control group only after the exogenous shock happened (after COW law adoption). Therefore, to ensure whether our models comply with a parallel trend of stock price crash risk prior to COW law adoption, we estimate a dynamic model with leads and lags of the *COW* indicator. Specially, we create $COW^{(-2)}$, $COW^{(-1)}$, $COW^{(0)}$, and $COW^{(1+)}$, which equal one if firms are in states that enact the COW law in two years, one year, current year, and

one or more years before, respectively. The coefficients of $COW^{(-2)}$, $COW^{(-1)}$, $COW^{(0)}$ reflect the effect of COW law on stock price crash risk before the adoption of COW law. The coefficient of $COW^{(1+)}$ reflects COW law effect on stock price crash risk after the adoption of COW law. Then, we re-estimate our baseline model as follows:

$$Crash\ Risk_{i,y+1} = \beta_0 + \beta_1 COW^{(-2)} + \beta_2 COW^{(-1)} + \beta_3 COW^{(0)} + \beta_4 COW^{(+1)} + \beta_5 Control_{i,y} + \beta_6 Firm_i + \beta_7 Industry_{i,y} \times Year_y + \beta_8 State_{i,y} \times Year_y + \epsilon_i , \quad (7)$$

The result in Panel B of Table 3.5 shows that the coefficients of $COW^{(-2)}$, $COW^{(-1)}$, and $COW^{(0)}$ are insignificant. It indicates that the stock price crash risk between firms incorporating in states that adopted COW law or non-adopted COW law is statistically similar before COW law enactment. More importantly, we find that the coefficients of $COW^{(1+)}$ are positive and statistically significant in both models of *NSKEW* and *DUVOL*, supporting our findings in the baseline models. This result suggests that our baseline findings do not violate the parallel trend assumption.

3.4.2.4. Confounding effects

Another potential concern is that our results may come from the effects of other state-level laws adopted during the same period rather than the COW law. We consider five other state-level laws relating to antitakeover laws that may have effects on stock price, including the control share acquisition laws (CS), the business combination laws (BC), the fair price laws (FP), the directors' duties laws (DD), and the poison pill laws (PP). The control share acquisition laws (CS) indicate that large shareholders must get approval from other shareholders to obtain control shares (Karpoff and Wittry, 2018). Fair price laws (FP) impose rules on fair prices in many firms (Karpoff and Wittry, 2018). The business combination laws (BC) restrict transactions between large shareholders and firms for a specific period

(Karpoff and Wittry, 2018). The directors' duties laws (DD) state that board members need to act in the firm's best interests and consider both the interests of investors and non-investors (Karpoff and Wittry, 2018). The poison pill laws (PP) discourage an individual or entity to acquire a major number of shares and hostile takeover of the firm (Karpoff and Wittry, 2018). Under the managerial-entrenchment and the stockholder-interest hypothesis, events associated with the state takeover law may cause an increase or decrease in stock prices (Karpoff and Malatesta, 1989). For example, Giroud and Mueller (2010) show that the business combination laws (BC) cause the stock price decline in firms with non-competitive industries. Therefore, to mitigate the concern about confounding effects, we conduct a test to control the effects of adoption of other state-level laws.

We collect data of five state-level laws adopted in the period from Table II of Karpoff and Wittry (2018). *First*, we create five dummy variables indicating the adoption of these laws: *CS_LAW, BS_LAW, FP_LAW, DD_LAW, and PP_LAW*, which are set to 1 for the year in which the state-level laws are effective in a firm's state of incorporation, and 0 otherwise. Then, we re-estimate our baseline models by including all five dummy variables together with *COW* dummy. We also include a set of control variables and model specifications as in the baseline regressions. The model is as follows:

$$Crash\ Risk_{i,y+1} = \beta_0 + \beta_1 COW_{i,y} + \beta_2 CS\_LAW_{i,y} + \beta_3 BC\_LAW_{i,y} + \beta_4 FP\_LAW_{i,y} + \beta_5 DD\_LAW_{i,y} + \beta_6 PP\_LAW_{i,y} + \beta_7 Control_{i,y} + \beta_8 Firm_i + \beta_9 Industry_{i,y} \times Year_y + \beta_{10} State_{i,y} \times Year_y + \epsilon_i \,, \quad (6)$$

As is shown in Panel C of Table 3.5, the coefficients of *COW* remain positive and significant at a 1% level in both models of *NSKEW* and *DUVOL*. It suggests that our baseline result is robust after we control the effects of other state-level laws adopted in the research period.

Table 3.5: Delaware effect, Parallel trend test and Confounding effects

This table presents the endogeneity tests results for difference-in-difference (DiD) regression of the stock price crash risk on the adoption of COW. Crash risk is measured by *NSKEW* and *DUVOL*. Panel A presents the results of Delaware effects. *COW_DE* (*COW_nonDE*) equals 1 for firms in Delaware states (non-Delaware states) in the post-COW law periods, and 0 otherwise. Panel B presents the result of the Parallel trend test. $COW^{(-2)}$, $COW^{(-1)}$, $COW^{(0)}$, and $COW^{(1+)}$ equal 1 or firms in states that will adopt COW law in two years later, one year later, the current year, and more than one year ago, respectively. Panel C presents the result of the confounding effects. *COW, CS_law, BC_ law, FP_ law, DD_ law*, and *PP_law* equal 1 for firms in states adopting COW law, control share acquisition law, business combination law, fair price law, directors' duties law, and poison pill law, respectively, in the post-law periods, and 0 otherwise. Firm fixed effects, headquarters-state × year fixed effects, and industry × year fixed effects are included. *T*-statistics computed using standard errors clustered at the state of incorporation level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions and data sources are in Appendix B1.

	Panel A: Delaware effect		Panel B: Parallel trend test		Panel C: Confounding effects	
	NSKEW	*DUVOL*	*NSKEW*	*DUVOL*	*NSKEW*	*DUVOL*
	(1)	(2)	(3)	(4)	(5)	(6)
COW_DE	0.0402***	0.0272***				
	(3.78)	(3.12)				
COW_nonDE	0.0389*	0.0305**				
	(1.72)	(2.20)				
$COW^{(-2)}$			0.0033	0.0032		
			(0.16)	(0.18)		
$COW^{(-1)}$			-0.0301	-0.0119		
			(-1.01)	(-0.59)		
$COW^{(0)}$			0.0023	0.0131		
			(0.10)	(1.07)		
$COW^{(1+)}$			0.0524***	0.0373***		
			(2.81)	(3.72)		
COW					0.0342***	0.0241***
					(3.18)	(2.77)
CS_law					-0.0470	0.1244**

					(-0.49)	(2.05)
BC_law					0.0688**	0.0857***
					(2.07)	(2.80)
FP_law					-0.2432	-0.2084*
					(-1.32)	(-1.80)
DD_law					-0.0063	-0.0311
					(-0.11)	(-0.66)
PP_law					0.0088	0.0358
					(0.23)	(1.36)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
State × Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
S.E. clustered	State	State	State	State	State	State
Observations	80,980	80,980	80,980	80,980	72,195	72,195
Adjusted R^2	0.0671	0.0588	0.0672	0.0588	0.0676	0.0594

3.4.3. Possible channels

In this section, we investigate the possible channels through which the COW law affects stock price crash risk: the effect of COW law on financial reporting opacity and external monitoring. To test the effect of these possible channels, we test the effect of COW law on stock price crash risk conditional on the level of financial reporting opacity and external monitoring in the pre-COW law adoption. We present the results of the channels test in Table 3.6.

3.4.3.1. Financial reporting opacity

The first possible channel is financial reporting opacity. Hutton *et al.* (2009) find that financial reporting opaque is one of the factors possibly leading to a higher stock price crash risk in the future. Opacity is also an expression of withholding negative information from managers. In line with Hutton *et al.* (2009), Jin and Myers (2006) show that the more opaque firms having more bad news hidden are more likely to have crashes than others. In addition, the corporate opportunities waiver (COW) law permits managers to get business opportunities for their own interests instead of the company's interests first. Then, managers tend to build their personal reputation to attract opportunities for themselves by various actions, including disclosing good news and delaying bad news Hirshleifer (1993). This action may increase the likelihood of stock price crashes in the future. Therefore, we consider whether increasing in financial reporting opacity affects the probability of stock price crash after COW law adopted.

To measure financial reporting opacity, we use *ACCM* developed by Hutton *et al.* (2009). *ACCM* is measured as a three-year moving sum of absolute discretionary accruals (Dechow, Sloan, and Sweeney, 1995) and show the opaqueness in the accounting of firms. Discretionary accruals have relationship with the probability of manipulation actions

(Dechow *et al.*, 1995; Hutton *et al.*, 2009). Then, we create the dummy variables *OPACITY* to capture the level of financial reporting opacity (*ACCM*) before COW law adoption. *OPACITY* equals 1 if the value of financial reporting opacity *(ACCM)* is higher than the state's average value in the state-year prior COW law adopted, and 0 otherwise. The definitions of *OPACITY* and *ACCM* are in Appendix B1. Then, we run the regression with the interaction between *COW* and financial reporting opacity indicator as follows:

$$Crash\ Risk_{i,y+1} = \beta_0 + \beta_1 COW_{i,y} + \beta_2 COW \times OPACITY_{i,y} + \beta_3 Control_{i,y} + \beta_4 Firm_i \quad (9)$$
$$+\beta_4 Industry_{i,y} \times Year_y + \beta_5 State_{i,y} \times Year_y + \epsilon_i ,$$

We also include a set of control variables and model specifications as in the baseline regressions. We report the results of financial reporting opacity channel test in Panel A of Table 3.6. The coefficients of *COW* are significantly positive and consistent with the baseline results. More importantly, the coefficients of interaction *COW* × *OPACITY* are positive and significant. This result suggests that the increase in stock price crash risk associated with the COW law adoption is more pronounced for firms with higher level of pre-enactment financial reporting opacity. An increase in the level of opacity contributes to explaining the rise in the stock price crash risk following the waiver's enactment.

3.4.3.2. External monitoring

The second channel is external monitoring. Previous studies indicate that external monitoring reduces managerial bad-news hoarding and crash risk in the future (Kim *et al.*, 2020; Jiang, Cai, Nofsinger, and Zheng, 2020). Similarly, Kim *et al*. (2011b) also report that the external monitoring measured by analyst coverage and institutional ownership play a role in reducing future crash risk. In addition, managers in poor monitored firms tend to focus on their own interest instead of behaving aligned with shareholders' interests (Ferrell, Liang, and Renneboog, 2016). The corporate opportunities waiver (COW) law allows managers to

pursue new business opportunities without first offering for their companies, which exacerbates agency conflicts and weaken monitoring or governance mechanism (Hu *et al.,* 2023; Boyd *et al*., 2025; Foroughi, 2025). Therefore, we consider whether decreasing in external monitoring affects the probability of stock price crash after COW law adopted.

We use the number of analysts and institutional ownership to measure external monitoring. Analysts with sufficient skills and knowledge can be deemed as external monitoring to raise questions through release conferences, discovery of fraud in corporate, and create pressure on managers (Yu, 2008). Institutional investors can monitor the operation of companies and reduce the likelihood that managers withhold bad news or negative information, which leads to the reduction in stock price crash risk in the future (Callen and Fang, 2013). Previous studies also use a number of analysts and institutional investors as proxies of external monitoring of firms (Yu, 2008; Kim *et al*., 2011a).

To test the effect of external monitoring channel, we create two dummy variables (*ANALYST* and *INST)* to capture external monitoring level of firms in the prior year of COW law adoption. *ANALYST* (*INST*) equals 1 if the value of number of analysts of firms (institutional ownership) is higher than the state-year's average value in the year prior COW law adopted, and 0 otherwise. The definitions of *ANALYST* and *INST* are in Appendix B1. Then, we run the regression with the interaction between *COW* and financial reporting opacity indicator as follows:

$$Crash\ Risk_{i,y+1} = \beta_0 + \beta_1 COW_{i,y} + \beta_2 COW \times ANALYST_{i,y} + \beta_3 Control_{i,y} + \beta_4 Firm_i + \beta_4 Industry_{i,y} \times Year_y + \beta_5 State_{i,y} \times Year_y + \epsilon_i \quad (10)$$

$$Crash\ Risk_{i,y+1} = \beta_0 + \beta_1 COW_{i,y} + \beta_2 COW \times INST_{i,y} + \beta_3 Control_{i,y} + \beta_4 Firm_i + \beta_4 Industry_{i,y} \times Year_y + \beta_5 State_{i,y} \times Year_y + \epsilon_i \quad (11)$$

We also include a set of control variables and model specifications as in the baseline regressions. We report the results of external monitoring channel test in Panel B of Table

3.6. The coefficients of COW are significantly positive and consistent with the baseline results. More importantly, the coefficients of interaction *COW* × *ANALYST* and *COW* × *INST* are negative and significant, suggesting that the increase in crash risk due to the COW law enactment is more pronounced for firms with lower levels of pre-enactment external monitoring. The results indicate that lower level of external monitoring helps explain the increase in stock price crash risk after COW law adoption.

Table 3.6: Channel analysis

This table presents the difference-in-difference (DiD) regression of stock price crash risk on the adoption of COW law with the channel analysis. Crash risk is measured by *NSKEW* and *DUVOL*. *COW* equals 1 for firms in the adopted COW law state in the post-COW law periods, and 0 otherwise. Panel A presents the results of the opacity channel *(Opacity)*. Panel B reports the results of the analyst channel (*Analyst*). Panel C reports the results of the institutional ownership channel (*Institution*). We create an indicator (*Opacity, Analyst, or Institution)* that equals one if this measure is higher than the state and year's average value in the pre-COW year, and zero otherwise Firm fixed effects, headquarter state × year fixed effects, and industry × year fixed effects are included. *T*-statistics computed using standard errors clustered at the state of incorporation level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions and data sources are in Appendix B1.

	Panel A: Opacity		Panel B: Analyst		Panel C: Institutional ownership	
	NSKEW	*DUVOL*	*NSKEW*	*DUVOL*	*NSKEW*	*DUVOL*
	(1)	(2)	(3)	(4)	(5)	(6)
COW	0.0289***	0.0225***	0.0828***	0.0479***	0.0911***	0.0601***
	(3.09)	(3.06)	(7.80)	(5.24)	(10.79)	(9.47)
COW × *Opacity*	0.0303**	0.0135**				
	(2.47)	(2.18)				
COW × *Analyst*			-0.0717***	-0.0343**		
			(-4.63)	(-2.55)		
COW × *Institution*					-0.0881***	-0.0560***
					(-8.38)	(-7.08)
Inv_highlow	0.1133***	0.0691***	0.1081***	0.0666***	0.1068***	0.0649***
	(9.34)	(8.30)	(9.40)	(7.90)	(10.01)	(8.62)
Nskew	-0.0980***	-0.0644***	-0.0980***	-0.0644***	-0.0982***	-0.0645***
	(-21.48)	(-16.47)	(-21.75)	(-16.61)	(-21.48)	(-16.47)
Lnsize	0.0861***	0.0600***	0.0879***	0.0609***	0.0881***	0.0612***
	(28.00)	(14.31)	(28.23)	(14.13)	(27.79)	(15.10)
Sigma	1.2504***	0.7947***	1.1911***	0.7664***	1.1914***	0.7574***
	(4.68)	(4.24)	(4.52)	(4.07)	(4.55)	(4.14)
Return	0.1039***	0.0650***	0.1005***	0.0633***	0.1007***	0.0629***

	(4.52)	(4.20)	(4.42)	(4.08)	(4.46)	(4.12)
Dturn	0.2310***	0.1535***	0.2308***	0.1535***	0.2312***	0.1538***
	(13.98)	(10.41)	(13.93)	(10.39)	(14.07)	(10.49)
Leverage	-0.1068***	-0.0800***	-0.1047***	-0.0790***	-0.1045***	-0.0786***
	(-5.09)	(-6.00)	(-4.95)	(-5.92)	(-4.94)	(-5.86)
Mtbe	0.0055***	0.0042***	0.0055***	0.0042***	0.0056***	0.0042***
	(6.43)	(5.69)	(6.39)	(5.66)	(6.37)	(5.67)
Roa	0.0880***	0.0463***	0.0878***	0.0462***	0.0878***	0.0460***
	(7.99)	(6.49)	(7.91)	(6.44)	(7.84)	(6.38)
Age	-0.0395***	-0.0297***	-0.0390***	-0.0294***	-0.0404***	-0.0304***
	(-7.26)	(-7.01)	(-6.75)	(-6.73)	(-7.19)	(-7.06)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
State × Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
S.E. clustered	State	State	State	State	State	State
Observations	78,890	78,890	78,890	78,890	78,890	78,890
Adjusted R^2	0.0663	0.0579	0.0665	0.0579	0.0666	0.0581

3.4.4. Cross-sectional analyses

In this section, we examine whether the effect of COW law adoption on stock price crash risk differs for different types of firms in certain conditions. We test how the COW law relates to stock price crash risk for firms with different levels of financial distress and market competition.

3.4.4.1. Financial distress

We consider the possibility that the effect of COW law on stock price crash risk matters more for firms with certain financial situations. Firms with higher financial distress face more difficulties in meeting their financial obligations (Campbell, Hilscher, and Szilagyi, 2008) and accessing the capital for operation and investment activities (Kaplan and Zingales, 2000). Managers of firms having higher levels of financial distress tend to obfuscate the firms' poor performance and operating situations to mislead the stakeholders, which may lead to the stock price crashes in the future (Andreou, Andreou, and Lambertides, 2021; He and Ren, 2023). In addition, corporate opportunities waiver (COW) law, motivating the managers' efforts to their own interests instead of firms' interests, leads to the significant decrease in innovation investment (Fich *et al.,* 2023). Ben-Nasr *et al.* (2019) find that number of patents (innovation) has negative relation to stock price crash risk. Therefore, we suggest that the effect of COW law on crash risk is more pronounced for firms with higher levels of financial distress.

We use Alman's Z-score, originally developed by Altman (1968), to measure the firm's financial distress. A lower value of Alman's Z-score means a higher level of financial distress. We re-estimate the baseline regressions in two subsamples (higher and lower levels of financial distress). The subsamples are divided based on the median value of Alman's Z-score of firms in each industry each year. Firms with Alman's Z-scores below the median

value of firms in each industry year belong to the higher financial distress group and vice versa. Panel A of Table 3.7 reports the results of subsample regressions on *NSKEW* and *DUVOL* models, respectively. The results suggest that the effect of COW law on the stock price crash risk is more pronounced for more financially distressed firms than others. The results of the *Chi-square* tests are statistically significant at the 1% level, supporting our findings.

3.4.4.2. Market competition

We further examine the possibility that the effect of COW law adoption on stock price crash risk differs for firms with different levels of market competition. Bhargava *et al.* (2017) mention that managers in firms with higher competition pressure tend to withhold bad news to the public. The disclosure of bad news and negative private information may lead to a decrease in firms' competitive positions in the market. Dedman and Lennox (2009) also find that while managers from firms facing higher levels of market competition are likely to delay disclosure of operating information from public statements, managers from firms facing low level of competition tend to disclose more. Then, when the bad news is released to the market, they cause a significant drop in stock price (Jia, 2018). Therefore, we suggest that the effect of COW law adoption on stock price crash risk is stronger for firms facing greater product market competition compared to others.

We use fluidity index developed by Hoberg, Phillips, and Prabhala (2014) to measure the firm-level market competition.[26] A higher fluidity index refers to a higher level of product market competition. Then, we re-estimate the baseline regressions in two subsamples divided based on the median value of fluidity index in each industry-year. Firms with fluidity index being above the median value of fluidity of firms in each industry-year belong to the high-

[26] We collect data of fluidity index to measure firm-level competitiveness from Hoberg *et al.* (2014).

market competition group, and vice versa. Panel B of Table 3.7 reports the results of subsample regression on stock price crash risk measures (*NSKEW* and *DUVOL*). The coefficients of *COW* in high-market competition groups are positive and statistically significant, while the coefficients of *COW* in low-market competition groups are insignificant. In addition, the results of *Chi-square* show that the differences of coefficients between two groups are statistically significant. Therefore, it implies that the effect of COW law on stock price crash risk is more pronounced for firms facing higher level of product market competition.

Table 3.7: Cross-sectional analysis

This table presents the difference-in-difference (DiD) regression of the stock price crash risk on the adoption of COW law with the cross-sectional analysis. Crash risk is measured by *NSKEW* and *DUVOL*. *COW* equals 1 for firms in the adopted COW law state in the post-COW law periods, and 0 otherwise. We divide the full sample into subsamples based on level (high/low) of financial distress (measured by Alman's Z-score) and market competition (measured by fluidity ratio) in Panel A and Panel B, respectively. Firm fixed effects, headquarter state × year fixed effects, and industry × year fixed effects are included. *T*-statistics computed using standard errors clustered at the state of incorporation level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions and data sources are in Appendix B1.

	Panel A: Financial distress Alman's Z-score				Panel B: Market competition Fluidity			
	High *NSKEW*	Low *NSKEW*	High *DUVOL*	Low *DUVOL*	High *NSKEW*	Low *NSKEW*	High *DUVOL*	Low *DUVOL*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
COW	0.1161**	-0.0397	0.1008***	-0.0269	0.2675***	0.0053	0.1464***	0.0215
	(2.59)	(-1.52)	(3.14)	(-1.28)	(5.60)	(0.27)	(4.43)	(1.52)
Inv_highlow	0.1349***	0.1186***	0.0847***	0.0833***	0.2188***	0.0991***	0.1451***	0.0615***
	(6.09)	(6.09)	(5.84)	(4.77)	(4.73)	(4.33)	(5.96)	(3.89)
Nskew	-0.1786***	-0.1400***	-0.1134***	-0.0945***	-0.1538***	-0.0961***	-0.0959***	-0.0643***
	(-30.68)	(-14.90)	(-33.43)	(-10.30)	(-11.17)	(-16.93)	(-11.10)	(-11.80)
Lnsize	0.1285***	0.0872***	0.0832***	0.0635***	0.1043***	0.1085***	0.0650***	0.0770***
	(8.98)	(11.84)	(9.74)	(10.91)	(10.06)	(9.72)	(12.35)	(8.25)
Sigma	-0.6173	1.4801**	-0.6333*	1.2655***	1.2732***	0.2530	0.6025*	0.0260
	(-1.28)	(2.42)	(-2.01)	(2.90)	(3.22)	(0.46)	(1.94)	(0.06)
Return	-0.0282	0.0991**	-0.0343	0.0844**	0.1238***	0.0367	0.0568**	0.0218
	(-0.85)	(2.25)	(-1.48)	(2.57)	(3.81)	(0.90)	(2.30)	(0.73)
Dturn	0.1008***	0.2513***	0.0657***	0.1721***	0.2644***	0.3044***	0.1542***	0.1955***
	(3.42)	(6.24)	(3.20)	(5.17)	(9.97)	(5.42)	(6.86)	(4.25)
Leverage	-0.0748**	-0.5370***	-0.0617**	-0.3288***	0.0418	-0.0935	0.0553*	-0.0639
	(-2.41)	(-6.41)	(-2.26)	(-4.33)	(0.95)	(-1.46)	(1.88)	(-1.38)

Mtbe	0.0023*	0.0122***	0.0014	0.0097***	0.0042***	0.0060***	0.0035***	0.0042**
	(1.71)	(6.83)	(1.39)	(6.12)	(6.98)	(3.09)	(9.07)	(2.14)
Roa	0.0073	0.2012***	0.0049	0.1383***	-0.0500***	0.2006***	-0.0497***	0.0994*
	(0.40)	(7.63)	(0.44)	(5.71)	(-3.48)	(3.04)	(-5.31)	(1.94)
Accm	-0.0187	0.0492***	-0.0147*	0.0377***	-0.0167*	0.0403**	-0.0000	0.0262*
	(-1.65)	(3.78)	(-1.97)	(3.76)	(-1.76)	(2.17)	(-0.01)	(1.81)
Age	-0.0277	-0.0407***	-0.0349**	-0.0264**	-0.0237	-0.0813***	-0.0048	-0.0567***
	(-1.07)	(-2.84)	(-2.19)	(-2.17)	(-0.81)	(-4.93)	(-0.23)	(-4.27)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State × Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
S.E. clustered	State	State	State	State	State	State	State	State
Observations	15,185	17,569	15,185	17,569	11,936	25,621	11,936	25,621
Adjusted R^2	0.0976	0.0797	0.0892	0.0737	0.0787	0.0639	0.0736	0.0573
Chi-square (χ^2) test	28.01***		32.01***		14.68***		8.91***	
p-value	0.00		0.00		0.00		0.00	

3.5. Robustness tests

3.5.1. Alternative measures of stock price crash risk

We use two alternative measures of stock price crash risk, which are *CRASH_below* and *CRASH_net*. *CRASH_below* is natural logarithm of the number of weekly returns that are 3.09 or more standard deviation below the mean of firm-specific weekly returns in a fiscal year.[27] *CRASH_above* is natural logarithm of the number of weekly returns that are 3.09 or more standard deviation above the mean of firm-specific weekly returns in a fiscal year. *CRASH_net* is calculated as follows:

$$CRASH\_net = \frac{(CRASH\_below - CRASH\_above)}{CRASH\_below + CRASH\_above} \quad (12)$$

We run regression models with *CRASH_below* and *CRASH_net* as dependent variables, *COW* as an independent variable. Controls variables and model specifications are as in baseline. Panel A of Table 3.8 reports the results of using two alternative measures of stock price crash risk. Both coefficients of dependent variables are positive and statistically significant at a level of 1% and 5%. These results again reinforce our findings in the baseline models.

3.5.2. Alternative DiD estimations

In this section, we employ three alternative DiD estimations tests. *First*, we use two-way clustering robust standard errors by state of incorporation and year to robust cross-sectional and time dependence. Clustering standard errors at the level of both incorporated state and year is better in dealing with the variances across firms within same incorporated state and year (Hu *et al.,* 2023). We report the results in Panel B of Table 3.8. Both

[27] "3.09 chosen is to generate a frequency of 0.1% in the normal distribution" (Hutton *et al.*, 2009, p.73).

coefficients are significantly positive at a 1% level. The results reinforce the findings in the baseline model.

Second, to minimize the potential bias coming from the comparisons of early and later treated units in DiD approach (Baker, Larcker, and Wang, 2022), we apply the stacked regression approach developed by Cengiz, Dube, Lindner, and Zipperer (2019) and the Callaway and Sant'Anna (2021) estimator to control the time-varying treatment effects. [28] These approaches modify the set of comparison units in the estimation process and ensure that treated firms are compared with control firms that have either never been treated or have not yet been treated. The use of "clean" controls can address the heterogeneous treatment effects in the staggered DiD model (Lai, Lin, and Ma, 2024). These approaches are recommended by Baker *et al.* (2022) to robust the DiD design model and used in recent papers such as Lai *et al.* (2024), and Babenko, Bennett, and Wang (2025).

Panel C and D of Table 3.8 report the results of the stacked regression approach and the Callaway and Sant'Anna (2021) estimator, respectively. The coefficients are positive and significant, being similar to the baseline results in Table 3.3. The results indicate that the potential issues arising from the staggered timing of the treatment effects and treatment-effect heterogeneity do not appear to affect our overall findings.

3.5.3. Placebo test

We conduct the placebo test to address the concern that our baseline results are spuriously driven by unobservable factors instead of the effect of COW law. We randomly assign the pseudo-year of COW law adoption for each state and create the *pseudo-COW*, which equals 1 from the beginning of pseudo-year in each state, and 0 otherwise. Then, we

[28] We thank Barrios (2022), Sant'Anna and Zhao (2020) and Callaway and Sant'Anna (2021) for providing the STATA code of the stacked DiD regression and Callaway and Sant'Anna (2021) estimator.

replace *COW* with the *pseudo-COW* in the baseline models and repeat the process 1000 times. Finally, we calculate the mean value of coefficients and *t*-statistics from 1000 pseudo-estimated coefficients and *t*-statistic values. If the increase in stock price crash risk is driven by unobservable factors instead of COW law, we should find the positive and significant relationship between the assigned *pseudo-COW* and stock price crash risk measures (*NSKEW* and *DUVOL*).

Panel E of Table 3.8 reports the result of placebo test. The mean value of *COW* of placebo test in *NSKEW* and *DUVOL* models are 0.0022 and 0.0032, respectively, which are different from the actual values from baseline results (0.0400 and 0.0277). In addition, the mean value of t-statistics of placebo test in *NSKEW* and *DUVOL* models are 0.30 and 0.58, respectively, which are also different from the actual values of t-statistics in baseline models (4.71 and 3.84). This result shows that it is very unlikely that the effect of COW law on the stock price crash risk is driven by omitted factors.

Table 3.8: Robustness test

This table presents the robust test of difference-in-difference (DiD) regression of the stock price crash risk on the adoption of COW law. Panel A reports the results of the effect of COW law on the alternative measures of crash risks. Panel B reports the results of two-ways standard errors clustering at the state of incorporate and year levels. Panel C reports the results for the stacked regression. Panel D reports the Callaway and Sant'Anna (2021) estimator's result. Panel E reports the results of the placebo test. Crash risk is measured by *NSKEW* and *DUVOL*. *COW* equals 1 for firms in the adopted COW law state in the post-COW law periods, and 0 otherwise. Firm fixed effects, headquarter state fixed effects, and year fixed effects are included. *T*-statistics computed using standard errors clustered at the state of incorporation level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions and data sources are in Appendix B1.

	Panel A: Alternative measure of crash risk		Panel B: Two-ways clustering		Panel C: Stacked regression		Panel D: Callaway and Santana's (2021) estimators	
	CRASH_below	*CRASH_net*	*NSKEW*	*DUVOL*	*NSKEW*	*DUVOL*	*NSKEW*	*DUVOL*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
COW	0.0121**	0.0916***	0.0400***	0.0277***	0.0364**	0.0245**	0.0291***	0.0211***
	(2.62)	(3.34)	(3.86)	(3.20)	(2.24)	(2.23)	(2.81)	(3.07)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State × Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel E: Placebo test

	Coefficients of *COW*		*t*-statistics of *COW*	
	Actual	*pseudo-COW*	Actual	*pseudo-COW*
in *NSKEW* model	0.0400***	0.0022	(4.71)	(0.30)
in *DUVOL* model	0.0277***	0.0032	(3.84)	(0.58)

3.6. Further analysis

3.6.1. The effect of COW law on stock liquidity

First, we study the effect of the COW law on stock liquidity. Chang *et al.* (2017) find that stock liquidity, defined as the ease of trading shares in the financial markets, is associated with stock price crash risk. As discussed above, the COW law can motivate managers to withhold negative information, which can increase information asymmetry. In addition, higher information asymmetry is associated with higher stock illiquidity in the market (Lang and Maffet, 2011). Therefore, we suppose that firms affected by the COW law may have higher stock illiquidity.

We use five measures for stock illiquidity. The *first measure* is the high-low spread (*Highlow*), developed by Corwin and Schultz (2012), reflecting both the bid-ask spread of the stock and its variance. The *second measure* is *Zeros* developed by Lesmond, Ogden, and Trzcinka (1999), as the ratio of zero trading days and the total observable days. The *third measure* is effective spread (*Edge*), developed by Ardia, Guidotti, and Kroencke (2021). This measure works well even for infrequently traded stocks, providing unbiased illiquidity estimates irrespective of the number of trades (Ardia *et al.,* 2021). The *fourth measure* is the close-high-low spread (*CHL*) measuring the spread at the close price, developed by Abdi and Ranaldo (2017). The *final measure* is the effective spread computed with respect to the quoted midpoint (*HJ*), developed by Holden and Jacobsen (2014). [29]

Table 3.9 presents the results of the COW law's effect on stock illiquidity. We find that the estimated coefficients of COW on the stock illiquidity are positive and statistically significant. The estimates of COW show that after accounting for the effects of the control variables, a firm's stock illiquidity rises from 13 to 21 basis points, indicating that the decline

[29] We thank Ardia *et al*. (2021) for the data of *Edge*, *CHL* and *HJ* measures.

in managers' fiduciary duty of loyalty following the adoption of the COW law is associated with an increase in firms' stock illiquidity in the financial markets.

Table 3.9: The effect of COW law on stock illiquidity

This table presents the difference-in-difference (DiD) regression of the stock illiquidity on the adoption of COW. Stock illiquidity is measured by *Highlow, Zeros, Edge, CHL*, and *HJ*. *COW* equals 1 for firms in the adopted COW law state in the post-COW law periods, and 0 otherwise. Firm fixed effects, headquarters-state × year fixed effects, and industry × year fixed effects are included. *T*-statistics computed using standard errors clustered at the state of incorporation level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions and data sources are in Appendix B1.

	Highlow	*Zeros*	*Edge*	*CHL*	*HJ*
	(1)	(2)	(3)	(4)	(5)
COW	0.0013***	0.0053**	0.0021***	0.0021***	0.0013***
	(2.74)	(2.51)	(3.17)	(3.80)	(2.70)
Nskew	0.0005***	0.0016***	0.0005***	0.0006***	0.0005***
	(5.59)	(5.97)	(4.14)	(3.57)	(3.47)
Lnsize	-0.0018***	-0.0065***	-0.0027***	-0.0018***	-0.0034***
	(-9.86)	(-11.37)	(-13.33)	(-9.92)	(-12.94)
Sigma	0.1311***	-0.1749**	0.0852***	0.0869***	0.0404***
	(25.01)	(-2.64)	(15.18)	(11.05)	(6.96)
Return	0.0034***	-0.0138***	0.0023***	0.0029***	0.0001
	(6.63)	(-3.53)	(5.35)	(4.06)	(0.30)
Dturn	-0.0085***	-0.0340***	-0.0140***	-0.0164***	-0.0106***
	(-10.34)	(-12.42)	(-14.05)	(-13.18)	(-12.25)
Leverage	0.0040***	0.0328***	0.0040***	0.0038***	0.0053***
	(4.96)	(6.69)	(3.31)	(3.00)	(3.92)
Mtbe	-0.0001***	-0.0009***	-0.0002***	-0.0002***	-0.0002***
	(-6.48)	(-7.93)	(-7.02)	(-8.57)	(-8.12)
Roa	-0.0077***	-0.0243***	-0.0093***	-0.0093***	-0.0081***
	(-7.66)	(-7.04)	(-8.39)	(-6.77)	(-7.80)
Accm	-0.0009***	-0.0048***	-0.0012***	-0.0015***	-0.0010**
	(-2.72)	(-4.43)	(-3.17)	(-3.37)	(-2.39)
Age	-0.0014***	-0.0008	-0.0024***	-0.0017**	-0.0017***
	(-3.60)	(-0.41)	(-3.32)	(-2.42)	(-3.62)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Industry × Year fixed effects	Yes	Yes	Yes	Yes	Yes
State × Year fixed effects	Yes	Yes	Yes	Yes	Yes
S.E. clustered	State	State	State	State	State
Observations	80,978	80,979	78,268	80,894	75,191
Adjusted R^2	0.6241	0.8311	0.7040	0.6518	0.7934

3.6.2. The effect of COW law on informed trading and stock price informativeness

Second, we test whether the COW law has significant effect on the informed trading and stock price informativeness. As discussed in the channel analysis, the COW law's effect is associated with the higher level of financial reporting opacity, which reflects the information environments. Maffett (2012) reports that firms with more opaque information environments have higher levels of informed trading. Therefore, we expect that COW law can increase the level of informed trading due to increasing information opacity. We use the generalized probability of informed trading (*Gpin*) developed by Duarte, Hu, and Young (2020). We also use the industry-adjusted generalized probability of informed trading (*Gpin_indus*) to account for variations in informed trading across industries. The higher value of *Gpin* and *Gpin_indus*, the higher level of informed trading. In addition, the higher probability of informed trading indicates the higher degree that firms-specific information is incorporated into stock prices (stock price informativeness) (Ben-Nasr and Alshwer, 2016). Prior literature also uses informed trading as a measure for stock price informativeness, for example, Ben-Nasr and Alshwer (2016), and Chen, Goldstein, and Jiang (2007). Therefore, we suppose that the adoption of COW law can increase the stock price informativeness through increasing level of informed trading. To capture stock price efficiency, we also use the price delay (*Price_delay)* developed by Hou and Moskowitz (2005), reflecting the average delay in stock price in information response. We also use the industry-adjusted price delay (*Price_delay_indus*) to capture variations in price delay measure across industries. The higher value of *Price_delay* and *Price_delay_indus,* the lower the stock price informativeness (Hou and Moskowitz, 2005; Pham, 2020).

Panel A and B in Table 3.10 show the results of the relationship between COW law and informed trading and stock price informativeness, respectively. Panel A shows the coefficients of *COW* on *Gpin* and *Gpin_indus* models are significantly positive, indicating

that the adoption of COW law increase the level of informed trading. Panel B reports the significantly negative coefficient of *COW* on *Price_delay,* suggesting that firms affected by COW law are associated with greater stock price informativeness. The COW law weakens fiduciary constraints, increasing managerial discretion and reducing transparency and monitoring. This widens the information gap and creates stronger incentives for traders with informational advantages, thereby increasing informed trading. As a result, more private information is incorporated into prices, increasing price informativeness. Thus, higher opacity and greater price informativeness can coexist, as the latter reflects private rather than public information.

Table 3.10: The effect of COW law on informed trading and stock price informativeness

This table presents the difference-in-difference (DiD) regression of the informed trading and stock price informativeness on the adoption of COW. Panel A reports the results of informed trading, measured by GPIN (*Gpin*), and industry-adjusted GPIN (*Gpin_indus*). Panel B reports the results of stock price informativeness, measured by price delay measure (*Price_delay*), and industry-adjusted price delay (*Price_delay_indus*). *COW* equals 1 for firms in the adopted COW law state in the post-COW law periods, and 0 otherwise. Firm fixed effects, headquarters-state × year fixed effects, and industry × year fixed effects are included. *T*-statistics computed using standard errors clustered at the state of incorporation level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions and data sources are in Appendix B1.

	Panel A: Informed trading		Panel B: Stock price informativeness	
	Gpin	*Gpin_indus*	*Price_delay*	*Price_delay_indus*
	(1)	(2)	(3)	(4)
COW	0.0067**	0.0874**	-0.0273**	-0.0800**
	(2.45)	(2.39)	(-2.42)	(-2.55)
Inv_highlow	0.0094***	0.0833**	-0.0225***	-0.0702**
	(5.04)	(2.54)	(-2.70)	(-2.56)
Nskew	-0.0019***	-0.0285***	0.0021*	0.0085**
	(-6.52)	(-5.78)	(1.96)	(2.39)
Lnsize	-0.0141***	-0.2467***	-0.0602***	-0.1998***
	(-16.73)	(-18.57)	(-12.49)	(-13.22)
Sigma	0.2783***	4.8327***	-0.1401	-0.1587
	(9.93)	(10.39)	(-0.64)	(-0.23)
Return	0.0115***	0.1596***	0.0040	0.0374
	(5.73)	(4.48)	(0.30)	(0.86)
Dturn	-0.0205***	-0.4034***	-0.0381***	-0.1153***
	(-12.79)	(-13.20)	(-5.36)	(-4.96)
Leverage	0.0156***	0.2547***	0.0658***	0.2090***
	(4.46)	(4.41)	(3.54)	(3.41)
Mtbe	-0.0000	0.0001	-0.0023***	-0.0074***
	(-0.15)	(0.09)	(-7.12)	(-6.98)
Roa	0.0013	-0.0425	-0.0517***	-0.1694***
	(0.67)	(-1.30)	(-9.46)	(-9.56)
Accm	-0.0017	-0.0208	-0.0043	-0.0123
	(-1.39)	(-1.20)	(-1.33)	(-1.15)
Age	-0.0049**	-0.0111	0.0031	0.0166*
	(-2.67)	(-0.42)	(0.95)	(1.76)
Firm fixed effects	Yes	Yes	Yes	Yes
Industry × Year fixed effects	Yes	Yes	Yes	Yes
State × Year fixed effects	Yes	Yes	Yes	Yes
S.E. clustered	State	State	State	State
Observations	24,694	24,694	46,667	46,667
Adjusted R^2	0.3803	0.3389	0.4910	0.4209

3.6.3. The effect of COW law on stock mispricing

We further examine whether the COW law is associated with the stock mispricing. As discussed above, the COW law waives the fiduciary duty of loyalty that the managers can take the business opportunities without offering them for operations first. Therefore, this may cause the agency problems and information asymmetry between managers and shareholders. In addition, prior studies find that mispricing occurs due to the increase in information disclosure quality (Healey and Palepu, 2001) and agency costs (Chernenko, Foley, and Greenwood, 2012). Therefore, we suggest that firms affected by COW law will experience higher levels of stock mispricing. We use the mispricing measure (MISP) developed by Stambaugh, Yu, and Yuan (2015) to measure the level of stock mispricing. The stocks with the highest (lowest) values of MISP are the most overpriced (underpriced) stocks. Then, we create the indicators *Misprice_3, Misprice_4, Misprice_5,* and *Misprice_10* that takes value of one if the MISP value is in the top and bottom tertile, quartile, quintile, and decile in the year, respectively, and zero otherwise. Higher values of these measures indicate higher level of stock mispricing.[30]

Table 3.11 presents the results of the COW law's effect on stock mispricing. All coefficients of *COW* are positive and statistically significant, indicating that the decline in managers' fiduciary duty of loyalty following the adoption of the COW law is associated with an increase in firms' stock mispricing.

[30] Data on the mispricing measure is only available through 2016. Accordingly, the analyses reported in Table 3.11 are conducted using the subsample for which mispricing data are available.

Table 3.11: The effect of COW law on stock mispricing

This table presents the difference-in-difference (DiD) regression of the stock mispricing on the adoption of COW. Stock mispricing is measured by the mispricing measure (MISP) developed by Stambaugh, Yu, and Yuan (2015). We create the indicators *Misprice_3, Misprice_4, Misprice_5*, and *Misprice_10* that takes value of one if the MISP value is in the top and bottom tertile, quartile, quintile, and decile in the year, respectively, and zero otherwise. *COW* equals 1 for firms in the adopted COW law state in the post-COW law periods, and 0 otherwise. Firm fixed effects, headquarters-state × year fixed effects, and industry × year fixed effects are included. *T*-statistics computed using standard errors clustered at the state of incorporation level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions and data sources are in Appendix B1.

	Misprice_3	*Misprice_4*	*Misprice_5*	*Misprice_10*
	(1)	(2)	(3)	(4)
COW	0.0266***	0.0311***	0.0208*	0.0302***
	(2.80)	(2.94)	(1.97)	(2.86)
Nskew	-0.0018	-0.0007	-0.0026	-0.0024
	(-0.63)	(-0.17)	(-0.84)	(-0.95)
Inv_highlow	0.0204*	0.0201	0.0189**	0.0088
	(1.85)	(1.63)	(2.06)	(1.19)
Lnsize	0.0197***	0.0238***	0.0300***	0.0310***
	(4.82)	(4.38)	(3.66)	(3.50)
Sigma	-1.2123***	-1.6490***	-1.6064***	-1.3991***
	(-5.98)	(-9.27)	(-7.20)	(-6.56)
Return	-0.0807***	-0.1147***	-0.1055***	-0.0863***
	(-4.17)	(-7.59)	(-5.63)	(-5.75)
Dturn	0.0993***	0.1605***	0.1510***	0.1028***
	(6.22)	(10.11)	(11.17)	(8.69)
Leverage	-0.0787**	-0.0819***	-0.1152***	-0.1368***
	(-2.30)	(-2.73)	(-4.17)	(-5.84)
Mtbe	-0.0010***	-0.0005	-0.0015***	-0.0018***
	(-2.86)	(-1.21)	(-5.42)	(-5.72)
Roa	-0.0564***	-0.0507***	-0.0267	-0.0080
	(-4.24)	(-2.90)	(-1.58)	(-0.69)
Accm	0.0314***	0.0290***	0.0214***	0.0266***
	(5.87)	(5.68)	(5.11)	(5.83)
Age	-0.0045	-0.0074	-0.0155	-0.0185
	(-0.58)	(-0.74)	(-1.63)	(-1.36)
Firm fixed effects	Yes	Yes	Yes	Yes
Industry × Year fixed effects	Yes	Yes	Yes	Yes
State × Year fixed effects	Yes	Yes	Yes	Yes
S.E. clustered	State	State	State	State
Observations	58,814	58,814	58,814	58,814
Adjusted R^2	0.1008	0.1442	0.1629	0.1833

3.6.4. The effect of COW law on audit pricing

In this section, we examine whether the COW law relates to the firm's audit pricing. As discussed above, the COW law reduces the fiduciary duty of loyalty, which may cause the agency conflicts and corporate governance problems. Fich *et al.* (2023) also find that COW law weaken firms' corporate governance. In addition, Bedard and Johnstone (2004) report that higher audit rates are associated with firms with higher earnings manipulation and corporate governance risk. Therefore, we suppose that firms incorporating in states with COW law experience higher audit prices. We use the natural logarithm of audit fee (*AUDIT_FEE*) to measure the audit pricing.

Table 3.12 presents the results of the COW law's effect on the audit pricing. We find that the estimated coefficients of COW on the audit pricing are positive and statistically significant. The estimates of COW show that after accounting for the effects of the control variables, a firm's audit pricing rises by more than 400 basis points, indicating that the decline in managers' fiduciary duty of loyalty following the adoption of the COW law is associated with an increase in firms' audit pricing.

Table 3.12: The effect of COW law on audit pricing

This table presents the difference-in-difference (DiD) regression of the audit pricing on the adoption of COW. Audit pricing is measured by *AUDIT_FEE*. *COW* equals 1 for firms in the adopted COW law state in the post-COW law periods, and 0 otherwise. Firm fixed effects, headquarters-state × year fixed effects, and industry × year fixed effects are included. *T*-statistics computed using standard errors clustered at the state of incorporation level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions and data sources are in Appendix B1.

	AUDIT_FEE	*AUDIT_FEE*	*AUDIT_FEE*
	(1)	(2)	(3)
COW	0.0270*	0.0420***	0.0586**
	(1.89)	(2.72)	(2.30)
Nskew		0.0049***	0.0070**
		(2.76)	(2.60)
Inv_highlow		-0.0483***	-0.0770***
		(-4.78)	(-3.67)
Lnsize		0.3835***	0.4020***
		(72.09)	(49.68)
Sigma		-1.2858***	-2.0781***
		(-3.76)	(-7.46)
Return		-0.0891***	-0.1020***
		(-2.91)	(-5.01)
Dturn		0.0072	0.0182
		(0.85)	(1.19)
Leverage		0.0745***	0.0503
		(4.60)	(1.49)
Mtbe		0.0019***	0.0006
		(5.66)	(1.67)
Roa		-0.1970***	-0.0957***
		(-15.10)	(-5.56)
Accm		-0.0060	-0.0204*
		(-1.20)	(-1.69)
Age		0.0270	-0.0178
		(1.68)	(-0.88)
Ln_nonaudit			0.0251***
			(7.44)
Audit_big4			0.1964***
			(7.96)
Audit_tenure			-0.0175***
			(-2.81)
Audit_opinion			0.0330***
			(6.26)
Dec_end			-0.0332
			(-0.85)
Restate			0.0109

			(1.59)
Tangibility			0.2832**
			(2.24)
Recinv			0.5390***
			(11.87)
Loss			0.0165**
			(2.03)
SI			0.0038
			(0.39)
Evol			0.4409***
			(5.86)
Retvol			0.0961
			(1.35)
Analyst			-0.0004
			(-0.06)
Ln_bseg			0.0264***
			(6.22)
Fsale			0.1540***
			(4.50)
Firm fixed effects	Yes	Yes	Yes
Industry × Year fixed effects	Yes	Yes	Yes
State × Year fixed effects	Yes	Yes	Yes
S.E. clustered	State	State	State
Observations	55,430	47,001	20,861
Adjusted R^2	0.8772	0.8955	0.8957

3.7. Conclusion

This study investigates the effect of the COW law, which leads to the change of the fiduciary duty of loyalty in the flexibility to pursue new business opportunities of managers, on the stock price crash risk. By employing the staggered difference-in-differences (DiD) design, we find that the stock price crash risk increases following the enactment of the COW law. The effect of COW law adoption on stock price crash risk is stronger for firms facing higher financial distress and facing more market competition. We further document two channels through which the adoption of COW law leads to higher stock price crash risk including increasing financial reporting opacity and reducing external monitoring. This finding remains robust after using alternative stock price crash risk measures, alternative models and estimators, addressing the potential endogeneity concerns, such as, the effect of firms incorporated in Delaware state, the validity of parallel trend assumptions, the confounding effects, the effect of differences in firm characteristics and unobservable factors. In addition, we find that COW law is significantly associated with higher illiquidity, informed trading, stock price informativeness, stock mispricing, and audit pricing.

CHAPTER 4

THE PRICE OF DISLOYALTY: THE EFFECT OF CORPORATE OPPORTUNITIES WAIVER LAW ON IMPLIED COST OF EQUITY

This chapter presents the second essay, which examines the effect of the change in fiduciary duty of loyalty on the implied cost of equity, employing difference-in-difference methodology for staggered adoption of the corporate opportunities waiver (COW) law to a sample of 22,022 firm-year observations covering 2,626 unique firms from 1983 to 2018. Section 4.2 discusses related literature and develops hypotheses. Section 4.3 shows data collection and variables in the baseline models. Section 4.4 reports empirical findings, including baseline results, endogeneity tests, channel mechanism, and cross-sectional analysis. Section 4.5 presents the robustness tests. Section 4.6 concludes. An appendix and reference of this chapter are provided at the end of the thesis.

THE PRICE OF DISLOYALTY:
THE EFFECT OF CORPORATE OPPORTUNITIES WAIVER LAW ON IMPLIED COST OF EQUITY

Abstract of Chapter 4

This study investigates how a change in the fiduciary duty of loyalty, which grants a corporation more flexibility to explore new business opportunities, affects its implied cost of equity. Exploiting the staggered adoption of the corporate opportunity waiver (COW) law as an exogenous shock that weakens the fiduciary duty of loyalty, we find that the cost of equity capital increases after the enactment of the COW law. The effect is more pronounced among firms that are less financially constrained, operate in less competitive product markets, and have weaker corporate governance. We identify two mechanisms through which the COW law affects the implied cost of equity: an increase in firm risk and information asymmetries following its adoption, leading to higher financing costs. Our results are robust across additional analyses addressing endogeneity concerns, alternative measures, and research models. Overall, our findings suggest the significance of the fiduciary duty in shaping corporate transparency and influencing financing costs.

Keywords: Corporate opportunities waiver; agency problems; implied cost of equity.

4.1. Introduction

Following the corporate opportunity doctrine, the fiduciary duty of loyalty, a fundamental aspect of governance mechanisms, is designed to mitigate agency problems when managers' interests depart from those of shareholders (e.g., Becker and Strömberg, 2012). Under the fiduciary duty of loyalty, corporate fiduciaries are prohibited from pursuing business opportunities for personal gain without first presenting them to the corporation. However, since 2000, several U.S. states have amended their statutes to permit waivers of the duty of loyalty (Talley and Hashmall, 2001; Rauterberg and Talley, 2017). In particular, the corporate opportunity waiver law allows corporate fiduciaries to pursue new business opportunities without first granting the corporation the right of first refusal (e.g., Talley, 2018; Velasco, 2018). Despite the significant changes in loyalty obligations and the agency environment following the adoption of the law (e.g., Fich *et al.,* 2023; Eldar and Grennan, 2024), little is known about its impact on financial markets and capital allocation. This study aims to fill the gap by investigating how the changes in the fiduciary duty of loyalty influence firms' implied cost of equity.

Understanding how the corporate information environment and agency conflicts influence the implied cost of equity is central to the accounting and financial economics literature (e.g., Diamond and Verrecchia, 1987; Graham and Harvey, 2001; Lambert, Leuz, and Verrecchia, 2007). According to the information acquisition framework (e.g., Samuelson, 1938; Grossman and Stiglitz, 1980), changes in the fiduciary duty of loyalty can influence the flow and credibility of information, thereby shaping investors' assessment of firm risk and valuation, which impacts their required rate of returns (e.g., Easley and O'hara, 2004; Drake, Johnson, Roulstone, and Thornock, 2020). However, a key challenge in assessing the impact of fiduciary duty on financing costs lies in the endogenous relationship between agency problems and corporate financing decisions.

In this study, we focus on the staggered adoption of the corporate opportunity waiver (COW hereafter) law. This quasi-natural experiment offers two key advantages. *First*, the COW law represents an exogenous shock that reduces the fiduciary duty of loyalty that is exogenous to firms' internal policies, enabling us to identify causal effects between changes in the fiduciary duty of loyalty and financing costs, if there are any. *Second*, the staggered implementation of COW law across states and varying adoption dates introduces greater heterogeneity in fiduciary duty of loyalty than a single market-wide shock, thereby facilitating the use of a difference-in-differences framework to evaluate financing cost differentials between treated and control firms.

From a theoretical standpoint, how changes in the fiduciary duty of loyalty influence firms' implied cost of equity remains unclear. On the one hand, firms may gain greater flexibility in accessing capital by waiving the restrictions of the corporate opportunity doctrine, enabling them to raise funds from individuals and venture capitalists with diverse interests and potentially overlapping duties of loyalty (Fich *et al.,* 2023). By mitigating litigation risks related to loyalty obligations, the COW law could enhance access to funding, leading to a lower implied cost of equity. On the other hand, fiduciary duties, particularly the duty of loyalty, plays a critical role in protecting shareholders from managerial self-dealing and conflicts of interest. By waiving a key component of the fiduciary duty of loyalty through the adoption of the COW law, managers face fewer constraints when pursuing outside opportunities, which may increase concerns about opportunistic behavior and conflicts of interest. As a result, investors may perceive higher governance and information risks and demand higher expected returns, leading to a higher cost of equity capital. In addition, the COW law may reduce managerial accountability and heighten agency conflicts (Boyd *et al.*, 2025), thereby weakening corporate governance and increasing the implied cost

of equity. Thus, the impact of the COW law on financing costs remains inconclusive and therefore requires a comprehensive empirical investigation.

The staggered adoption of COW law in different states and different adoption dates enables a difference-in-differences approach to compare the implied cost of equity between treated firms (incorporated in states that have enacted the law) and control firms (in states that did not). Using a large sample of over 22,022 firm-year observations covering 2,626 unique firms from 1983 to 2018, we find that firms incorporated in the states that adopted the COW law experience a higher cost of equity capital. The impact of COW law on the implied cost of equity is economically considerable. After the enactment of the COW law, a firm's cost of equity rises by 32 basis points, which is 7.80% of the variable's standard deviation and 4.38% of its mean. The effect of the COW law on the implied cost of equity is more pronounced for firms with lower financial constraints, those operating in less competitive environments, and those with weaker corporate governance. The findings are robust after accounting for alternative measures of the implied cost of equity and different model estimations.

To mitigate potential endogeneity concerns, we employ a number of approaches. *First*, we employ propensity score matching and entropy balancing methods to account for the differences in systematic firm characteristics. By matching the observations in the treated group and their counterparts in the control group based on firm characteristics from the year preceding the adoption of the COW law, the propensity score matching and entropy balancing methods reinforce the results from the baseline regressions. The results confirm that the effect of COW law on the implied cost of equity is not driven by omitted variables or differences in systematic firm characteristics. *Second*, we examine the effect of Delaware-incorporated firms, which account for the majority of observations in our sample. *Third*, we test whether the impact of COW law violates the parallel trend assumption, which is an

important assumption of the difference-in-differences method. *Fourth*, we test whether the effect of COW law on the implied cost of equity is affected by other state-level laws enacted during the research period. The results corroborate our main findings, indicating that the effect of the COW law on the implied cost of equity does not violate the parallel trend assumption and is not driven by the influence of Delaware-incorporated firms or other state-level laws. *Finally*, we employ the first difference test and placebo test as additional endogeneity tests. The first difference test is for mitigating unobserved heterogeneity and controlling unobserved variables. The placebo test is for minimizing the concern that features of underlying data and omitted variables drive our baseline findings. The results from the baseline regression remain robust after the implementation of several endogeneity tests.

In addition, our main findings remain robust after addressing the potential bias in the staggered difference-in-differences (DiD) design due to the treatment effects within treated groups (e.g., Baker, Larcker, and Wang, 2022). Particularly, we apply the Goodman-Bacon decomposition tests to evaluate whether our DiD estimate comes from treated and treated comparisons and then apply two alternative methodologies, including the stacked regression and the Callaway and Sant'Anna (2021) estimator. The results from these robustness tests consistently support that the COW law has a significant and positive effect on the implied cost of equity at the firm level.

We further investigate the possible channels through which the COW law influences the implied cost of equity. Our channel analysis reveals that firms incorporated in states that have enacted COW law exhibit higher levels of information asymmetry and firm-specific risk, leading to higher financing costs.

This study contributes to literature in several ways. *First*, our study is the first to examine the effect of corporate opportunity waiver (COW) laws, which waive the duty of loyalty under the corporate opportunities doctrine, on firms' implied cost of equity, thereby

contributing to the emerging literature on the economic consequences of adopting COW laws (e.g., Fich *et al.*, 2023; Eldar and Grennan, 2024; Boyd *et al.*, 2025). *Second*, this study contributes to the growing body of research that examines the determinants of a firm's implied cost of equity.[31] Existing literature on this topic has focused on firm-specific characteristics in explaining the implied cost of equity, including information asymmetry, top managers' attributes, corporate governance, accounting, and disclosure activities.[32] Our study contributes to the literature by showing that corporate opportunity waivers have a significant effect on a firm's implied cost of equity. Overall, our finding provides more insights into agency problems and corporate outcomes by examining the economic consequences of waivers of the duty of loyalty.

The rest of the chapter is organized as follows. In Section 4.2, we review the relevant literature and develop our hypothesis. Section 4.3 presents data collection, sample selection, and variable construction. Section 4.4 discusses the baseline results, endogeneity concerns, the mechanisms through which COW law affects the implied cost of equity, and cross-sectional analysis. Section 4.5 discusses robustness tests. Section 4.6 concludes the chapter.

4.2. Related Literature and Hypothesis Development

Under the corporate governance framework, a firm's operations should aim to maximize shareholder value. Managers are expected to avoid activities that may harm shareholder interests and to subordinate their personal interests to those of shareholders when

[31] See, for example, Diamond and Verrecchia (1987), Easley and O'hara (2004), Lambert, Leuz, and Verrecchia (2007, 2012), Dhaliwal, Li, Tsang, and Yang (2011), Dhaliwal, Judd, Serfling, and Shaikh (2016), Drake *et al.*, (2020), and Lai, Lin, and Ma (2024). Armstrong, Core, Taylor, and Verrecchia (2011) and Jagannathan, Liberti, Liu, and Meier (2017) provide excellent reviews of the literature.

[32] Recent studies document the role of several laws or external regulations, including the antitakeover law (Wald and Long, 2007), the private securities litigation reform act (Lee, Mande, and Son, 2009), regulation fair disclosure (Chen, Dhaliwal, and Xie, 2010; the shareholder protection law (Houston, Lin, and Xie, 2018), and medical marijuana legalization (Guernsey, Serfling, and Yan, 2025).

conflicts arise (e.g., Becker & Strömberg, 2012). The fiduciary duty of loyalty, mandated by the corporate opportunity doctrine, prohibits corporate fiduciaries (i.e., managers, directors, and dominant shareholders) from pursuing new business opportunities in their personal capacities in the line of the corporation's business unless the corporation is given the right of first refusal (Talley, 2018). This doctrine serves as a crucial regulation to mitigate conflicts of interest and ensure that corporate fiduciaries prioritize the interests of the corporations over their own. With its ability to enhance the efficiency of firm operations, investment, and entrepreneurship, the fiduciary duty of loyalty is widely perceived as one of the most important and immutable obligations (Rauterberg and Talley, 2017). However, the corporate opportunity waiver (COW) law, first introduced in Delaware in 2000, allows corporate fiduciaries to breach the duty of loyalty without facing litigation risk and explore new business opportunities on their own (Talley and Hashmall, 2001; Rauterberg and Talley, 2017). Consequently, this substantially reduces the fiduciary duty of loyalty (Talley, 2018; Velasco, 2018). This waiver was later adopted by eight additional states, including Oklahoma, Missouri, Kansas, Texas, Nevada, New Jersey, Maryland, and Washington. Several studies examine the effect of the corporate opportunity waiver law on corporate operations, for example, the probability of receiving takeover bids (Li and Ni, 2024), corporate social responsibility (Boyd *et al.*, 2025), venture capital (Eldar and Grennan, 2024), and investments in innovation (Fich *et al.,* 2023; Geng *et al.*, 2023). Our study contributes to the literature by examining how changes in the fiduciary duty of loyalty affect firms' implied cost of equity, one of the first-order considerations in corporate financial management.

Implied cost of equity is widely considered a fundamental benchmark used by executives, analysts, investors, and other stakeholders in various decisions (e.g., Graham and Harvey, 2001; Easley and O'Hara, 2004; Lambert *et al.*, 2007; Yang, An, Gao, and Li, 2023;

Lai *et al.*, 2024). Given the significance of a firm's implied cost of equity, the literature has extensively focused on analyzing various internal and external factors relating to a firm's implied cost of equity.[33] Despite the significant changes in loyalty obligations and the agency's environment following the adoption of the corporate opportunity waiver (COW) law, little is known about its impact on financial markets and capital allocation. Our study fills the gap in literature by investigating the effect of the COW law, an exogenous shock that reduces the fiduciary duty of loyalty of managers, on a firm's implied cost of equity.

The effect of the COW law, which reduces the fiduciary duty of loyalty, on a firm's implied cost of equity remains inconclusive. From one perspective, the COW law may improve access to funding. The corporate opportunities doctrine can limit firms' ability to secure financing from individuals or venture capitalists with diverse interests and overlapping loyalty obligations. By waiving this duty, firms may gain greater flexibility in raising capital (e.g., Fich *et al.,* 2023). From another perspective, the COW law may help firms mitigate litigation risk (Rauterberg and Talley, 2017), particularly in cases involving venture capital investors (Eldar and Grennan, 2024). Firms facing higher litigation risk and related costs often experience lower credit ratings and higher interest rates on loans and

[33] Several internal factors have been identified as determinants of the cost of capital, including managerial characteristics and corporate governance (e.g., Chen, Huang, and Wei, 2013; Dow, 2013; Mishra, 2014; Zhu, 2014; Chen, Li, and Zou, 2016; Gupta, Krishnamurti, and Tourani-Rad, 2018; Lartey, Kesse, and Danso, 2020; Pham, Merkoulova, and Veld, 2023), the information and transparency environment (e.g., Bloomfield and Wilks, 2000; Isabel Maria and Ligia, 2017; Barth, Konchitchki, and Landsman, 2013; Gray, Koh, and Tong, 2009; Hughes *et al.*, 2007; Armstrong *et al.*, 2011; Johnstone, 2016; Duarte, Han, Harford, and Young, 2008; Easley and O'Hara, 2004), accounting practices and manipulation (e.g., Kim and Sohn, 2013; Gietzmann and Ireland, 2005; Li, 2010, 2015), disclosure quality (Francis, Nanda, and Olsson, 2008; Kothari, Li, and Short, 2009; Core, Hail, and Verdi, 2015), corporate reputation (Cao, Myers, Myers, and Omer, 2015), investment and innovation activities (e.g., Frank and Shen, 2016; Yang *et al.,* 2023), and other internal policies and strategies (e.g., Hann, Ogneva, and Ozbas, 2013; Jones and Tuzel, 2013; Hail and Leuz, 2009; Solomon, 1963). Some external factors have also been linked to the cost of capital, including rating-based regulations (Kisgen and Strahan, 2010), customer satisfaction, and customer concentration (e.g., Dhaliwal *et al.*, 2016; Truong, Nguyen, and Huynh, 2021). While many internal and external factors have been studied, relatively few examine the role of legal and regulatory frameworks, such as the Antitakeover Law (Wald and Long, 2007), the Private Securities Litigation Reform Act (Lee *et al.*, 2009), and the Shareholder Protection Law (Houston *et al.*, 2018).

bonds (e.g., Arena, 2018). Thus, adopting the COW law could potentially lower a firm's cost of equity capital by reducing litigation risks. Based on these arguments, our first hypothesis is as follows:

Hypothesis 1a: *Firms incorporated in the states that have adopted the Corporate Opportunities Waiver Law (COW) exhibit a lower cost of equity capital.*

On the other hand, the enactment of COW laws allows corporate fiduciaries to pursue business opportunities without first offering them to the corporation, thereby relaxing fiduciary duties and weakening shareholder protection (Fich *et al.,* 2023). This institutional change reduces governance discipline and increases agency conflicts between fiduciaries and dispersed shareholders. Prior studies suggest that weaker governance structures arising from intensified agency conflicts are associated with higher financing costs (Dey, 2008; Zhu, 2014). Heightened agency conflicts may further affect firms' operating and disclosure environments. For example, firms incorporated in states adopting COW laws exhibit reductions in corporate social responsibility activities (Boyd *et al.,* 2025), signaling weaker stakeholder orientation and governance quality, which investors may interpret as higher cost of capital (El Ghoul, Guedhami, Kwok, and Mishra, 2011). Furthermore, the waiver of the duty of loyalty may incentivize corporate fiduciaries to prioritize their personal reputation to attract new business opportunities, potentially leading to selective disclosure of positive information and withholding of negative news (e.g., Hirshleifer, 1993). Such behavior reduces disclosure quality and increases information asymmetry between insiders and outside investors. Greater information asymmetry raises uncertainty faced by investors, leading them to demand higher risk premia and higher cost of capital (e.g., Hughes, Liu, and Liu, 2007). Based on these rationales, we propose the second hypothesis as follows:

Hypothesis 1b: *Firms incorporated in the states that have adopted the corporate opportunities waiver law exhibit a higher cost of equity capital.*

4.3. Data and variables

This section discusses our data and sample. We first describe the measures for implied cost of equity, corporate opportunities waiver, and control variables. We then provide data collection and sample selection. Finally, we present the descriptive statistics of the variables in the study.

4.3.1. Dependent variable: Implied cost of equity

To measure the cost of equity capital, we follow the literature and employ four implied costs of capital estimates developed by Gebhardt, Lee, and Swaminathan (2001), Claus and Thomas (2001), Easton (2004), and Ohlson and Juettner-Nauroth (2005). We refer to the estimates based on these approaches as *COC_GLS, COC_CT, COC_Easton,* and *COC_OJ*, respectively. More specifically, Gebhardt *et al.* (2001) estimate the firm-level implied cost of equity based on the market implied cost of equity derived from the discounted residual income model. Claus and Thomas (2001) estimate the equity premium by using the discount rate that equates market valuations with prevailing expectations of future flows. Easton (2004)'s model calculates the expected rate of return on equity based on the earnings and earnings growth models. Ohlson and Juettner-Nauroth (2005) estimate the cost of equity by developing a model relating to the earnings per share and its growth rate. The implied cost of equity is estimated using analysts' earnings forecasts and represents a forward-looking measure of expected returns. This measure is particularly appropriate for our study as it captures how investors incorporate governance-related information into their expectations, whereas conventional factor-model-based approaches rely on realized returns and are inherently backward-looking. Accordingly, the implied cost of equity provides a more direct measure of how governance changes, such as COW adoption, affect the pricing

of risk in the future. We provide detailed descriptions of the four measures of implied cost of equity in Appendix C2.

Because there is little consensus in the existing literature on which models provide the most reliable estimates (e.g., Botosan and Plumlee, 2005), and to mitigate bias and measurement errors associated with any specific model, we follow the literature and use the equally weighted average of the four implied cost of equity measures (denoted *COC_AVG*) as our key measure of the cost of equity capital (e.g., Hail and Leuz, 2006, 2009). This average measure of the implied cost of equity is widely employed in the literature (e.g., Li, 2010; Dhaliwal *et al.,* 2011; El Ghoul *et al.,* 2011; Naiker, Navissi, and Truong, 2013; Cao *et al.,* 2015; Chen, Truong, and Veeraraghavan, 2015; Houston *et al.,* 2018; Truong, Nguyen, and Huynh, 2021; Yang *et al.,* 2023; Lai *et al.*, 2024).

We also consider five alternative measures of the implied cost of equity, including each individual implied cost of equity measure (*COC_GLS, COC_CT, COC_Easton,* and *COC_OJ*) and the implied cost of equity measure (denoted *FICC* as in Lee, So, and Wang (2021). We discussed these tests in Section 4.5- Alternative measures of implied cost of equity.

4.3.2. Independent variable: Measures of corporate opportunities waiver

This study investigates the effects of the corporate opportunities waiver law (COW) on the implied cost of equity. We create the explanation variable *COW,* a firm-level dummy variable referring to the adoption of the COW law in the state that the firm incorporates. Based on the dates that states adopted the COW law, *COW* equals one for the years in which the COW law was effective in the state where the firm incorporates, and zero otherwise. We obtain data on the law's adoption from Rauterberg and Talley (2017), who compile COW disclosures using both hand-collected and machine-learning samples.

Appendix C3 reports the effective date of the COW law in each state. Appendix C4 summarizes the sample distribution by year and state of incorporation in Panel A and Panel B, respectively. Panel A shows that the number of observations increases steadily over time until 2000, after which it remains relatively stable. Panel B indicates that Delaware accounts for a large proportion of the sample, while several other states contribute relatively few observations. In the subsequent analyses, we conduct robustness tests and find that our main results are not primarily driven by Delaware firms.

4.3.3. Control variables

We include several control variables based on previous studies to capture other factors influencing the cost of equity capital. *First*, we include firm characteristics and financial performance indicators that could affect the implied cost of equity: firm size (*Lnsize*), leverage (*Leverage*), book-to-market ratio (*Btme*), and return on assets (*Roa*). For example, highly leveraged companies face more risks that could increase the implied cost of equity (Cao *et al.,* 2015). Stocks with a higher value of the book-to-market have a higher abnormal implied risk premium until the stock price is corrected (Gebhardt *et al.,* 2001). *Second*, we control the stock characteristics factors, including return over a year (*Return*), idiosyncratic volatility (*Ivol*), and the beta for systematic risk (*Brm*), which capture the company's risk profile (e.g., Merton, 1987; Chen *et al.*, 2016; Houston *et al.*, 2018). *Finally*, we control for analyst forecast dispersion (*Dispersion*) and long-term growth forecast (*Ltg*), which reflect uncertainty in the information environment (e.g., Botosan, Plumlee, and Wen, 2011; Campbell, Dhaliwal, and Schwartz, 2012; Nekrasov and Ogneva, 2011; Cao *et al.,* 2015; Chen *et al.*, 2015; Truong *et al.*, 2021).[34] We provide a detailed description of the variables in Appendix C1.

[34] For example, a firm facing greater uncertainty is likely to be riskier, which may increase its cost of capital

4.3.4. Data collection and sample selection

Our sample includes firms with stocks listed on the NYSE, AMEX, or Nasdaq. We follow the literature and exclude financial firms (SIC 6000-6999) and utility firms (SIC 4900-4999) as these firms may be subject to different capital structures and regulatory frameworks. We collect data on the year that the corporate opportunities waiver (COW) law was passed in states from Rauterberg and Talley (2017).[35] We collect data to calculate the cost of equity from the I/B/E/S and Compustat. The data on stock prices and stock returns are collected from CRSP. Data on firm size, leverage, book-to-market, return on assets, idiosyncratic risk, and stock beta are collected from the merged CRSP-Compustat database. The analyst forecast dispersion and long-term growth rate data are from the I/B/E/S database. Data on the state of incorporation are obtained from Compustat, while data on the headquarters state come from Gao, Leung, and Qiu (2021), who extend the historical headquarters data provided by Bai, Fairhurst, and Serfling (2020). To mitigate the effect of outliers, we winsorize all continuous variables at the 1st and 99th percentiles. Our final sample includes 22,022 firm-year observations covering 2,626 unique firms from 1983 to 2018.[36] We provide a detailed description of the variables in Appendix C1.

(e.g., Cao *et al.*, 2015).

[35] Nine states passed the Corporate Opportunities Waiver (COW) Law, including Delaware in 2000, Oklahoma in 2001, Missouri in 2003, Kansas in 2005, Texas in 2006, Nevada in 2007, New Jersey in 2011, Maryland in 2014, and Washington in 2016. The data of states that adopted the COW law is available from Rauterberg and Talley's (2017).

[36] Our sample begins in 1983 and ends in 2018 to ensure non-missing observations for the main and alternative cost of capital measures and the control variables. This also allows us to avoid disruptions in capital markets and resource allocations caused by the COVID-19 pandemic.

4.3.5. Descriptive statistics

Table 4.1 shows the summary statistics for the variables included in the models. For each variable, we report the number of observations (*N*), mean, standard deviation (*STD*), and the 25th, 50th, and 75th percentile values.

The mean value of *COW* is 0.416, suggesting that more than 40% of the firm-year observations in our sample are affected by the adoption of COW law, which is consistent with the literature (e.g., Fich *et al.*, 2023; Babenko, Bennett, and Wang, 2025). For the implied cost of equity measure, the mean and the standard deviation of *COC_AVG* are 0.073 and 0.041, respectively. These values are consistent with the literature (e.g., Cao *et al.*, 2015; Houston *et al.*, 2018; Truong *et al.*, 2021; Lai *et al.*, 2024; Guernsey *et al.*, 2025), suggesting that the cost of equity capital varies substantially across firms in our sample.

Regarding the control variables, the average values are also consistent compared to prior literature. For firm characteristics, the average value of firm size and book-to-market is 7.192 and 0.469, respectively. These values are consistent with those documented in Li (2010), El Ghoul *et al.* (2011), and Truong *et al.* (2021). Our sample firms, on average, have a leverage of 0.197 (approximately 20%) and a return on assets of 0.077 (approximately 1%), which is consistent with the average value of Dhaliwal *et al.* (2016). For stock characteristics, our sample's average values of idiosyncratic risk, beta, and stock return are 0.02, 1.034, and 0.219, respectively. These values are in line with El Ghoul *et al.* (2011), Dhaliwal *et al.* (2016), Houston *et al.* (2018), and Yang *et al.* (2023). The mean analyst forecast dispersion is 25.5%, and the analyst forecast long-term growth rate is 15.789, consistent with Chen, Chen, and Wei (2011), El Ghoul *et al.* (2011), and Seo, Ding, Ke, and Shi (2025).

Table 4.1: Descriptive statistics

This table presents the descriptive statistics for the sample of 22,022 firm-year observations spanning 1983 to 2018. For each variable, we report the number of observations, mean, standard deviation (*STD*), and the 25th, 50th, and 75th percentile values. We winsorize all continuous variables at the 1st and 99th percentiles to mitigate the impact of outliers. Implied cost of equity (*COC_AVG*) is measured as the average of four implied cost of equity measures based on four methods, including (i) Gebhardt *et al.* (2001) method (*COC_GLS*), (ii) Easton (2004) method (*COC_Easton*), (iii) Ohlson and Juettner-Nauroth (2005) method (*COC_OJ*), and (iv) Claus and Thomas (2001) method (*COC_CT*). *FICC* is a implied cost of equity measure developed by Lee *et al.* (2021). Appendix C1 provides a detailed description of the variables.

Variables	Observations	Mean	STD	25th Pctl	50th Pctl	75th Pctl
Implied cost of equity measures						
COC_AVG	22,022	0.073	0.041	0.046	0.061	0.086
COC_GLS	22,022	0.075	0.032	0.055	0.071	0.090
COC_Easton	22,022	0.093	0.097	0.034	0.064	0.102
COC_OJ	22,022	0.062	0.040	0.037	0.053	0.074
COC_CT	22,022	0.064	0.040	0.040	0.053	0.076
FICC	22,022	0.006	0.004	0.003	0.006	0.009
Corporate opportunities waiver (COW) law measure						
COW	22,022	0.416	0.493	0.000	0.000	1.000
Firm-specific characteristics						
Lnsize	22,022	7.192	1.827	5.906	7.137	8.422
Leverage	22,022	0.197	0.162	0.047	0.182	0.304
Btme	22,022	0.469	0.317	0.257	0.401	0.603
Roa	22,022	0.077	0.054	0.042	0.069	0.104
Ivol	22,022	0.020	0.010	0.013	0.018	0.025
Brm	22,022	1.034	0.483	0.741	1.013	1.308
Return	22,022	0.219	0.462	-0.062	0.149	0.395
Dispersion	22,022	0.255	1.028	0.050	0.103	0.205
Ltg	22,022	15.789	9.179	10.750	15.000	20.000

4.4. Empirical Findings

4.4.1. Baseline regression results

To investigate the effect of the corporate opportunities waiver (COW) law on the future implied cost of equity, we employ a difference-in-difference (DiD) method. Our model specifications are as follows:

$$COC\_AVG_{i,y+1} = \beta_0 + \beta_1 COW_{i,y} + \beta_2 Control_{i,y} + \beta_3 Firm_i + \beta_4 State_{i,y} + \beta_5 Year_y + \epsilon_{i,y} \quad (1)$$

where $COC\_AVG_{i,y+1}$ is the implied cost of equity measure of firm *i* in year *y+1*, measured by the average of four implied cost of equity measures based on four methods discussed in the previous section, including (*i*) Gebhardt *et al.* (2001) method, (*ii*) Easton (2004) method, (*iii*) Ohlson and Juettner-Nauroth (2005) method, and (*iv*) Claus and Thomas (2001) method. Our key variable of interest, $COW_{i,y}$, is a dummy variable that equals one if the COW law was passed in states of incorporation and zero otherwise. $Control_{i,y}$ refers to the vector of the control variables of firm *i* in year *y*. $Firm_i$, $State_y$, and $Year_y$ refers to firm fixed effects, state of headquarters fixed effects, and year fixed effects, respectively.

We include firm fixed effects and year fixed effects to control for firm-specific heterogeneity and time-specific unobservable factors that may be related to financing decisions. State of headquarters fixed effects accounts for unobservable factors at the state level (e.g., Bourveau, Lou, and Wang, 2018).[37] Since the passage of the COW law is implemented at the state level, we cluster standard errors by state of incorporation (e.g., Houston *et al.*, 2018). This conservative clustering method accounts for potential time-varying correlations in omitted variables that may affect different firms within the same state (e.g., Bertrand, Duflo, and Mullainathan, 2004; Giroud and Mueller, 2010; Houston *et al.,*

[37] The implied cost of equity capital primarily reflects investors' required returns based on firm risk and macroeconomic conditions, which are adequately captured by year fixed effects. Adding additional high-dimensional fixed effects may absorb too much variation and lead to over-controlling. This is consistent with previous literature in implied cost of equity capital.

2018; Keum, 2021). To avoid potential reverse causality issues, all independent variables are lagged by one year relative to the dependent variable (e.g., Chen *et al.*, 2011; Chen *et al.*, 2016; Pham, Merkoulova, and Veld, 2023; Yang *et al.*, 2023).[38] Our variable of interest, β_1, is the DiD estimator and captures the effect of COW law adoption on the implied cost of equity.

Table 4.2 presents the baseline results. We find that the estimated coefficients of COW on the implied cost of equity are positive and statistically significant. This result remains robust when clustering standard errors at the state level (Column 2) or using two-way clustering by state and year (Column 3). The findings suggest that the cost of equity increases following the enactment of the COW law. In terms of economic significance, the estimate of *COW* in Column 2 show that, after accounting for the effects of the control variables, a firm's cost of equity rises by 32 basis points, which is 7.80% (i.e., 0.0032/0.041) of the variable's standard deviation and 4.38% (i.e., 0.0032/0.073) of its mean after the enactment of the COW law.[39] Thus, Table 4.2's results support *Hypothesis 1b*, indicating that the decline in managers' fiduciary duty of loyalty following the adoption of the COW law is associated with an increase in firms' implied cost of equity capital.

Regarding control variables for firm characteristics, we find that firms with larger size (*Lnsize*) and higher stock returns (*Return)* have lower future costs of capital. However, only the coefficient of firm size is statistically significant. Consistent with the literature, we also find a positive relationship between the implied cost of equity and leverage (*Leverage*), the book-to-market ratio (*Btme*), and idiosyncratic risk (*Ivol*). These results suggest that firms with higher levels of risk experience higher costs of capital. In line with prior studies, the

[38] Our findings remain qualitatively unchanged when the independent and dependent variables are measured in concurrent years.

[39] Dhaliwal *et al.* (2016), Houston *et al.* (2018), Truong *et al.* (2021), and Lai *et al.* (2024) document comparable magnitudes of effects on firms' cost of equity and conclude that these magnitudes are economically significant.

coefficient of *Dispersion* reveals a positive association between analyst forecast dispersion and the cost of equity. However, the long-term growth rate of analyst forecasts (*Ltg*) exhibits the opposite effect, demonstrating a negative relationship with the implied cost of equity. Overall, Table 4.2's results support *Hypothesis 1b* that firms incorporated in the states that adopted the COW law experience a higher cost of equity capital.

Table 4.2: The effect of COW law on the implied cost of equity - Baseline results

This table presents the difference-in-difference (DiD) regression of the implied cost of equity on the adoption of COW law and other firm and stock characteristics. Implied cost of equity (*COC_AVG*) is measured as the average of four implied cost of equity measures based on four methods, including (i) Gebhardt *et al.* (2001) method, (ii) Easton (2004) method, (iii) Ohlson and Juettner-Nauroth (2005) method, and (iv) Claus and Thomas (2001) method. *COW* is a dummy variable that equals 1 for firms in the adopted COW law state in the post-COW law period, and 0 otherwise. Firm fixed effects, state fixed effects, and year fixed effects are included. *T*-statistics, reported in parentheses, are computed using standard errors clustered at the state of incorporation level (Columns 1 and 2) and at both the state of incorporation and year level (Column 3). *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions and data sources are in Appendix C1.

	COC_AVG	*COC_AVG*	*COC_AVG*
	(1)	(2)	(3)
COW	0.0036***	0.0032**	0.0032**
	(3.01)	(2.51)	(2.65)
Lnsize		-0.0036***	-0.0036***
		(-6.13)	(-5.08)
Leverage		0.0096***	0.0096***
		(3.86)	(2.78)
Btme		0.0326***	0.0326***
		(22.36)	(9.90)
Roa		0.1181***	0.1181***
		(15.31)	(8.13)
Ivol		0.0899*	0.0899
		(1.88)	(1.48)
Brm		0.0003	0.0003
		(0.42)	(0.36)
Return		-0.0002	-0.0002
		(-0.24)	(-0.20)
Dispersion		0.0023***	0.0023***
		(3.31)	(3.15)
Ltg		-0.0002***	-0.0002***
		(-8.33)	(-9.56)
Firm fixed effects	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
S.E. clustered	State	State	State × Year
Observations	21,424	21,424	21,424
Adjusted R^2	0.3403	0.3855	0.3854

4.4.2. Addressing Endogeneity Concerns

We acknowledge that there is a potential endogeneity concern that might drive the effect of COW law on the implied cost of equity, which could come from unknown factors correlated with COW law and the firm-level implied cost of equity. To alleviate these concerns, we employ several approaches, including propensity score matching, entropy balancing, testing the parallel trend assumption, and accounting for confounding effects. We report the results of these tests in the following sections.

4.4.2.1. Baseline regression results with matched sample

We acknowledge that the effect of the COW law on the implied cost of equity might be influenced by the systematic differences between firms in states that adopted the COW law (the treated group) and those in states that did not adopt the waiver (the control group). To address this, we apply the propensity score matching to generate the matched sample of firms from the treated and control groups surrounding the adoption of the COW law. This method allows us to compare the effect of COW law on the implied cost of equity by mitigating the differences in systematic characteristics between the two groups.

The process of the propensity score matching method is as follows. *First,* we match the firms in the treated group (the firms incorporated in the states adopting COW law) and those in the control group (the firms incorporated in the states that have not adopted COW law). We match the treated and control groups based on all firm characteristic variables from the baseline model and two-digit industry code (SIC) in the year before the COW law was enacted. We apply the nearest neighbor matching 1:1 with a level less than 0.01% and the non-replacement method. *Second*, we re-estimate the baseline model using the matched sample with the same control variables and model specifications.

The regression result of the matched sample is presented in Panel A of Table 4.3. The results show that the coefficient of *COW* on costs of equity capital is positive and statistically significant. This result is consistent with the findings from our baseline models using a full sample. It refers that firms incorporated in the states adopting the COW law have higher costs of capital, and this relation is not affected by the differences in firm-specific characteristics. We also report the differences in the mean values of matching firm characteristics between the treated and control groups and the logit model results to create the propensity score before and after matching in Appendix C5.

To ensure the results of propensity score matching, we conduct the entropy balancing method. By matching the propensity score to mitigate the difference in the firm characteristics between the treated and control groups, the propensity score matching could ignore the balance in moments of covariates. Therefore, we apply the entropy-balancing method developed by Hainmueller (2012), which reweighs each observation in the control group and post-weighting properties of matched observations in both treated and control groups. This method ensures the balance in the moments (e.g., mean or variance) of all covariates between treated and control firms, and avoids eliminating many observations in the sample. We report the result on Panel B of Table 4.3.

The result shows a significantly positive relation between *COW* and the costs of equity capital. The coefficient is positive and statistically significant. The result supports the findings in the propensity score matching approach that baseline results are not pushed by the systematic differences. The results consistently confirm the impact of COW law on the implied cost of equity. We also report the differences in the mean values of matching firm characteristics between the treated and control groups, and the logit model results before and after the balancing process in Appendix C6.

Table 4.3: The effect of COW law on the implied cost of equity – Matched sample

This table presents the difference-in-difference (DiD) regression of implied cost of equity on the adoption of COW law and other firm and stock characteristics with a matched sample based on the propensity score matching and the entropy balancing. Implied cost of equity (*COC_AVG*) is measured as the average of four implied cost of equity measures based on four methods. *COW* equals 1 for firms in the adopted COW law state in the post-COW law periods, and 0 otherwise. The treated group (i.e., firms incorporating in the states adopting COW law) and the control group (i.e., firms incorporating in the states non-adopting COW law) are matched based on all control variables, industry, and year in the year before COW law adoption. Panels A and B report the results of DiD analysis with the matched sample using propensity score matching and the balanced sample using entropy balancing, respectively. Firm fixed effects, state fixed effects, and year fixed effects are included. *T*-statistics computed using standard errors clustered at the state of incorporation level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions and data sources are in Appendix C1.

	Panel A: Propensity score matching	Panel B: Entropy balancing
	COC_AVG	*COC_AVG*
	(1)	(2)
COW	0.0031**	0.0047**
	(2.08)	(2.30)
Lnsize	-0.0015**	-0.0037***
	(-2.26)	(-5.56)
Leverage	0.0142***	0.0091***
	(3.77)	(5.00)
Btme	0.0352***	0.0312***
	(23.04)	(22.85)
Roa	0.1294***	0.1216***
	(16.21)	(27.88)
Ivol	0.0198	0.0558***
	(0.27)	(3.65)
Brm	0.0004	0.0013***
	(0.29)	(4.87)
Return	0.0004	-0.0009***
	(0.70)	(-3.04)
Dispersion	0.0036***	0.0029***
	(7.14)	(14.88)
Ltg	-0.0002***	-0.0002***
	(-5.52)	(-13.26)
Firm fixed effects	Yes	Yes
State fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
S.E. clustered	State	State
Observations	12,168	21,424
Adjusted R^2	0.3162	0.4078

4.4.2.2. Delaware effects

Delaware was the first of nine states to pass the COW law in 2000. As Delaware-incorporated firms account for more than half of our sample, we examine whether Delaware-incorporated firms drive our main findings. Specifically, we construct two dummy variables, namely *COW_DE* and *COW_nonDE*, indicating firm years after the enactment of COW in Delaware and in other states, respectively. We also include a set of control variables and model specifications as in the baseline regressions. The regression is as follows:

$$COC\_AVG_{i,y+1} = \beta_0 + \beta_1 COW\_DE_{i,y} + \beta_2 COW\_nonDE_{i,y} + \beta_3 Control_{i,y} + \beta_4 Firm_i + \beta_5 State_{i,y} + \beta_6 Year_y + \epsilon_{i,y} \quad (2)$$

Column (1) in Table 4.4 shows the result of the Delaware-effects test. The coefficients of *COW_DE* and *COW_nonDE* are both positive and statistically significant, suggesting that our main results are not predominantly driven by Delaware firms.

4.4.2.3. Parallel trend test

A potential concern in the difference-in-difference method (DiD) is whether other factors other than COW law might drive our results. These factors could violate the parallel trend assumptions and validity of DiD models (Fich *et al.,* 2023). This assumption requires no difference in the implied cost of equity between the treated group and the control group before the adoption of treatment (the COW law passed). Therefore, to examine whether our DiD models satisfy a parallel trend of capital prior to COW law, we estimate a dynamic model with time dummies around the COW adoption. We incorporate leads and lags of the treatment indicator. Specifically, we generate four indicators, including $COW^{(-2)}$, $COW^{(-1)}$, $COW^{(0)}$, and $COW^{(1+)}$, which equal one if firms are in states that adopt COW law in two years, in one year, in the current year, and one or more years ago, respectively. We then re-

estimate our baseline model and include a set of control variables and model specifications as in the baseline regressions. We report the results for these tests in Column (2) of Table 4.

As shown in Column (2) in Table 4.4, the coefficients of $COW^{(-2)}$, $COW^{(-1)}$, and $COW^{(0)}$ are all statistically insignificant. More importantly, we find that the coefficient of $COW^{(1+)}$ is positive and statistically significant. It indicates that the firms in passing-law states experience a higher implied cost of equity than the control firms only after adopting the COW law, but not before. This result suggests that our baseline findings satisfy the parallel trends assumption.

4.4.2.4. Confounding effects – State-level laws effects

Another potential concern in our model is the confounding effects: other events adopted during our research period might drive our baseline results rather than the COW law. Therefore, to mitigate the confounding effects, we control the adoption of other state-level laws and examine whether these laws affect the relationship between the COW law and the implied cost of equity. We consider five other state-level laws, including the Control Share Acquisition Laws (CS), the Business Combination Laws (BC), the Fair Price Laws (FP), the Directors' Duties Laws (DD), and the Poison Pill Laws (PP).[40] We generate five dummy variables indicating the adoption of these laws: *CS_law, BS_law, FP_law, DD_law*, and *PP_law*, which are set to one for the year in which the state-level laws are effective in a firm's state of incorporation, and zero otherwise. We then re-estimate our baseline models

[40] The *Control Share Acquisition Laws* (CS) indicate that large shareholders must get approval from other shareholders to obtain the control shares. *Fair Price Laws* (FP) impose rules on fair prices in many firms. The *Business Combination Laws* (BC) restrict transactions between large shareholders and firms for a specific period. *The Directors' Duties Laws* (DD) state that board members need to act in the firm's best interests and consider both the interests of investors and non-investors. The *Poison Pill Laws* (PP) discourage an individual, or entity acquires a major number of shares and hostile takeover of the firm. We collect the data on five state-level laws adopted during the period from Karpoff and Wittry (2018).

by including all five dummy variables and the *COW* variable. We also include a set of control variables and model specifications as in the baseline regressions. The model is as follows:

$$COC\_AVG_{i,y+1} = \beta_0 + \beta_1 COW_{i,y} + \beta_2 CS\_LAW_{i,y} + \beta_3 BC\_LAW_{i,y} + \beta_4 FP\_LAW_{i,y} + \beta_5 DD\_LAW_{i,y} + \beta_6 PP\_LAW_{i,y} + \beta_7 Control_{i,y} + \beta_8 Firm_i + \beta_9 State_{i,y} + \beta_{10} Year_y + \epsilon_{i,y}\,, \quad (3)$$

As shown in Column (3) in Table 4.4, the coefficients of *COW* remain positive and significant at a 1% level. Our baseline result is robust after accounting for the effects of other state-level laws adopted in the research period. It suggests that the positive effect of the COW law on the implied cost of equity is not driven by the effects of other state-level laws adopted in the same period.

Table 4.4: Delaware effect, Parallel trend test, and Confounding effects

This table presents the endogeneity test results for the difference-in-difference (DiD) regression of implied cost of equity on the adoption of the COW law. Implied cost of equity (*COC_AVG*) is measured as the average of four implied cost of equity measures based on four methods. Panel A presents the results of Delaware effects. *COW_DE* equals 1 for firms in Delaware state in the post-COW law periods, and 0 otherwise. *COW_nonDE* equals 1 for firms in non-Delaware states in the post-COW law periods, and 0 otherwise. Panel B presents the result of the Parallel trend test. $COW^{(-2)}$, $COW^{(-1)}$, $COW^{(0)}$, and $COW^{(1+)}$ equal 1 if firms in states that adopt the COW law in two years, in one year, in the current year, and one or more years ago, respectively. Panel C presents the result of the confounding effects. *COW, CS_law, BC_ law, FP_law, DD_law*, and *PP_law* equal 1 for firms in states adopting COW law, control share acquisition law, business combination law, fair price law, directors' duties law, and poison pill law, respectively, in the post-law periods, and 0 otherwise. Firm fixed effects, state fixed effects, and year fixed effects are included. *T*-statistics computed using standard errors clustered at the state of incorporation are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions and data sources are in Appendix C1.

	Panel A: Delaware effect *COC_AVG* (1)	Panel B: Parallel trend test *COC_AVG* (2)	Panel C: Confounding effects *COC_AVG* (3)
COW_DE	0.0023**		
	(2.15)		
COW_nonDE	0.0079**		
	(2.48)		
$COW^{(-2)}$		-0.0004	
		(-0.29)	
$COW^{(-1)}$		0.0003	

		(0.12)	
$COW^{(0)}$		0.0022	
		(0.75)	
$COW^{(1+)}$		0.0035**	
		(2.63)	
COW			0.0037***
			(2.98)
CS_law			-0.0013
			(-0.50)
BC_law			-0.0002
			(-0.10)
FP_law			-0.0020
			(-1.53)
DD_law			0.0039
			(1.58)
PP_law			0.0017
			(0.81)
Controls	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
S.E. clustered	State	State	State
Observations	21,424	21,424	21,424
Adjusted R^2	0.3856	0.3854	0.3856

4.4.3. Possible channels

In this section, we explore the possible channels through which the COW law affects the implied cost of equity, namely, information risk and company risk. Information risk and company risk capture different sources of uncertainty: the former relates to disclosure quality and information asymmetry, while the latter reflects volatility in firm fundamentals. To disentangle these channels, we use distinct proxy sets for each type of risk. Then, we analyze how the COW law affects the implied cost of equity in relation to the levels of firm risk and information risk in the pre-COW law adoption by using the interaction term of pre-treatment risk measures with the COW indicator. Stronger COW effects among firms with higher pre-existing information risk support the information risk channel, while stronger effects among firms with higher volatility support the firm risk channel. We present the results of the channel test in Table 4.5.

4.4.3.1. Information risk

The first possible channel is the information risk. Greater transparency in information is associated with a lower implied cost of equity by reducing transaction costs and estimation risk. Easley and O'Hara (2004) suggest that firms can lower the cost of capital by improving the information environment through greater quantity and quality of disclosures to investors. Applying accounting standards and enhancing disclosure quality helps attract more active analysts and investors, thereby reducing the cost of capital. Similarly, Leuz and Verrecchia (2005) report that information quality serves as a crucial signal between firms and investors regarding access to capital investments. Poor-quality reporting could decrease the relationship and interaction between firms and investors. In addition, the corporate opportunities waiver (COW) law, by permitting managers to take new business opportunities and prioritize personal gain over corporate interests, incentivizes managers to build their personal reputation, including disclosing selective good news and delaying bad news (Hirshleifer, 1993). Such practices may increase information asymmetry and decrease the information quality. To test this possibility, we examine the effect of the COW law on the implied cost of equity conditional on the pre-adoption corporate information environment. We conjecture that information risk becomes more pronounced following the adoption of the COW law, which exacerbates agency conflicts between managers and shareholders, leading to an increase in a firm's cost of equity capital.

To measure information risk, we use several measures, including abnormal accruals, financial reporting opacity, and bid-ask spread.[41] Abnormal accruals and financial reporting opacity capture irregularities and uncertainties in corporate accounting practices. [42]

[41] Abnormal accruals are calculated based on discretionary accruals estimated following the model of Jones (1991). Financial reporting opacity, measured following the approach of Hutton, Marcus, and Tehranian (2009), is measured as the three-year moving sum of absolute discretionary accruals, following Dechow, Sloan, and Sweeney (1995).

[42] Discretionary accruals are linked to earnings manipulation (Dechow *et al.*, 1995), and high levels of

Consequently, higher values of abnormal accruals and financial reporting opacity refer to lower levels of information transparency within firms (e.g., (e.g., Aboody, Hughes, and Liu, 2005; Francis, LaFond, Olsson, and Schipper, 2005). In addition, disclosure quality could negatively affect the cost of capital through its impact on the information environment and on enhancing managerial alignment (Lambert *et al*., 2007). We also use bid-and-ask spread, measured following the approach of Corwin and Schultz (2012), to capture information risk (e.g., Diamond and Verrecchia, 1991; Leuz and Verrecchia, 2000; Pham *et al.*, 2023).

We create three dummy variables, *Bid-ask, Abacc,* and *Accm,* to capture the level of bid-ask spread, abnormal accruals, and opacity of firms before the adoption of the COW law. *Bid-ask* (*Abacc* or *Accm*) equals one if the value of the bid-ask spread (abnormal accruals or opacity) is higher than the state's average value in the year before the COW law was adopted, and zero otherwise. The definitions of variables *Bid-ask, Abacc,* and *Accm* are reported in Appendix A1. We then run the regression with the interaction between *COW* and information risk indicators. We also include a set of control variables and model specifications as in the baseline regressions. We report the results of the information risk channel in Columns (1), (2), and (3), Panel A of Table 4.5.

The coefficients of *COW* are significantly positive and consistent with the baseline results. The coefficients of three interaction terms, *COW* × *Bid-ask, COW* × *Abacc,* and *COW* × *Accm,* are positive and significant. The results suggest that the increase in the implied cost of equity associated with the adoption of the COW law is more pronounced for firms with higher levels of pre-enactment information risk. This suggests that increased information contributes to explaining the rise in the implied cost of equity following the waiver's enactment.

discretionary accruals indicate a greater likelihood of such manipulation (Hutton *et al.*, 2009).

4.4.3.2. Company risk

The second possible channel is the company risk. The corporate opportunities waiver (COW) law weakens managers' fiduciary duty of loyalty, potentially increasing information asymmetry and future uncertainty.[43] In an environment of imperfect information, stock prices are affected by uninformed traders who lack access to fully revealed information, thereby contributing to increased volatility (e.g., Attanasio, 1990). To test this possibility, we examine the effect of the COW law on the implied cost of equity, conditional on pre-enactment corporate risk profiles. We conjecture that, following the adoption of the COW law, which exacerbates agency conflicts, future cash flows become more uncertain, which increases firm risk and, in turn, leads to a higher implied cost of equity.

We use stock return volatility and cash flow volatility to measure firm risk. *First*, French, Schwert, and Stambaugh (1987) recommend stock return volatility as a measure of firm risk. This measure is widely used in both theoretical and practical contexts (e.g., Gharbi, Sahut, and Teulon, 2014; Bonsall IV, Leone, Miller, and Rennekamp, 2017; Brogaard, Li, and Xiam, 2017). In addition, Pastor, Sinha, and Swaminathan (2008) find a positive relation between the market-level cost of capital and market returns volatility. At the firm level, Hail and Leuz (2009) indicate that the cost of capital is positively correlated with return volatility. *Second*, cash flow volatility serves as another reliable measure of firm risk, as higher volatility indicates a greater likelihood of internal cash shortfalls (Minton and Schrand, 1999; Gryglewicz, Mancini, Morellec, Schroth, and Valta, 2022). Cash flow volatility may raise the probability that a firm needs to access external capital markets, thereby increasing financing costs (e.g., Minton and Schrand, 1999; Liu, Pincus, and Xu, 2023).[44]

[43] As Attanasio (1990) notes, higher levels of information asymmetry can lead to greater stock price volatility.
[44] Several studies use stock return volatility and cash flow volatility as proxies for firm risk, including Chay and Suh (2009), Hail and Leuz (2009), Bessler, Drobetz, and Grüninger (2011), Harjoto and Jo (2015), Li and Ni (2024).

We create two dummy variables, *Retvol* and *CFvol,* to capture the stock return volatility and cashflow volatility levels before the adoption of the COW law. *Retvol* (*CFvol*) equals one if the value of stock return volatility (cashflow volatility) is higher than the state's average value in the year before the COW law was adopted, and zero otherwise. The definitions of *Retvol* and *CFvol* are in Appendix A1. We then run the regression with the interaction between *COW* and firm risk indicators. We also include a set of control variables and model specifications as in the baseline regressions. We report the results of the firm risk channel test in Columns (4) and (5), Panel B of Table 4.5.

There are two key takeaways from these results. *First*, the coefficients of *COW* are significantly positive and consistent with the baseline results. *Second*, the coefficients of interaction *COW* × *Retvol* and *COW* × *CFvol* are positive and significant, suggesting that the increase in implied cost of equity due to the COW law adoption is more pronounced for firms with higher levels of pre-enactment firm risk. The results suggest that higher firm risk helps explain the increase in the implied cost of equity following the waiver's enactment.

Table 4.5: Channel analysis

This table presents the difference-in-difference (DiD) regression of the implied cost of equity on the adoption of the COW law with the channel analysis. Implied cost of equity (*COC_AVG*) is measured as the average of four implied cost of equity measures based on four methods. *COW* equals 1 for firms in the adopted COW law state in the post-COW law periods, and 0 otherwise. Panel A presents the results of the firm's risk channel, which are: return volatility (*Retvol*), cash flow volatility (*CFvol*). Panel B reports the results of the information risk channel, which are proxied by bid-ask spread, abnormal accruals, and opacity. We create an indicator (*Retvol*, *CFvol*, *Bid-ask, Abacc,* or *Accm)* that equals one if this measure is higher than the state's average value in the pre-COW year, and zero otherwise. Firm fixed effects, state fixed effects, and year fixed effects are included. *T*-statistics computed using standard errors clustered at the state of incorporation level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions and data sources are reported in Appendix C1.

	Panel A: Information risk			Panel B: Firm risk	
	Bid-ask spread	Abnormal accruals	Opacity	Return volatility	Cash flow volatility
	COC_AVG	*COC_AVG*	*COC_AVG*	*COC_AVG*	*COC_AVG*
	(1)	(2)	(3)	(4)	(5)
COW	0.0027**	0.0022*	0.0029**	0.0028**	0.0029**
	(2.18)	(1.72)	(2.25)	(2.35)	(2.25)
COW × *Bid-ask*	0.0069***				
	(4.02)				
COW × *Abacc*		0.0047***			
		(5.32)			
COW × *Accm*			0.0012**		
			(2.07)		
COW × *Retvol*				0.0057**	
				(2.01)	
COW × *CFvol*					0.0039***
					(4.85)
Lnsize	-0.0038***	-0.0038***	-0.0037***	-0.0038***	-0.0038***
	(-6.44)	(-6.29)	(-6.21)	(-6.41)	(-6.46)
Leverage	0.0106***	0.0106***	0.0105***	0.0097***	0.0097***
	(4.19)	(4.21)	(4.15)	(3.81)	(3.85)

Btme	0.0331***	0.0330***	0.0331***	0.0325***	0.0326***
	(26.11)	(26.02)	(26.41)	(21.89)	(22.38)
Roa	0.1194***	0.1191***	0.1192***	0.1179***	0.1183***
	(15.93)	(15.95)	(15.96)	(15.27)	(15.32)
Brm	0.0005	0.0005	0.0005	0.0004	0.0004
	(0.78)	(0.78)	(0.78)	(0.70)	(0.70)
Return	0.0001	0.0001	0.0001	-0.0000	-0.0000
	(0.14)	(0.12)	(0.12)	(-0.03)	(-0.01)
Dispersion	0.0025***	0.0025***	0.0025***	0.0024***	0.0024***
	(3.72)	(3.68)	(3.70)	(3.47)	(3.46)
Ltg	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***
	(-7.08)	(-7.26)	(-7.27)	(-7.80)	(-8.01)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
S.E. clustered	State	State	State	State	State
Observations	21,115	21,115	21,115	21,424	21,424
Adjusted R^2	0.3832	0.3832	0.3830	0.3853	0.3852

4.4.4. Cross-sectional analyses

In this section, we examine whether the effect of COW law adoption on a firm's implied cost of equity differs across different firm types and conditions. Specifically, we examine how the COW law is associated with the implied cost of equity for firms with different levels of financial constraints, competitive environments, and corporate governance structures.

4.4.4.1. Financial constraint

We examine whether the effect of COW law on a firm's implied cost of equity differs among firms with different financial conditions. The nature of the COW is to facilitate firms accessing capital funds more flexibly. By adopting this waiver, corporate capital mobilization is not limited by capital sources that cause conflicts with the fiduciary of loyalty. Firms with higher levels of financial constraints may gain more flexible access to capital following the adoption of the COW law. Consequently, the positive effect of COW law adoption on the implied cost of equity might be stronger for firms with lower financial constraints than for those with higher financial constraints.

We use the KZ Index as a proxy for financial constraints, where a higher KZ Index indicates a greater level of financial constraint (e.g., Kaplan and Zingales, 1997). We re-estimate the baseline regressions in two subsamples (higher and lower levels of financial constraints). The subsamples are divided based on the median value of the KZ index of firms within each industry and year. Firms with the KZ index value above the median value are classified into the higher financial constraints group and vice versa. Panel A of Table 4.6 reports the results of subsample regressions on the cost of equity capital.

Panel A's results suggest that the effect of the COW law on the implied cost of equity is more pronounced for less financially constrained firms than for more financially

constrained firms. The *Chi-square* tests for equality of coefficients are statistically significant at the 1% level, supporting our findings.

4.4.4.2. Competition

We examine the effect of product market competition on the relation between COW law and the firm's implied cost of equity. Firms, particularly those in highly competitive markets, may benefit more from access to external financing following the enactment of the COW law. Consequently, the effect of the COW law on increasing the implied cost of equity is expected to be more pronounced for firms operating in less competitive markets.

We follow Hoberg, Phillips, and Prabhala (2014) and use the fluidity index to capture the product market competition.[45] A higher fluidity index refers to a higher level of product market competition. We re-estimate the baseline regressions in two subsamples (higher and lower levels of competition). The subsamples are divided based on the median value of the fluidity ratio of firms within each industry and year. Firms with a fluidity ratio value above the median value are classified into the higher competition group and vice versa. Panel B of Table 4.6 reports the results of subsample regressions on costs of equity capital. Panel B's results indicate that the positive effect of the COW law on the implied cost of equity is more pronounced for firms facing lower levels of product competition. The results of the *Chi-square* tests are statistically significant at a 1% level and support the findings.[46]

4.4.4.3. Corporate governance

We examine the effect of the COW law on a firm's implied cost of equity differs among firms with different corporate governance characteristics. Effective corporate

[45] We collect data on the fluidity index from Hoberg *et al.* (2014) to measure firm-level competitiveness.
[46] Consistent with Rauterberg and Talley (2017) and Fich *et al.* (2023), we find that (results untabulated for brevity) the effect of the COW law on the cost of capital is more pronounced for larger firms.

governance mitigates agency conflicts and protects minority shareholders (e.g., Dey, 2008), thereby reducing a firm's cost of capital (Chen, Chen, and Wei, 2009; Zhu, 2014). The COW law, which allows corporate fiduciaries to take new business opportunities for themselves rather than offering them to the company, may reduce managerial monitoring (Wang, 2022), increase agency conflicts between managers and shareholders (Fich *et al.,*2023), and negatively affect corporate governance quality (Dey, 2008). Therefore, we expect that the effect of the COW law is stronger for firms with weaker corporate governance mechanisms.

We use two measures to capture corporate governance, including the number of board members and the number of independent members. *First*, as an element of corporate governance, the number of board members is reported to be associated with the implied cost of equity. Upadhyay and Sriram (2011) find that firms tend to maintain larger boards in response to investors' demand for higher corporate governance standards, which also helps reduce capital costs through improved monitoring and transparency. *Second*, independent boards, which are used widely in the literature to measure corporate governance standards, are associated with lower rates of return on capital (Huang, Wang, Xie, and Zhou, 2021) through reducing negative corporate outcomes and improving firm performance (Huang, Lobo, Wang, and Zhou, 2018).

We re-estimate the baseline regressions in two subsamples divided based on the median value of the number of board members and the number of independent board members of firms within each industry and year. Firms with a number of board members (a number of independent board members) above the median value are classified into the bigger board group (bigger independent board group) and vice versa. Panel C of Table 4.6 reports the results of subsample regressions on costs of equity capital. Panel C's results indicate that the positive effect of the COW law on the implied cost of equity is more pronounced for firms with a smaller number of board members and a smaller number of independent board

members. The results of the *Chi-square* tests are statistically significant at a 1% level and support the findings.

Table 4.6: Cross-sectional analysis

This table presents the difference-in-difference (DiD) regression of the implied cost of equity on the adoption of the COW law with cross-sectional analyses. Implied cost of equity (*COC_AVG*) is measured as the average of four implied cost of equity measures based on four methods. *COW* equals 1 for firms in the adopted COW law state in the post-COW law periods, and 0 otherwise. We divide the full sample into subsamples based on the level of financial constraints (measured by the KZ Index), competition (measured by the fluidity ratio), and the number of board members and independent members. Firm fixed effects, state fixed effects, and year fixed effects are included. *T*-statistics computed using standard errors clustered at the state of incorporation level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions and data sources are in Appendix C1.

	Panel A: Financial constraint KZ Index		Panel B: Competition Fluidity		Panel C: Corporate governance Board members		Independent members	
	High *COC_AVG*	Low *COC_AVG*	High *COC_AVG*	Low *COC_AVG*	High *COC_AVG*	Low *COC_AVG*	High *COC_AVG*	Low *COC_AVG*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
COW	0.0031	0.0050***	0.0008	0.0035**	0.0021	0.0085***	0.0019	0.0076**
	(1.42)	(3.08)	(0.47)	(2.34)	(1.39)	(2.87)	(1.22)	(2.68)
Lnsize	-0.0032***	-0.0030**	-0.0021***	-0.0045***	-0.0037***	-0.0028**	-0.0038***	-0.0015
	(-5.00)	(-2.39)	(-3.08)	(-5.50)	(-6.53)	(-2.12)	(-6.04)	(-1.29)
Leverage	0.0202***	-0.0010	0.0142***	0.0073*	0.0122***	0.0035	0.0100***	0.0086*
	(4.85)	(-0.19)	(3.89)	(1.86)	(3.78)	(0.82)	(3.22)	(1.96)
Btme	0.0319***	0.0303***	0.0310***	0.0336***	0.0354***	0.0205***	0.0340***	0.0251***
	(15.87)	(12.16)	(27.94)	(13.39)	(21.24)	(4.40)	(22.06)	(7.07)
Roa	0.1338***	0.1131***	0.1230***	0.1163***	0.1386***	0.0748***	0.1300***	0.0822***
	(13.99)	(12.97)	(12.96)	(14.11)	(14.72)	(10.09)	(11.35)	(9.48)
Ivol	0.1544*	0.0466	0.0850	0.0641	0.0936**	0.1587	0.1390***	-0.0223
	(1.83)	(0.67)	(1.57)	(0.54)	(2.02)	(1.65)	(3.20)	(-0.25)
Brm	0.0003	0.0001	0.0009	0.0000	-0.0001	0.0011	-0.0000	0.0017
	(0.26)	(0.17)	(1.28)	(0.04)	(-0.22)	(0.54)	(-0.06)	(0.91)
Return	-0.0002	0.0002	-0.0008	0.0005	0.0005	-0.0018	0.0003	-0.0011
	(-0.41)	(0.19)	(-1.65)	(0.49)	(1.03)	(-1.04)	(0.64)	(-0.57)
Dispersion	0.0010	0.0024**	0.0022***	0.0019*	0.0023***	0.0059***	0.0024***	0.0015

	(1.07)	(2.45)	(4.21)	(1.74)	(3.31)	(5.55)	(2.70)	(1.59)
Ltg	-0.0002***	-0.0001***	-0.0003***	-0.0001***	-0.0002***	-0.0002***	-0.0002***	-0.0001**
	(-6.76)	(-3.70)	(-5.95)	(-3.17)	(-6.67)	(-3.93)	(-6.46)	(-2.43)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
S.E. clustered	State	State	State	State	State	State	State	State
Observations	11,295	9,643	11,038	9,895	17,388	3,595	17,325	3,671
Adjusted R^2	0.4339	0.3568	0.3944	0.3867	0.4069	0.3141	0.4064	0.3277
Chi-square (χ^2) test	29.06***		11.05***		18.10***		21.38***	
p-value	0.00		0.00		0.00		0.00	

4.5. Robustness checks

4.5.1. Alternative measures of implied cost of equity

To ensure the robustness of our results to variations in variable measurements, we conduct additional tests using five alternative measures of the implied cost of equity. *First*, we consider the effect of the COW law on four implied costs of capital, which are used to calculate the average implied cost of equity measure in our baseline regressions. The *first measure, COC_GLS,* developed by Gebhardt *et al.* (2001), derives the implied cost of equity using a discounted residual income model. *The second measure, COC_CT*, proposed by Claus and Thomas (2001), is based on the discount rate that equates market valuations with prevailing expectations of future flows. The *third measure, COC_Easton*, developed by Easton (2004), calculates the implied cost of equity from the earnings and earnings growth model. The *fourth measure, COC_OJ*, introduced by Ohlson and Juettner-Nauroth (2005), utilizes the earnings-per-share model in evaluating the implied cost of equity. *Finally*, we use *FICC,* a measure developed by Lee *et al.* (2021), as the fifth alternative measure of the implied cost of equity. *FICC* is derived from the systematic cross-sectional association between implied cost of equity (*ICC*) measures and firm-specific characteristics, where *ICC* is the equal-weighted average of the four previously discussed implied cost of equity measures.[47]

We substitute *COC_AVG* by *COC_GLS, COC_Easton, COC_OJ, COC_CT*, and *FICC* as dependent variables and regress them on the *COW* variable, applying the same model specifications as in the baseline model. We report the results for these tests in Table 4.7. The results in Table 4.7 show that the COW law has a positive and significant effect on

[47] To calculate the *FICC* measure, the ICC measure is regressed on three firm characteristics, including firm size, book-to-market ratio, and return momentum (Hou, Van Dijk, and Zhang, 2012; Lee *et al.*, 2021).

most alternative measures of the cost of equity capital, providing further support for the baseline findings.

Table 4.7: Alternative measures of implied cost of equity

This table presents the difference-in-difference (DiD) regression of the implied cost of equity on the adoption of the COW law with alternative measures of implied cost of equity. We use five alternative measures of implied cost of equity, which are: *COC_GLS* (Gebhardt et al., 2001), *COC_Easton* (Easton, 2004), *COC_OJ* (Ohlson and Juettner-Nauroth, 2005), *COC_CT* (Claus and Thomas, 2001), and *FICC* (Lee *et al.,* 2021). *COW* equals 1 for firms in the adopted COW law state in the post-COW law periods, and 0 otherwise. Firm fixed effects, state fixed effects, and year fixed effects are included. *T*-statistics computed using standard errors clustered at the state of incorporation level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions and data sources are in Appendix C1.

	COC_GLS	*COC_Easton*	*COC_OJ*	*COC_CT*	*FICC*
	(1)	(2)	(3)	(4)	(5)
COW	0.0020*	0.0085**	0.0007	0.0016	0.0002**
	(2.00)	(2.41)	(0.58)	(0.77)	(2.40)
Lnsize	-0.0021***	-0.0050***	-0.0043***	-0.0046***	-0.0016***
	(-4.63)	(-2.83)	(-9.52)	(-7.76)	(-35.35)
Leverage	0.0120***	-0.0160***	0.0278***	0.0209***	-0.0001
	(4.16)	(-2.76)	(10.30)	(8.89)	(-0.70)
Btme	0.0377***	0.0211***	0.0366***	0.0347***	0.0017***
	(25.58)	(8.20)	(24.13)	(15.28)	(13.18)
Roa	0.1123***	0.0363*	0.2181***	0.1196***	-0.0022***
	(18.75)	(1.82)	(24.65)	(19.02)	(-12.56)
Ivol	0.0704**	-0.0144	0.2010***	0.1943***	-0.0035
	(2.42)	(-0.13)	(3.67)	(3.43)	(-1.09)
Brm	0.0003	0.0001	0.0004	-0.0006	0.0000**
	(0.62)	(0.11)	(0.87)	(-1.54)	(2.64)
Return	-0.0000	-0.0005	0.0001	0.0003	-0.0002***
	(-0.01)	(-0.36)	(0.17)	(0.88)	(-8.00)
Dispersion	0.0008	0.0028***	0.0028***	0.0036***	0.0001***
	(1.16)	(2.70)	(3.10)	(5.06)	(3.54)
Ltg	-0.0002***	-0.0002***	-0.0003***	-0.0002***	-0.0000***
	(-10.35)	(-2.94)	(-8.11)	(-8.74)	(-7.71)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
S.E. clustered	State	State	State	State	State
Observations	21,424	21,424	21,424	21,424	16,328
Adjusted R^2	0.3855	0.5175	0.2091	0.5000	0.5113

4.5.2. First difference test and placebo test

In this section, we employ a first-difference test and a placebo test to validate the baseline results. *First*, the first difference model is to mitigate unobserved heterogeneity in panel data and control for unobserved variables that change over time (e.g., Pham *et al.*, 2023). Specifically, we examine a re-estimation of our baseline model after taking the first differences of all continuous variables. We report the results for these tests in Panel A of Table 4.8. Results of Panel A consistently show that the coefficient estimate on *COW* is positive and statistically significant, suggesting that the cost of equity capital increases after the enactment of the COW law. *Second*, we continue to employ placebo tests to mitigate concerns that our documented findings are spuriously driven by features of the underlying data instead of the adoption of the COW law. Specifically, we randomly assign the pseudo-year of COW law adoption for each state in our sample, which is not the true year of COW law adoption, and then create the *pseudo-COW*, which equals 1 from the beginning of the pseudo-year in each state, and 0 otherwise. Then, we run the re-estimated baseline model by replacing *COW* with *pseudo-COW* and repeat the process 100 times. *Finally*, we calculate the mean value of coefficients and *t*-statistics from 100 pseudo-estimated coefficients and *t*-statistic values. Panel B of Table 4.8 reports the result of the placebo test.

The mean value of *COW* of the placebo test in the *COC_AVG* model is 0.0011, which is different from the actual values from baseline results, 0.0032. In addition, the mean value of *t*-statistics of the placebo test in the *COC_AVG* model is 1.43 and which is also different from the actual values of *t*-statistics in the baseline model (t=2.51). Moreover, the value is not statistically significant, suggesting that there is no significant relation between pseudo-COW and the implied cost of equity. This result suggests that the baseline findings are unlikely to occur if the COW law has no real effect on the implied cost of equity, reducing concerns that the results are mainly driven by omitted variables.

Table 4.8: First difference test and placebo test

This table presents the robustness checks on the baseline results of the effect of the COW law on the implied cost of equity. Implied cost of equity (*COC_AVG*) is measured as the average of four implied cost of equity measures based on four methods. *COW* equals 1 for firms in the adopted COW law state in the post-COW law periods, and 0 otherwise. Panel A reports the results of the first difference method. Panel B reports the results of the placebo test. For each state, we create a *pseudo-COW* by randomly assigning a COW law adoption year during the period, and equals 1 from the pseudo-event year, and 0 otherwise. We re-estimate the baseline models with *pseudo-COW* and repeat the process 100 times. Firm fixed effects, state fixed effects, and year fixed effects are included. *T*-statistics computed using standard errors clustered at the state of incorporation level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions and data sources are in Appendix C1.

Panel A: First differences test

	ΔCOC_AVG	*ΔCOC_AVG*
	(1)	(2)
COW	0.0008***	0.0009***
	(3.43)	(3.69)
ΔLnsize		-0.0059***
		(-5.01)
ΔLeverage		0.0059*
		(1.83)
ΔBtme		0.0207***
		(10.23)
ΔRoa		0.1313***
		(18.23)
ΔIvol		0.1969***
		(3.11)
ΔBrm		0.0013*
		(1.94)
ΔReturn		0.0029***
		(9.18)
ΔDispersion		-0.0001
		(-0.17)
ΔLtg		-0.0001
		(-1.28)
Observations	19,276	19,276
Adjusted R^2	0.000	0.046

Panel B: Placebo test

COC_AVG	Actual	Mean in this test	SD	Min	Max
Coefficient of *COW*	0.0032	0.0011	0.0009	-0.0010	0.0042
t-statistics of *COW*	2.51	1.43	1.55	-2.08	7.61

4.5.3. Alternative DiD estimators

One potential concern with the staggered difference-in-differences (DiD) design is the possibility of changing treatment effects over time, which might lead to biased estimates of the average treatment effect on the treated (*ATT*) using a two-way fixed effects (TWFE) DiD regression. This bias could arise due to "bad comparisons" of treatment effects between earlier and later treated units (e.g., Baker *et al*., 2022).

We consider several approaches to address these concerns. *First*, we utilize the Goodman-Bacon decomposition test to assess the likelihood of bias from using a traditional staggered DiD design, which is recommended and employed in recent literature (e.g., Baker *et al.,* 2022; Fich *et al.*, 2023; Lai *et al.,* 2024). This test can evaluate whether the DiD regression could provide meaningful and significant estimates (Goodman-Bacon, 2021).[48] The purpose of the Goodman-Bacon decomposition in DiD is to understand how the overall DiD estimate is built when treatment happens at different times. Particularly, we calculate the average effect and total weight of the three types: Treatment (later treated) vs. Control (earlier treated), Treatment (earlier/later treated) vs. Control (always treated), and Treatment (earlier/later treated) vs. Control (never treated). Panel A of Table 4.9 reports the results of the Goodman-Bacon decomposition test.

The average effect for all three groups is positive, with the third group (earlier/later treated vs. never treated) having the highest weight at approximately 86%. The total weight of the first group (later treated vs. earlier treated) and the second group (earlier/later treated vs. always treated) are only 10.59% and 3.66%, respectively. It implies that "already treated" and "always treated" group as a control group is less weighted. The vast majority (i.e., 86%)

[48] We thank Goodman-Bacon, Goldring, and Nichols (2019) for providing the Stata command "bacondecomp" used in these tests.

of the DiD estimate comes from treated units versus never-treated units, which are usually the cleanest and least biased.

Second, to mitigate the potential bias coming from the use of early treated units as controls for later treated ones, we apply the stacked regression approach developed by Cengiz, Dube, Lindner, and Zipperer (2019) and the Callaway and Sant'Anna (2021) estimator to address the time-varying treatment effects.[49] These two approaches involve modifying the set of comparison units in the estimation process, ensuring that treated firms are compared with control firms that have either never been treated or have not yet been treated.[50] These approaches are recommended by Baker *et al.* (2022) to strengthen the DiD design and have been used in recent studies such as Lai *et al.* (2024), Bourveau, Brochet, Ferri, and Sun (2024), Babenko *et al.* (2025), and Nagengast and Yotov (2025). Panels B and C of Table 4.9 report the results of the stacked regression approach and the Callaway and Sant'Anna (2021) estimator, respectively.

According to Table 4.9's results, the coefficients are positive and significant, consistent with the baseline results shown in Table 4.2. Thus, the positive effect of COW law on the implied cost of equity is robust to using the alternative methods of DiD regression, including the stacked regression and Callaway and Sant'Anna (2021) estimator. Collectively, the results in Table 4.9 suggest that potential issues from staggered treatment timing and treatment-effect heterogeneity do not appear to affect our overall conclusions.

[49] We thank Barrios (2022) for providing the Stata code used to implement the stacked DiD regression, following Callaway and Sant'Anna (2021) and Sant'Anna and Zhao (2020).

[50] The use of clean controls can address the heterogeneous treatment effects in the staggered DiD model (e.g., Lai *et al*., 2024).

Table 4.9: Alternative estimators

This table presents the results of alternative model estimations, including the Goodman-Bacon decomposition test, stacked regression, and Callaway and Sant'Anna (2021) estimator. Implied cost of equity (*COC_AVG*) is measured as the average of four implied cost of equity measures, derived from the four methods outlined in the baseline model. *COW* equals 1 for firms in the adopted COW law state in the post-COW law periods, and 0 otherwise. Panel A reports the results for Goodman-Bacon decomposition test. Panel B reports the results for the stacked regression. Panel C reports the Callaway and Sant'Anna (2021) estimator's result. Firm fixed effects, state fixed effects, and year fixed effects are included. *T*-statistics computed using standard errors clustered at the state of incorporation level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions and data sources are in Appendix C1.

	Panel A: Goodman-Bacon decomposition test	
Comparisons (Treatment vs Control)	Coefficients	Percentage (%)
Later vs Earlier treated	0.009	10.59%
Treated vs Later treated	0.007	3.66%
Treated vs Never treated	0.002	85.74%

	Panel B: Stacked regression	Panel C: Callaway & Sant'Anna (2021)
	COC_AVG	*COC_AVG*
	(1)	(2)
COW	0.0047***	0.0045**
	(2.72)	(2.30)
All Controls	Yes	Yes
Firm fixed effects	Yes	Yes
State fixed effects	Yes	Yes
Year fixed effects	Yes	Yes

4.6. Conclusion

This study examines the impact of a change in the fiduciary duty of loyalty, which allows corporations greater flexibility to pursue new business opportunities, on the implied cost of equity. Using the staggered adoption of the corporate opportunity waiver (COW) law as an exogenous shock that relaxes the fiduciary duty of loyalty, we find that the cost of equity capital rises following the law's enactment. The effect is stronger for firms with lower financial constraints, operating in less competitive markets, and with weaker corporate governance. We further identify two channels through which the COW law influences the implied cost of equity: increased firm risk and greater information asymmetries, both of which contribute to higher financing costs. Our findings remain robust when using alternative measures of the implied cost of equity, accounting for the validity of parallel trend assumptions, considering the effects of Delaware-incorporated firms and other state-level laws, controlling for differences in firm-specific characteristics, and employing alternative model specifications. Our findings suggest that the fiduciary duty of loyalty plays an important role in influencing corporate transparency and financing costs.

CHAPTER 5 CONCLUSION

In this chapter, the thesis summarize the key findings and their significance within each of the three essays in Section 5.1. Section 5.2. suggests areas for future research.

5.1. Major findings and implications

This thesis examines how governance mechanisms shape financial market outcomes by affecting the information environment and agency conflicts. By investigating both internal governance (corporate culture) and external governance (fiduciary duty of loyalty), the thesis demonstrates that governance mechanisms influence agency problems, managerial behavior, transparency, and monitoring, which in turn affect financial market outcomes, investor perceptions, and risk pricing.

Across the three essays, a consistent mechanism emerges. The first essay finds that strong governance mechanisms, by enhancing corporate culture, improves information quality, firm trusts, and investor recognition, leading to better market outcomes such as higher stock liquidity. In contrast, the last two essays find that weakened governance mechanisms, by reducing the fiduciary duty of loyalty, increase opacity and reduce monitoring, resulting in higher crash risk and a higher implied cost of equity. While the last two essays both examine the same governance shock, they capture different underlying mechanisms. The second essay focuses on the managerial channel, where reduced transparency and weaker monitoring lead to greater bad news hoarding and higher crash risk. In contrast, the third essay focuses on the shareholder perception channel, where increased risk and information asymmetry lead investors to demand higher returns, raising the implied cost of equity.

Overall, the findings highlight that governance mechanisms operate through a common channel - shaping information and agency friction - and thereby determine how risk is perceived and priced in financial markets. This unified perspective contributes to the literature by linking internal and external governance within a single framework.

5.1.1. The first essay

The first essay investigates how financial market participants incorporate corporate culture via stock liquidity using a sample of 48,785 firm-year observations covering 6,630 unique firms. Constructing a comprehensive measure based on five cultural values from utilizing firm-level corporate culture measures derived from the earnings conference call transcripts through textual analysis (Li *et al.,* 2021), the essay shows one standard deviation increase in corporate culture value is associated with a 6.76% increase in the Amihud liquidity ratio. This study also provides empirical evidence that a positive corporate culture enhances stock liquidity through three channels: including reducing information risk, enhancing firm reputation, and increasing the degree of investor recognition. This impact is more pronounced for firms with higher financial distress and firms with higher financial constraints. Finally, there is also evidence that stronger corporate culture is significantly associated with higher stock price informativeness and future stock returns, and lower level of default risk and informed trading.

In summary, this essay reveals that corporate culture is an important determinant of stock liquidity. These findings have implications for several financial market participants. In particular, greater stock liquidity reduces liquidity risk and transaction costs, enabling more efficient portfolio and capital allocation decisions for investors. Greater liquidity reflects a greater information environment, facilitating more accurate evaluation and improving market participation for financial professionals. Ultimately, this evidence highlights the significance of internal governance mechanisms – corporate culture – and suggests complementary policies to traditional regulations that encourage ethical norms and culture.

5.1.2. The second essay

The second essay examines the effect of the fiduciary duty of loyalty on the stock price crash risk by employing the difference-in-difference model (DiD) for the staggered adoption of the corporate opportunity waiver (COW) law, an exogenous shock that reduces the fiduciary duty of loyalty. Utilizing a large sample of 84,000 firm-year observations covering 9,297 unique firms, the essay reports that the enactment of COW law is associated with a 57.71% or 85.11% average values of stock price crash risk (depending on stock price crash risk measures). This effect is more pronounced for firms with more financial distresses and more competition. This study also provides empirical evidence that the COW law affects stock price crash risk through two channels: an increase in financial reporting opacity and a deterioration in external monitoring, leading to higher agency problems. In addition, this essay also shows that COW law is significantly associated with higher illiquidity, informed trading, stock price informativeness, stock mispricing, and audit pricing.

In summary, this essay shows that the decline in fiduciary duty of loyalty under the COW law increases the risk of a stock price crash, with important economic implications for relevant market participants. For investors, higher crash risk signals require a more cautious portfolio allocation, higher risk premiums, and enhanced monitoring, especially for firms operating under a change in fiduciary duty of loyalty. For analysts or risk managers, higher crash risk increases the difficulty of forecasting and evaluation, requiring more sophisticated assessment frameworks. Lastly, the main results of this essay highlight the potential unintended outcomes of relaxing fiduciary duty of loyalty requirements, emphasizing the need for strengthening legal governance mechanisms.

5.1.3. The third essay

The third essay conducts an analysis of how fiduciary duty of loyalty changes under the COW law affects the implied cost of equity by using a large sample of over 22,022 firm-year observations covering 2,626 unique firms. Exploiting the staggered adoption of the corporate opportunity waiver (COW) law as an exogenous shock that weakens the fiduciary duty of loyalty, this essay demonstrates that after the enactment of the COW law, a firm's implied cost of equity rises by 7.80% of the standard deviation and 4.38% of the mean value. The effect is more pronounced among firms that are less financially constrained, operate in less competitive product markets, and have weaker corporate governance. The essay also reveals two mechanisms through which the COW law affects the implied cost of equity: an increase in firm risk and information asymmetries following its adoption, leading to higher financing costs.

In summary, this essay documents that a weakness in fiduciary duty of loyalty under the COW law leads to a higher implied cost of equity, with meaningful implications for market participants, policymakers, and regulators. For example, with a higher implied cost of equity, investors may require higher expected returns and reallocate portfolios away from firms operating under weakened fiduciary duty. For financial professionals, the rising implied cost of equity can affect investment and capital structure decisions, necessitating closer estimation and assessment of governance-related risks. Finally, the evidence underscores the importance of fiduciary duty standards and internal governance mechanisms to address agency problems, once again supporting the need for a legal framework to protect investors and other market participants.

5.2. Future areas of research

This thesis offers a solid empirical setting for future studies. *First*, while the first essay of this thesis explores the relation between corporate culture and stock liquidity, future research could consider other specific cultural dimensions – such as innovation, integrity, quality, respect, or teamwork and how they interact with different aspects of internal governance mechanisms. Broader studies could investigate their consequences for market outcomes and firm performance.

For example, future studies can examine how governance mechanisms, shaped by corporate culture, influence other financial market outcomes, such as price discovery and the trading activities of institutional and retail investors.

Further research may also explore whether governance practices driven by corporate culture influence how market participants process information and trade. Scholars also could examine how market efficiency, investor sentiment, and the responsiveness of asset prices to new information vary across firms with distinct cultures. These extensions could broaden the understanding of corporate culture, as one of the governance mechanisms, shapes market dynamics. Future studies may also revisit the relationship between governance practices and liquidity costs using an international sample, allowing researchers to assess whether the findings generalize across global markets.

Second, the evidence from Essays Two and Three suggests that changes in fiduciary duty of loyalty increase the risk of stock price crashes and the implied cost of equity, raising questions about the broader consequences of fiduciary duty of loyalty. Future studies may investigate whether weakening fiduciary duty affects firms' internal strategies, policies, regulations, and performance, as well as long-term growth and market competitiveness.

Another possible avenue is to explore whether any adjustment to this duty may influence directors' and officers' incentives, thereby shaping firms' contractual arrangements, compliance practices, and the overall stability of the business ecosystem. Scholars could also consider the interactions between duty-of-loyalty modifications and firm value-related factors, or between perceptions of fairness and trust within or outside the corporation. These further analyses offer promising opportunities to understand the wider societal impact of governance reforms.

Future studies can examine how changes in the fiduciary duty of loyalty affect other key stakeholders such as customers, creditors, suppliers, tax authorities, and other government agencies. For example, the significant change in this duty may influence product quality, services reliability, consumer trust, brand reputation, and contract stability and duration. Further research may consider other consequences of this modification, including credit risk and default likelihood, debt covenants and monitoring.

More broadly, further investigation might examine the joint effect of internal corporate culture and external legal frameworks to determine whether these mechanisms reinforce one another in shaping firms' performance and financial market outcomes. Further research could consider the outcomes both short or long term to understand if the corporate responses are temporary or a significant and fundamental changes. If the data permits, future studies can revise these relations several years before and after market shocks or downturns, such as COVID-19, to draw new insights.

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APPENDIX A FOR CHAPTER 2

Table of Content

Section A.2: Sensitivity analysis

In this section, we include additional analyses on the propensity score matching approach, including estimated average treatment effects and Rosenbaum sensitivity analysis. The results are reported in Appendix A2. First, we estimate the average treatment effects (ATT), which is the difference in stock liquidity measures (*Liq_Amihud* and *Liq_FHT)* between the treated group (the group contains all firms having strong corporate culture) and its counterparts. ATT values are 0.7667 and 0.1117 for *Liq_Amihud* and *Liq_FHT*, respectively. Both values are significant at a level of 1%. The results are consistent with our findings from baseline models that stock liquidity is significantly higher for firms with better corporate culture.

Second, we assess the sensitivity of our propensity score matching using the sensitivity analysis developed by Rosenbaum (2002), which evaluates the strength of omitted variables that could affect the treatment and potentially overturn our baseline findings.[51] It is worth noting that the sensitive bound values do not indicate that there is no true effect of corporate culture on *Liq_FHT.* We estimate this bound, named cut-off gamma levels (Γ), which indicate the points at which the treatment effects become insignificant for stock liquidity.[52] The Γ level of 1.70 (or 1.72) for *Liq_Amihud* indicates that unobservable variables are associated with a more than 70% change in the odds ratio of whether firms having strong culture in order to make our main findings on *Liq_Amihud* become insignificant. The Γ of 1.72 is high for gamma bounds, as suggested by prior studies (e.g., Peel and Makepeace, 2012; Barbopoulos and Adra, 2016). This result suggests that unobservable factors are unlikely to weaken our results for *Liq_Amihud*. We also notice that

[51] Rosenbaum (2002) also indicates that although the sensitivity analysis shows the degree that the main findings could be overturn by the hidden biases, it does not indicate that the hidden biases is truly present. In line with Rosenbaum (2002), DiPrete and Gang (2004) also indicate that the Rosenbaum bounds are the worst scenarios.

[52] We thank Giovanni Cerulli for providing the code to calculate the Rosenbaum sensitivity analysis.

while the Γ values for *Liq_Amihud* models are high, the Γ values for *Liq_FHT* models are relatively smaller, suggesting that, among the two liquidity measures, the result of *Liq_FHT* tend to be more sensitive with unobservable biases than that of *Liq_Amihud.*

Section A.3: Placebo test

Since the propensity score matching based on the *Strong_Culture* variable can be sensitive to unobservable factors, we conduct a further analysis: the placebo test. Specifically, we randomly assign the *pseudo-Strong_Culture* for each firm each year in our sample as value one or zero. Then, we re-estimate the baseline regressions by replacing *Strong_Culture* with *pseudo-Strong_Culture* and repeat the process 1,000 times and 2,000 times. If the higher stock liquidity is driven by unobservable factors instead of corporate culture, we should find the positive and significant relation between assigned *pseudo-Strong_Culture* and stock liquidity measures (*Liq_Amihud* and *Liq_FHT).*

We report the results in Appendix A3. Column (1) of Appendix A3 shows the actual values of coefficients and *t*-statistics of *Strong_Culture* on *Liq_Amihud* and *Liq_FHT* from baseline results in Table 2.2. Columns (2) and (3) of Appendix A3 show the average coefficients and *t*-statistics of *pseudo-Strong_Culture* (with random mean of *pseudo-Strong_Culture)* on *Liq_Amihud* and *Liq_FHT* in 1000-times and 2000-times processes. Columns (4) and (5) report the average coefficients and *t*-statistics of *pseudo-Strong_Culture* (with the mean of *pseudo-Strong_Culture* below 0.25 being similar to *Strong_Culture)* in 1000-times and 2000-times processes.[53]

[53] The *Strong_Culture* variable from our baseline models is the dummy variable that takes the value of one if the average of a firm's five cultural values is in the top quartile in a year, and zero otherwise. Consequently, it has the average value around 0.25 (or 1/4). Therefore, we assign a random dummy for *pseudo-Strong_Culture* under the condition that the mean is below 0.25, as shown in Columns (4) and (5) of Appendix A3.

The average value of coefficients and *t*-statistics of *pseudo-Strong_Culture* in all models is significantly different from the actual values of baseline results and not statistically significant. These results suggest that there is no significant relation between *pseudo-Strong_Culture* and stock liquidity measures. The results indicate that it is very unlikely that the effect of corporate culture on stock liquidity is driven by unobservable factors.

Section A.4: Firm characteristics and the effect of corporate culture

In this Appendix, we examine whether the impact of corporate culture on stock liquidity differs among firms with different characteristics.[54] To test for this possibility, we first create interaction terms of corporate culture and a number of firm characteristics, including *Corp_Culture* × *Size, Corp_Culture* × *Leverage, Corp_Culture* × *Advertising_dummy, Corp_Culture* × *RD_dummy, Corp_Culture* × *Analysts, Corp_Culture* × *Institution,* and *Corp_Culture* × *Age*). We then run the following model:

$$\begin{aligned} Liquidity_{i,y} = {} & \beta_0 + \beta_1 Corp\_Culture_{i,y} + \beta_2 Corp\_Culture \times Size_{i,y} \\ & + \beta_3 Corp\_Culture \times Leverage_{i,y} \\ & + \beta_4 Corp\_Culture \times Advertising\_dummy_{i,y} \\ & + \beta_5 Corp\_Culture \times RD\_dummy_{i,y} + \beta_6 Corp\_Culture \times Analysts_{i,y} \\ & + \beta_7 Corp\_Culture \times Institution_{i,y} + \beta_8 Corp\_Culture \times Age_{i,y} \\ & + \beta_9 Control_{i,y} + \beta_{10} Industry_i + \beta_{11} Year_y + \epsilon_{i,y}, \end{aligned}$$

where $Liquidity_{i,y}$ is one of liquidity measures, $Corp\_Culture_{i,y}$ is corporate culture measures, $Control_{i,y}$ is the vector of the control variables, and $Industry_i$ and $Year_y$ are industry and year-fixed effect variables, respectively.

[54] We thank the referee for suggesting this test.

Appendix A4 reports the results. The coefficients of *Corp_Culture* are positive and significant for all models, consistently suggesting that the higher culture value increases the stock's liquidity. This result is consistent with the baseline models. Regarding to the interaction terms of corporate culture and firm characteristics, Table A4's results suggest that only the coefficients on *Leverage* and *Analysts* are significant for both models of stock liquidity measures (*Liq_Amihud* and *Liq_FHT*). The results indicate that the effect of corporate culture on stock liquidity is more pronounced for firms with higher levels of leverage ratio and analyst coverage.

Literature shows that firms with more liquidity stock experience lower costs of equity (Lipson and Mortal, 2009) and lower bank fees (Butler, Grullon, and Weston, 2005). In addition, improving stock liquidity also increases the opportunities to access external finance resources (Amihud *et al*., 2015b). Thus, firms with higher leverage ratios have stronger incentives to enhance their corporate culture and stand to gain more benefits from these improvements compared to firms with lower leverage ratios. Consequently, the effect of corporate culture on stock liquidity is more pronounced among firms with higher levels of leverage ratio, which is consistent with our results.

Regarding to analyst coverage, Roulstone (2003) shows that firms with a higher value of analyst coverage have more liquid stocks. In addition, high analyst coverage is associated with high level of investor recognition (Alhomaidi *et al.*, 2019). Analyst coverage serves as a measure of external monitoring that reduces information asymmetry (Kim *et al.,* 2011b) and increases pressure on managers regarding the performance and operations of their companies (Yu, 2008). Therefore, firms with higher levels of analyst coverage may be more inclined to enhance their corporate culture, which in turn can improve stock liquidity. Consequently, the effect of corporate culture on stock liquidity is more pronounced for firms with higher levels of analyst coverage, which is consistent with our results in Appendix A4.

Section A.5: The effect of abnormal culture on stock liquidity

In this Appendix, we consider abnormal culture as an alternative measure of corporate culture that covers the within-firm variation in culture. Specifically, first, for each firm year, we calculate the abnormal culture value as the difference between the culture of firm *i* in year *y* and the average culture value of that firm over the last 5 years.[55] We then create the dummy variable, *Abnormal_Culture*, that takes the value one if the abnormal culture value of firm *i* in year *y* is above the average abnormal culture, and zero otherwise. By way of construction, a higher value of *Abnormal_Culture* indicates that the firm has a higher culture value than expected. [56] We rerun our baseline regressions with *Abnormal_Culture* as the independent variable and include all control variables as in the baseline model. We report the results for these tests in Appendix A5.

Results from Appendix A5 show that the coefficients of *Abnormal_Culture* are positive and significant at the 1% level across difference measures of liquidity, suggesting that firms with abnormal culture values have higher stock liquidity. These additional results confirm the baseline findings that firms with higher corporate culture levels have higher stock liquidity.

[55] The results (untabulated for brevity and available upon request) are robust when a firm's abnormal culture is defined based on its average culture values over the last 10 years.

[56] We thank the referee for suggesting this measure.

Appendix A.1: Variable description

Variables	Definitions	Sources
Stock liquidity measures		
Liq_Amihud	The natural logarithm of the annual Amihud ratio, measured over a firm's fiscal year. Liq_Amihud is the inverse of the natural logarithm of Amihud's ratio.	CRSP
Liq_FHT	The natural logarithm of the annual FHT measure over a firm's fiscal year. Liq_FHT is the inverse of the natural logarithm of FHT measure.	CRSP
Corporate culture measures		
Integrity	Weighted-frequency count of integrity-related words in the QA section of earnings calls averaged over a 3-year window.	Li *et al.* (2021)
Teamwork	Weighted-frequency count of teamwork-related words in the QA section of earnings calls averaged over a 3-year window.	Li *et al.* (2021)
Innovation	Weighted-frequency count of innovation-related words in the QA section of earnings calls averaged over a 3-year window.	Li *et al.* (2021)
Respect	Weighted-frequency count of respect-related words in the QA section of earnings calls averaged over a 3-year window.	Li *et al.* (2021)
Quality	Weighted-frequency count of quality-related words in the QA section of earnings calls averaged over a 3-year window.	Li *et al.* (2021)
Corp_Culture	The average of five cultural values of a firm.	Authors' calculation
Strong_Culture	An indicator variable that takes the value of one if the average of a firm's five cultural values is in the top quartile in a year, and zero otherwise.	Authors' calculation
Culture_Ind_Adj	The industry-adjusted culture values, measured as the difference between firm-level culture values and the average culture values of the industry that a firm belongs to.	Authors' calculation
Firm-specific characteristics		
Size	The logarithm of firm size which is measured by total assets.	Compustat
Leverage	The ratio of total debt to book assets.	Compustat
Advertising_dummy	An indicator variable that takes the value of one if the firm has advertising expenses, and zero otherwise.	Compustat

RD_dummy	An indicator variable that takes the value of one if the firm has research and development expenses, and zero otherwise.	Compustat
Price_Inv	The inverse of the mean daily stock's price over year t. It is the difference between price and marginal cost divided by the price.	CRSP
Dollar_vol	The average dollar trading volume (in millions) of firm over the year.	CRSP
Ivol	The standard deviation of OLS regression residuals where the excess daily return of firm's stock is regressed on the Fama-French-Carhart four factors. The OLS regressions are estimated over one year.	CRSP
Analysts	The natural logarithm of 1 plus the average number of analysts following the company during the year.	I/B/E/S
Institution	Institutional ownership computed as the fraction of its outstanding common shares owned by all 13F reporting institutions.	Thompson Reuters Institutional 13F
Age	The number of years listed on Compustat.	Compustat
Other variables		
Abs_Accruals	The absolute discretionary accruals estimated following Dechow *et al.* (1995).	Compustat
Opacity	Financial reporting opacity, measured as a three-year moving sum of absolute discretionary accruals, where discretionary accruals are estimated with the modified Jones (1991) model, following Dechow *et al.* (1995).	Compustat Hutton *et al.* (2009)
ARC	The accounting reporting complexity, the natural log of the total number of distinct monetary XBRL tags in Item 8 of the 10-K filings.	Calcbench
CSR5	CSR rating based on five categories: community, diversity, employee relations, human right, and product.	KLD
CSR6	CSR rating based on six categories: community, diversity, employee relations, human right, product, and environment.	KLD
Abs_Car2	The absolute value of cumulative abnormal returns during the two-day window surround earnings announcement.	Compustat, CRSP
Abs_Car3	The absolute value of cumulative abnormal returns during the three-day window surround earnings announcement.	Compustat, CRSP
Abs_Car5	The absolute value of cumulative abnormal returns during the five-day window surround earnings announcement.	Compustat, CRSP
Sue	Standardized unexpected earnings, measured as seasonally adjusted quarterly earnings per share divided by the share price at the end of the quarter, following Livnat and Mendenhall (2006).	I/B/E/S, CRSP, Compustat

Q4	An indicator for the firm's fiscal fourth quarter.	Compustat
IO_breadth	The natural logarithm of the total number of institutional investors owning the firm's stocks from 13F fillings.	Thompson Reuters Institutional 13F
Media_coverage	The natural logarithm of the number of stories in articles related to a firm.	Thomson Reuters News Analytics (TRNA).
Media_tone	The difference between weighted-average positive and negative stories related to a firm.	Thomson Reuters News Analytics (TRNA).
Fin_constraint	KZ index estimated following Kaplan and Zingales (1997).	Compustat
Fin_distress	The Altman's Z-score.	Compustat
Non-sync	Price non-synchronicity, measured by the stock return variation, following Durnev *et al.* (2004).	Compustat, CRSP
Edf	Expected default frequency estimated following Bharath and Shumway (2008).	Compustat, CRSP
Gpin	Generalized informed trading probability, following Duarte *et al.* (2020).	Duarte *et al.* (2020)

Appendix A.2: Sensitivity analysis

This table presents the outcome (treatment effects estimates) of the propensity score matching approach, which is the difference in stock liquidity between firms with strong corporate cultural scores and their counterparts, and Rosenbaum sensitivity analysis. For each of the stock liquidity measures (*Liq_Amihud* and *Liq_FHT),* we calculate the average treatment effects (*ATT*) from the propensity score matching method in Section 4.2.1. We present the cut-off Γ value at which the treatment effects become insignificant at the 5% and 10% levels for *Liq_Amihud* and *Liq_FHT. t*-statistics are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions are in Appendix A1.

Outcome	*Liq_Amihud*	*Liq_FHT*
ATT	0.7667***	0.1117***
t-stat	(17.49)	(5.66)
Cut-off Γ value (*p*=5%)	1.70	1.14
Cut-off Γ value (*p*=10%)	1.72	1.16

Appendix A.3: Placebo test

This table presents the results for placebo tests, including the estimated coefficients and t-statistics of *pseudo-Strong_Culture* on stock liquidity, measured by *Liq_Amihud* and *Liq_FHT.* For each firm each year, we create a *pseudo-Strong_Culture* by randomly assigning dummy values one and zero. We then replace *Strong_Culture* with *pseudo-Strong_Culture* in the baseline models and repeat the process 1000 times and 2000 times. *Strong_Culture* is the dummy variable that takes the value of one if the average of a firm's five cultural values is in the top quartile in a year, and zero otherwise. *t*-statistics computed using standard errors clustered at firm and year level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions are in Appendix A1.

	Actual	*Pseudo-Strong_Culture*		*Pseudo-Strong_Culture* with mean below 0.25	
	(1)	(2)	(3)	(4)	(5)
Coefficient of *Strong_Culture*		1,000 times	2,000 times	1,000 times	2,000 times
in *Liq_Amihud* model	0.1145***	-0.0002	0.0000	0.0003	0.0002
in *Liq_FHT* model	0.0312***	0.0000	-0.0002	-0.0001	0.0002
t-statistics of *Strong_Culture*		1,000 times	2,000 times	1,000 times	2,000 times
in *Liq_Amihud* model	(6.08)	(-0.03)	(0.00)	(0.03)	(0.02)
in *Liq_FHT* model	(4.61)	(-0.00)	(-0.04)	(-0.03)	(0.03)

Appendix A.4: Firm characteristics and the effect of corporate culture

This table presents the effects of corporate culture (denoted *Corp_Culture*) on stock liquidity with the effects of firm characteristics. We use the interaction terms between *Corp_Culture* and firm characteristics variables (*Size, Leverage, Advertising_dummy, RD_dummy, Analysts, Institution,* and *Age*) to capture the effects of the corporate culture on stock liquidity conditioned on firm characteristics. Constant term, year-fixed effect, and industry-fixed effect based on two-digit SIC are included. *t*-statistics computed using standard errors clustered at firm and year level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions are in Appendix A1.

	Liq_Amihud	*Liq_FHT*
	(1)	(2)
Corp_Culture	0.4175***	0.0734*
	(4.91)	(1.75)
Corp_Culture × *Size*	-0.0521***	-0.0016
	(-3.23)	(-0.22)
Corp_Culture × *Leverage*	0.2208***	0.1040***
	(2.86)	(3.11)
Corp_Culture × *Advertising_dummy*	-0.0039	-0.0177
	(-0.12)	(-1.09)
Corp_Culture × *RD_dummy*	0.0307	0.0078
	(0.79)	(0.58)
Corp_Culture × *Analysts*	0.0671*	0.0240**
	(1.90)	(2.16)
Corp_Culture × *Institution*	-0.0912	-0.1222***
	(-1.36)	(-3.10)
Corp_Culture × *Age*	-0.0030**	-0.0005
	(-2.05)	(-0.85)
Controls	Yes	Yes
Industry and Year FE	Yes	Yes
S.E. clustered	Firm, Year	Firm, Year
Observations	48,785	43,912
Adj R-squared	0.8513	0.6744

Appendix A.5: The effect of abnormal culture on stock liquidity

This table presents the effects of abnormal culture, as an alternative measure of corporate culture, on stock liquidity. For each firm year, we calculate the abnormal culture value as the difference between the culture of firm *i* in year *y* and the average culture value of that firm over the last 5 years. *Abnormal_Culture* is an indicator that takes the value one if the abnormal culture value of firm *i* in year *y* is above the average abnormal culture, and zero otherwise. Constant term, year-fixed effect, and industry-fixed effect based on two-digit SIC are included. *t*-statistics computed using standard errors clustered at firm and year level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variable: Liquidity measure	
	Liq_Amihud	*Liq_FHT*
	(1)	(2)
Abnormal_Culture	0.0487***	0.0230***
	(3.54)	(5.54)
Size	0.5253***	0.0704***
	(21.49)	(9.26)
Leverage	-0.3252***	-0.1267***
	(-5.10)	(-5.39)
Advertising_dummy	0.0630**	-0.0125
	(2.49)	(-1.38)
RD_dummy	0.2317***	0.0594***
	(7.79)	(6.11)
Price_Inv	-11.1008***	-11.2910***
	(-27.62)	(-43.26)
Dollar_vol	0.0034***	-0.0000
	(10.04)	(-0.22)
Ivol	-10.7077***	-18.1708***
	(-3.09)	(-31.96)
Analysts	0.9087***	0.0876***
	(28.86)	(10.70)
Institution	0.8682***	0.0748***
	(8.99)	(3.76)
Age	0.0057***	0.0015***
	(4.75)	(3.87)
Industry and Year FE	Yes	Yes
S.E. clustered	Firm, Year	Firm, Year
Observations	48,785	43,912
Adj R-squared	0.850	0.674

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GRADUATE RESEARCH SCHOOL

STATEMENT OF CONTRIBUTION
DOCTORATE WITH PUBLICATIONS/MANUSCRIPTS

We, the student and the student's main supervisor, certify that all co-authors have consented to their work being included in the thesis and they have accepted the student's contribution as indicated below in the Statement of Originality.

Student name:	Thanh Le Thanh Tran
Name and title of main supervisor:	Associate Professor Harvey Nguyen
In which chapter is the manuscript/published work?	Essay One in Chapter 2

Describe the contribution that the student and members of the supervisory team have made to the manuscript/published work:[1]

Thanh, Harvey, and Mia discussed and agreed on the topic for Essay One. Thanh handled the datasets and conducted the empirical analyses. In fortnightly meetings, Harvey and Mia reviewed her result findings and provided suggestions for improvement. Thanh wrote the initial draft paper. The whole team revised the paper for journal submission.

Please select one of the following three options:

(●) **The manuscript/published work is published or in press**

Please provide the full reference of the research output:

Tran, T., Nguyen, H., & Pham, M. H. (2025). Do financial markets value corporate culture?. International Review of Financial Analysis, 98, 103823.

( ) **The manuscript is currently under review for publication**

Please provide the name of the journal:

( ) **It is intended that the manuscript will be published, but it has not yet been submitted to a journal**

Student's signature:	Thanh Tran Digitally signed by Thanh Tran Date: 2025.12.05 18:31:09 +13'00'	Main supervisor's signature:	Harvey Nguyen Digitally signed by Harvey Nguyen DN: cn=Harvey Nguyen, c=NZ, o=Massey University, email=h.nguyen3@massey.ac.nz Date: 2025.12.01 16:11:47 +13'00'

This form should be placed at the beginning of each relevant thesis chapter.

[1] Refer to the Massey University Publishing and Authorship guidelines (OneMassey for staff, Stream for students) and/ or Contributor Roles Taxonomy (CRediT) guidelines for guidance.

APPENDIX B FOR CHAPTER 3

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Section B.4: Before and after dynamic test of the propensity score matching.

In this Appendix, we test the differences in the mean value of matching firm characteristics between the treated and the control groups in the propensity score matching and the logit model results to create the propensity score before and after matching. Appendix B4 reports the results. The *t*-statistics in Columns (2) and (4) of Panel A show that the means of characteristics between the treated and control groups are significantly different before applying propensity score matching and become insignificant after matching. This result means that there is no significant difference in firm-specific characteristics between the two groups after matching. Columns (1) and (2) in Panel B report the logit model results to create the propensity score before and after matching, which is used to match the groups. The logit regression results show that there is no significant relationship between firm characteristics and the *COW* variable after matching.

Section B.5: Before and after dynamic test of the entropy balancing.

In this Appendix, we test the differences in the mean value of matching firm characteristics between the treated and the control groups in the entropy balancing and the logit model results after balancing. Appendix B5 reports the results. The t-statistics in Columns (2) and (4) of Panel A show that the means of characteristics between the treated and control groups are significantly different before applying the entropy balancing and become insignificant after balancing. This result means that there is no significant difference in firm-specific characteristics between the two groups after applying a balancing approach. Columns (1) and (2) in Panel B report the logit model results to create the matching score before and after balancing, which is used to match the groups. The logit regression results show that there is no significant relationship between firm characteristics and the *COW* variable after balancing.

Appendix B.1: Variable descriptions

Variables	Definitions	Sources
Corporate opportunities waiver (COW) measures		
COW	Indicator variable that equals 1 for the year in which the waiver from the corporate opportunity doctrine is effective in a firm's state of incorporation, and 0 otherwise.	Fich *et al.* (2023) Authors' estimation
COW_DE	Indicator variable that equals 1 for the year in which the waiver from the corporate opportunity doctrine is effective in a firm's state of incorporation and firm's state of incorporation is Delaware, and 0 otherwise.	Fich *et al.* (2023) Authors' estimation
COW_nonDE	Indicator variable that equals 1 for the year in which the waiver from the corporate opportunity doctrine is effective in a firm's state of incorporation and firm's state of incorporation is not Delaware, and 0 otherwise.	Fich *et al.* (2023) Authors' estimation
COW(-2)	Indicator variable that equals 1 for the year in which the waiver from the corporate opportunity doctrine is effective in a firm's state of incorporation in two years later, and 0 otherwise.	Fich *et al.* (2023) Authors' estimation
COW(-1)	Indicator variable that equals 1 for the year in which the waiver from the corporate opportunity doctrine is effective in a firm's state of incorporation in one year later, and 0 otherwise.	Fich *et al.* (2023) Authors' estimation
COW(0)	Indicator variable that equals 1 for the year in which the waiver from the corporate opportunity doctrine is effective in a firm's state of incorporation in the current year, and 0 otherwise.	Fich *et al.* (2023) Authors' estimation
COW(1+)	Indicator variable that equals 1 for the year in which the waiver from the corporate opportunity doctrine is effective in a firm's state of incorporation 1 and more years ago, and 0 otherwise.	Fich *et al.* (2023) Authors' estimation
Stock price crash risk measures		
NSKEW	The negative skewness of firm-specific weekly returns over the fiscal year period. This is the ratio of the third moment of firm-specific weekly returns over the standard deviation of firm-specific weekly returns raised to the third power and then multiplied by -1.	CRSP
DUVOL	The natural logarithm of the ratio of the standard deviation of firm-specific weekly returns in down weeks to the standard deviation in up weeks, where down (up) weeks are weeks with firm-specific weekly returns below (above) the annual mean.	CRSP
CRASH_below	The logarithm of the number of weekly returns that are 3.09 or more standard deviations below the mean firm-specific weekly returns in a fiscal year.	CRSP
CRASH_above	The logarithm of the number of weekly returns that are 3.09 or more standard deviations above the mean firm-specific weekly returns in a fiscal year.	CRSP
CRASH_net	The ratio of (*CRASH_below - CRASH_above)* divided by *(CRASH_below + CRASH_above)*	CRSP

Firm-specific characteristics		
Lnsize	The logarithm of firm size which is measured by total assets.	Compustat
Inv_highlow	The high-low spread is defined as high (1+spread/2)/low(1+spread/2), measured over a month. Yearly high-low spread=average monthly high-low spread.	CRSP
Sigma	The standard deviation of firm-specific weekly returns over the fiscal year period.	CRSP
Return	The mean of firm-specific weekly returns over the fiscal year period.	CRSP
Dturn	The average monthly share turnover over the current fiscal year period minus the average monthly share turnover over the previous fiscal year period, where monthly share turnover is calculated as the monthly trading volume divided by the total number of shares outstanding during the month.	CRSP
Leverage	The ratio of total debt to book assets.	Compustat
Mtbe	The market value of equity divided by the book value of equity.	Compustat
Roa	Income before extraordinary items divided by lagged total assets.	Compustat
Accm	Financial reporting opacity, measured as a three-year moving sum of absolute discretionary accruals, where discretionary accruals are estimated with the modified Jones (1991) model, following Dechow *et al.* (1995).	Compustat
Age	The number of years listed on Compustat.	Compustat
Other state-law variables		
CS_law	Indicator variable that equals 1 for the year in which the control share acquisition law is effective in a firm's state of incorporation, and 0 otherwise.	Karpoff and Wittry (2018)
BC_law	Indicator variable that equals 1 for the year in which the business combination law is effective in a firm's state of incorporation, and 0 otherwise.	Karpoff and Wittry (2018)
FP_law	Indicator variable that equals 1 for the year in which the fair price law is effective in a firm's state of incorporation, and 0 otherwise.	Karpoff and Wittry (2018)
DD_law	Indicator variable that equals 1 for the year in which the directors' duties law is effective in a firm's state of incorporation, and 0 otherwise.	Karpoff and Wittry (2018)
PP_law	Indicator variable that equals 1 for the year in which the poison pill law is effective in a firm's state of incorporation, and 0 otherwise.	Karpoff and Wittry (2018)
Other variables		
Opacity	Indicator variable that equals 1 if financial reporting opacity is higher than a state's average value, and 0 otherwise.	Compustat

Analyst	Indicator variable that equals 1 if the natural logarithm of 1 plus the number of analysts of firm is higher than a state's average value, and 0 otherwise.	I/B/E/S
Institution	Indicator variable that equals 1 if institutional ownership measured by the fraction of its outstanding common shares is higher than a state's average value, and 0 otherwise.	Thompson Reuters Institutional 13F
Highlow	The high-low spread is defined as high (1+spread/2)/low(1+spread/2), measured over a month. Yearly high-low spread=average monthly high-low spread, developed by Corwin and Schultz (2012).	CRSP
Zeros	The ratio of zero trading days and the total observable days developed by Lesmond *et al.* (1999).	CRSP
Edge	The effective spread (Edge), developed by Ardia *et al.* (2021).	Ardia *et al.* (2021)
CHL	The close-high-low spread (CHL) measuring the spread at the close price, developed by Abdi and Ranaldo (2017)	Ardia *et al.* (2021)
HJ	the effective spread computed with respect to the quoted midpoint (HJ), developed by Holden and Jacobsen (2014).	Ardia *et al.* (2021)
Gpin	The generalized informed trading probability, following Duarte *et al.* (2020).	Duarte *et al.* (2020)
Gpin_indus	The industry-adjusted generalized probability of informed trading	Duarte *et al.* (2020) Authors' estimation
Price_delay	The price delay measure proposed by Hou and Moskowitz (2005), defined as 1- (R-squared for the restricted model/R-squared of the non-restricted model).	CRSP, Compustat
Price_delay_indus	The industry-adjusted price delay measure, as the difference between firm-level price delay and the average price delay of the industry that a firm belongs to.	CRSP, Compustat
Misprice_3	Indicator variable that equals 1 for the MISP (stock mispricing score) value is in the top and bottom tertile, and 0 otherwise.	Stambaugh *et al.* (2015) Authors' estimation
Misprice_4	Indicator variable that equals 1 for the MISP (stock mispricing score) value is in the top and bottom quartile, and 0 otherwise.	Stambaugh *et al.* (2015) Authors' estimation
Misprice_5	Indicator variable that equals 1 for the MISP (stock mispricing score) value is in the top and bottom quintile, and 0 otherwise.	Stambaugh *et al.* (2015) Authors' estimation
Misprice_10	Indicator variable that equals 1 for the MISP (stock mispricing score) value is in the top and bottom decile, and 0 otherwise.	Stambaugh *et al.* (2015) Authors' estimation
AUDIT_FEE	The natural logarithm of audit fee	

Appendix B.2: Corporate Opportunities Waiver (COW) Law effective date across States

This table reports the effective date of the COW law in each state. Data are from Rauterberg and Talley (2017).

State	COW law effective date
Delaware	01 July 2000
Oklahoma	01 November 2001
Missouri	01 October 2003
Kansas	01 January 2005
Texas	01 January 2006
Nevada	01 October 2007
New Jersey	11 March 2011
Maryland	01 October 2014
Washington	01 January 2016

Appendix B.3: Sample distribution

This table presents the sample distributions. Panel A shows the sample distribution by year. Panel B shows the sample distribution by the state of incorporation. The sample of 84,000 firm-year observations, covering 9,297 unique firms from 1990 to 2019.

Panel A: By year

Year	Obs.	%	Year	Obs.	%	Year	Obs.	%
1990	389	0.46	2000	3633	4.33	2010	2526	3.01
1991	2340	2.79	2001	3399	4.05	2011	2435	2.90
1992	2570	3.06	2002	3482	4.15	2012	2394	2.85
1993	3052	3.63	2003	3269	3.89	2013	2347	2.79
1994	3182	3.79	2004	3151	3.75	2014	2326	2.77
1995	3346	3.98	2005	2969	3.53	2015	2319	2.76
1996	3587	4.27	2006	2898	3.45	2016	2336	2.78
1997	3660	4.36	2007	2777	3.31	2017	2326	2.77
1998	3610	4.30	2008	2700	3.21	2018	2278	2.71
1999	3804	4.53	2009	2646	3.15	2019	2249	2.68
Total	84,000	100						

Panel B: By state

State	Obs.	%	State	Obs.	**%**	State	Obs.	**%**
Alaska	25	0.03	Kentucky	81	0.10	Ohio	1825	2.17
Alabama	44	0.05	Louisiana	194	0.23	Oklahoma	240	0.29
Arkansas	43	0.05	Massachusetts	1493	1.78	Oregon	647	0.77
American Samoa	1	0.00	Maryland	862	1.03	Pennsylvania	1702	2.03
Arizona	116	0.14	Maine	36	0.04	Puerto Rico	31	0.04
California	1884	2.24	Michigan	770	0.92	Rhode Island	102	0.12
Colorado	709	0.84	Minnesota	2191	2.61	South Carolina	191	0.23
Connecticut	253	0.30	Missouri	451	0.54	South Dakota	57	0.07
District of Columbia	9	0.01	Mississippi	45	0.05	Tennessee	516	0.61
Delaware	53003	63.1	Montana	22	0.03	Texas	1334	1.59
Florida	1592	1.90	North Carolina	563	0.67	Utah	385	0.46
Georgia	913	1.09	North Dakota	10	0.01	Virginia	1035	1.23
Hawaii	32	0.04	Nebraska	85	0.10	Vermont	26	0.03
Iowa	182	0.22	New Hampshire	5	0.01	Washington	864	1.03
Idaho	10	0.01	New Jersey	1032	1.23	Wisconsin	986	1.17
Illinois	316	0.38	New Mexico	20	0.02	West Virginia	20	0.02
Indiana	859	1.02	Nevada	2153	2.56	Wyoming	46	0.05
Kansas	131	0.16	New York	2369	2.82	Others	1489	1.77
Total	84,000	100						

Appendix B.4. Before and after dynamic test of the propensity score matching

This table presents the before and after dynamic test of the propensity score matching. Crash risk is measured by *NSKEW* and *DUVOL*. *COW* equals 1 for firms in the adopted COW law state in the post-COW law periods, and 0 otherwise. The treated group (i.e., firms incorporating in the states adopting COW law) and the control group (i.e., firms incorporating in the states non-adopting COW law) are matched based on all control variables, industry, and year in one-year prior COW law adopted. We use the nearest neighboring method with level less than 0.01% and non-replacement method. Panel A reports the differences in means of firm characteristics between treatment and control groups. Panel B reports the logit regression before and after matching. Firm fixed effects, headquarter state fixed effects, and year fixed effects are included. *T*-statistics computed using standard errors clustered at the state of incorporation level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions and data sources are in Appendix B1.

Panel A: Differences in mean of characteristics

	Before matching		After matching	
	Difference	*T*-statistics	Difference	*T*-statistics
	(1)	(2)	(3)	(4)
Inv_highlow	-0.06***	(-10.52)	-0.01	(-0.36)
Nskew	-0.03***	(-5.46)	-0.03	(-1.43)
Lnsize	-0.37***	(-23.52)	-0.01	(-0.14)
Sigma	-0.01***	(-16.83)	0.00	(0.00)
Return	0.05***	(14.23)	0.00	(0.01)
Dturn	0.00*	(-1.74)	0.00	(0.07)
Leverage	-0.03***	(-18.88)	0.00	(-0.20)
Mtbe	-0.49***	(-13.00)	0.02	(0.15)
Roa	0.05***	(25.06)	0.00	(0.24)
Accm	-0.09***	(-21.06)	0.01	(0.61)
Age	0.27***	(43.03)	-0.01	(-0.49)

Panel B: Logit model before and after matching

	COW	*COW*
	(1)	(2)
Inv_highlow	0.7096***	0.0324
	(15.32)	(0.49)
Nskew	-0.0900***	0.0609
	(-3.02)	(1.44)
Lnsize	0.0338*	-0.0100
	(1.92)	(-0.42)
Sigma	33.8197***	0.0853
	(16.28)	(0.03)
Return	1.9013***	-0.0202
	(11.03)	(-0.09)
Dturn	-0.4170*	-0.0457
	(-1.92)	(-0.15)
Leverage	0.8747***	0.0402
	(7.58)	(0.25)
Mtbe	0.0155***	-0.0007
	(3.54)	(-0.11)
Roa	-0.4176***	-0.0548
	(-4.66)	(-0.41)
Accm	-0.4621***	-0.0448
	(-9.17)	(-0.68)
Age	-0.7166***	0.0175
	(-24.68)	(0.43)
Firm fixed effects	Yes	Yes
Industry × Year fixed effects	Yes	Yes
State × Year fixed effects	Yes	Yes
S.E. clustered	State	State
Observations	26,347	4,470
Adjusted R^2	0.0956	0.0005

Appendix B.5: Before and after dynamic test of the entropy balancing

This table presents before and after dynamic tests of the entropy balancing. Crash risk is measured by *NSKEW* and *DUVOL*. *COW* equals 1 for firms in the adopted COW law state in the post-COW law periods, and 0 otherwise. The treated group (i.e., firms incorporating in the states adopting COW law) and the control group (i.e., firms incorporating in the states non-adopting COW law) are matched based on all control variables, industry, and year in one-year prior COW law adopted with entropy balancing method. Panel A reports the differences in means of firm characteristics between treatment and control groups. Panel B reports the logit regression before and after balancing. Firm fixed effects, headquarter state fixed effects, and year fixed effects. are included. *T*-statistics computed using standard errors clustered at the state of incorporation level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions and data sources are in Appendix B1.

Panel A: Differences in mean of characteristics

	Before balancing		After balancing	
	Difference	*T*-statistics	Difference	*T*-statistics
	(1)	(2)	(3)	(4)
Inv_highlow	-0.06***	(-10.52)	-0.0001	(-0.01)
Nskew	-0.03***	(-5.46)	-0.0001	(-0.00)
Lnsize	-0.37***	(-23.52)	-0.0003	(-0.01)
Sigma	-0.01***	(-16.83)	0.0000	(0.02)
Return	0.05***	(14.23)	-0.0002	(-0.02)
Dturn	0.00*	(-1.74)	0.0000	(0.00)
Leverage	-0.03***	(-18.88)	0.0000	(0.00)
Mtbe	-0.49***	(-13.00)	0.0004	(0.00)
Roa	0.05***	(25.06)	-0.0001	(-0.01)
Accm	-0.09***	(-21.06)	-0.0001	(-0.01)
Age	0.27***	(43.03)	-0.0006	(-0.03)

Panel B: Logit model before and after matching

	COW	*COW*
	(1)	(2)
Inv_highlow	0.7096***	0.0005
	(15.32)	(0.01)
Nskew	-0.0900***	-0.0003
	(-3.02)	(-0.01)
Lnsize	0.0338*	0.0001
	(1.92)	(0.00)
Sigma	33.8197***	0.0574
	(16.28)	(0.03)
Return	1.9013***	0.0037
	(11.03)	(0.02)
Dturn	-0.4170*	-0.0001
	(-1.92)	(-0.00)
Leverage	0.8747***	0.0002
	(7.58)	(0.00)
Mtbe	0.0155***	0.0000
	(3.54)	(0.00)
Roa	-0.4176***	-0.0003
	(-4.66)	(-0.00)
Accm	-0.4621***	-0.0010
	(-9.17)	(-0.02)
Age	-0.7166***	-0.0007
	(-24.68)	(-0.02)
Firm fixed effects	Yes	Yes
Industry × Year fixed effects	Yes	Yes
State × Year fixed effects	Yes	Yes
S.E. clustered	State	State
Observations	26,347	26,347

APPENDIX C FOR CHAPTER 4

Table of Content

Section C.5: Before and after dynamic test of the propensity score matching.

In this Appendix, we test the differences in the mean value of matching firm characteristics between the treated and the control groups in the propensity score matching and the logit model results to create the propensity score before and after matching. Appendix C5 reports the results. The *t*-statistics in Columns (2) and (4) of Panel A show that the means of characteristics between the treated and control groups are significantly different before applying propensity score matching and become insignificant after matching. This result means that there is no significant difference in firm-specific characteristics between the two groups after matching. Columns (1) and (2) in Panel B report the logit model results to create the propensity score before and after matching, which is used to match the groups. The logit regression results show that there is no significant relationship between firm characteristics and the *COW* variable after matching.

Section C.6: Before and after dynamic test of the entropy balancing.

In this Appendix, we test the differences in the mean value of matching firm characteristics between the treated and the control groups in the entropy balancing and the logit model results after balancing. Appendix C6 reports the results. The t-statistics in Columns (2) and (4) of Panel A show that the means of characteristics between the treated and control groups are significantly different before applying the entropy balancing and become insignificant after balancing. This result means that there is no significant difference in firm-specific characteristics between the two groups after applying a balancing approach. Columns (1) and (2) in Panel B report the logit model results to create the matching score before and after balancing, which is used to match the groups. The logit regression results show that there is no significant relationship between firm characteristics and the *COW* variable after balancing.

Appendix C.1: Variable description

Variables	Definitions	Sources/ Key references
Implied cost of equity measures		
COC_AVG	The average of four implied cost of equity measures based on four methods: (1) Gebhardt et al. (2001) method, (2) Easton (2004) method, (3) Ohlson and Juettner-Nauroth (2005) method, and (4) Claus and Thomas (2001) method.	Naiker *et al.* (2013), Dahliwal *et al.* (2016)
COC_GLS	The implied cost of equity estimated based on the Gebhardt *et al.* (2001) method.	Gebhardt *et al.* (2001)
COC_Easton	The implied cost of equity estimated based on the Easton (2004) method.	Easton (2004)
COC_OJ	The implied cost of equity estimated based on the Ohlson and Juettner-Nauroth (2005) method.	Ohlson & Juettner-Nauroth (2005)
COC_CT	The implied cost of equity capital is based on the Claus and Thomas (2001) method.	Claus & Thomas (2001)
FICC	The implied cost of equity developed in Lee *et al.* (2021), estimated by regressing the *COC* measure on three firm characteristics: size, book-to-market ratio, and momentum.	Lee *et al.* (2021)
Corporate opportunities waiver (COW) measures		
COW	The indicator variable that equals 1 for the year in which the waiver from the corporate opportunity doctrine is effective in a firm's state of incorporation, and 0 otherwise.	Rauterberg and Talley 2017
COW_DE	The indicator variable equals 1 for the year in which the waiver from the corporate opportunity doctrine is effective in a firm's state of incorporation and the firm's state of incorporation is Delaware, and 0 otherwise.	Authors' estimation
COW_nonDE	The indicator variable that equals 1 for the year in which the waiver from the corporate opportunity doctrine is effective in a firm's state of incorporation and the firm's state of incorporation is not Delaware, and 0 otherwise.	Authors' estimation
Firm-specific characteristics		
Lnsize	The logarithm of firm size, which is measured by total assets.	Compustat
Leverage	The ratio of total debt to book assets.	Compustat
Btme	The market value of equity divided by the book value of equity.	Compustat
Roa	The ratio of income before extraordinary items divided by lagged total assets.	Compustat
Ivol	The standard deviation of OLS regression residuals where the excess daily return of a firm's stock is regressed on the Fama-French-Carhart four factors. The OLS regressions are estimated over one year.	CRSP

Brm	The term Beta is a proxy for a firm's systematic risk estimated by the market model using daily returns from the previous 12 months.	CRSP
Return	The stock return of 12 months.	CRSP
Dispersion	The standard deviation of analysts' 1-year-ahead earnings per share (EPS) forecasts.	I/B/E/S
Ltg	The median analysts' long-term growth forecast.	I/B/E/S
Other state-law variables		
CS_law	The indicator variable that equals 1 for the year in which the control share acquisition law is effective in a firm's state of incorporation, and 0 otherwise.	Karpoff and Wittry (2018)
BC_law	The indicator variable that equals 1 for the year in which the business combination law is effective in a firm's state of incorporation, and 0 otherwise.	Karpoff and Wittry (2018)
FP_law	The indicator variable that equals 1 for the year in which the fair price law is effective in a firm's state of incorporation, and 0 otherwise.	Karpoff and Wittry (2018)
DD_law	The indicator variable that equals 1 for the year in which the directors' duties law is effective in a firm's state of incorporation, and 0 otherwise.	Karpoff and Wittry (2018)
PP_law	The indicator variable that equals 1 for the year in which the poison pill law is effective in a firm's state of incorporation, and 0 otherwise.	Karpoff and Wittry (2018)
Other variables		
Retvol	An indicator variable that equals 1 if return volatility is higher than a state's average value, and 0 otherwise.	CRSP
CFvol	An indicator variable that equals 1 if cash flow volatility is higher than a state's average value, and 0 otherwise.	Compustat
Bid-ask	An indicator variable that equals 1 if the bid-ask spread, measured following Corwin and Schultz (2012), is higher than a state's average value, and 0 otherwise.	CRSP
Abacc	An indicator variable that equals 1 if abnormal accruals, estimated following the model of Jones (1991), are higher than a state's average value, and 0 otherwise.	Compustat
Accm	An indicator variable that equals 1 if financial reporting opacity, measured following Hutton, Marcus, and Tehranian (2009), is higher than a state's average value, and 0 otherwise.	Compustat

Appendix C.2: Implied cost of equity measures

1. GLS measure developed by Gebhardt *et al.* (2001)

Gebhardt *et al.* (2001) estimate the firm-level implied cost of equity capital based on the market-implied cost of equity derived from the discounted residual income model. The *GLS* measure is calculated as follows:

$$P_t = B_t + \frac{FROE_{t+2} - r_{GLS}}{(1 + r_{GLS})^2} B_{t+1} + TV, \tag{1}$$

$$B_{t+i} = B_{t+i-1} + FEPS_{t+i} - FDPS_{t+i}, \tag{2}$$

$$TV = \sum_{i=3}^{T-1} \frac{FROE_{t+i} - r_{GLS}}{(1 + r_{GLS})^2} B_{t+i-1} + \frac{FROE_{t+T} - r_{GLS}}{r_{GLS}(1 + r_{GLS})^{T-1}} B_{t+T-1}, \tag{3}$$

where r_{GLS} is the *GLS* cost of equity measure. P_t is the price per share of a firm's common stock at the end of June of year *t*. B_t and B_{t+i-1} is the book value of equity from the most recently available financial statement in year *t* scaled by the number of common shares outstanding in June of year *t* and year *t+i-1*. $FROE_{t+i}$ is the forecasted return on equity (ROE) for year *t+1*.[57] $FEPS_{t+i}$ is the forecasted earnings per share (EPS) for year *t+i*. $FDPS_{t+i}$ is the forecasted dividend per share for year *t+i*. TV is the terminal value. *T* is the forecast time horizon, which equals 12.

2. CT measure developed by Claus and Thomas (2001)

Claus and Thomas (2001) estimate the equity premium using the discount rate that equates market valuations with prevailing expectations of future flows. The *CT* measure is calculated as follows:

$$P_t = B_t + \sum_{i=1}^{5} \frac{AE_{t+i}}{(1 + r_{CT})^i} + \frac{AE_{t+5}(1 + G_{AE})}{(r_{CT} - G_{AE})(1 + r_{CT})^5}, \tag{4}$$

$$AE_{t+i} = FEPS_{t+i} - r_{CT} \times B_{t+i-1}, \tag{5}$$

where r_{CT} is the *CT* cost of equity measure. AE_{t+i} is the expected abnormal earnings for year *t*. G_{AE} is the growth rate of abnormal earnings beyond year *t+5*, which equals the risk-free rate (the yield on a 10-year Treasury note in June of year *t*) minus 3%.

3. Easton measure developed by Easton (2004)

Easton (2004) develops the model to estimate the expected rate of return on equity capital based on the earnings and earnings growth models. The *Easton* measure is calculated as follows:

$$P_t = \frac{FEPS_{t+2} + r_{Easton} \times DPS_{t+1} - FEPS_{t+1}}{r_{Easton}^2}, \tag{6}$$

[57] For the first three years, $FROE_{t+i} = FEPS_{t+1}/B_{t+i-1}$. After three years, $FROE_{t+i}$ is a linear interpolation to the industry median ROE.

where r_{Easton} is the *Easton* cost of equity measure. DPS_{t+1} is the dividends per share in year *t+1*. This model requires $FEPS_{t+2} \geq FEPS_{t+1} > 0$.

4. OJ measure developed by Ohlson and Juettner-Nauroth (2005)

Ohlson and Juettner-Nauroth (2005) estimate the cost of equity by developing a model that relates to the earnings per share and the growth rate of earnings per share. The *OJ* measure is calculated as follows:

$$r_{OJ} = A + \sqrt{A^2 + \left(\frac{FEPS_{t+1}}{P_t}\right)\left(g_2 - (r_f - 3\%)\right)}, \quad (7)$$

$$A = 0.5\left(\left(r_f - 3\%\right) + \frac{DPS_{t+1}}{P_t}\right), \quad (8)$$

where r_{OJ} is the OJ cost of equity measure. g_2 is the short-term earnings growth rate. [58] This model requires $FEPS_{t+2} > 0$ and $FEPS_{t+1} > 0$.

Appendix C.3: Corporate Opportunities Waiver (COW) Law effective date across States

This table reports the effective date of the COW law in each state. Data are from Rauterberg and Talley (2017).

State	COW law effective date
Delaware	01 July 2000
Oklahoma	01 November 2001
Missouri	01 October 2003
Kansas	01 January 2005
Texas	01 January 2006
Nevada	01 October 2007
New Jersey	11 March 2011
Maryland	01 October 2014
Washington	01 January 2016

[58] g_2 equals the consensus long-term earnings growth forecast when available; otherwise, $\frac{FEPS_{t+2}}{FEPS_{t+1}} - 1$.

Appendix C.4: Sample distribution

This table presents the sample distributions. Panel A shows the sample distribution by year. Panel B shows the sample distribution by the state of incorporation. The sample of 22,022 firm-year observations, covering 2,626 unique firms from 1983 to 2018.

Panel A: By year						Panel B: By State of incorporation							
Year	Obs.	%	Year	Obs.	%	State	Obs.	%	State	Obs.	%	State	Obs.	%
1983	246	1.76	2001	706	2.95	Alabama	15	0.07	Michigan	242	1.10	Texas	282	1.28
1984	383	1.85	2002	653	3.34	Arkansas	44	0.20	Missouri	256	1.16	Tennessee	239	1.09
1985	388	1.79	2003	649	3.76	Arizona	14	0.06	Mississippi	10	0.05	Utah	128	0.58
1986	407	1.76	2004	735	4.03	California	327	1.48	Montana	7	0.03	Virginia	396	1.80
1987	394	1.84	2005	829	3.82	Colorado	42	0.19	North Carolina	203	0.92	Vermont	7	0.03
1988	387	1.90	2006	888	3.73	Connecticut	94	0.43	North Dakota	4	0.02	Washington	322	1.46
1989	406	1.92	2007	841	3.30	Delaware	13,358	60.66	Nebraska	59	0.27	Wisconsin	266	1.21
1990	418	1.87	2008	822	3.09	Florida	460	2.09	New Jersey	336	1.53	West Virginia	2	0.01
1991	422	1.80	2009	726	3.17	Georgia	315	1.43	New Mexico	2	0.01	Wyoming	7	0.03
1992	412	2.03	2010	681	3.76	Iowa	72	0.33	Nevada	252	1.14	Other	158	0.72
1993	396	2.20	2011	698	3.62	Illinois	91	0.41	New York	678	3.08			
1994	446	2.69	2012	828	3.46	Indiana	275	1.25	Ohio	696	3.16			
1995	484	2.89	2013	798	3.46	Kansas	7	0.03	Oklahoma	37	0.17			
1996	592	3.15	2014	761	3.47	Kentucky	45	0.20	Oregon	202	0.92			
1997	636	3.18	2015	762	3.12	Louisiana	35	0.16	Pennsylvania	519	2.36			
1998	694	3.24	2016	765	3.03	Massachusetts	450	2.04	Rhode Island	47	0.21			
1999	700	3.21	2017	688	1.12	Maryland	295	1.34	South Carolina	43	0.20			
2000	714	2.97	2018	667	1.74	Maine	7	0.03	South Dakota	21	0.10			
Total	22,022	100				Total	22,022	100						

Appendix C.5. Before and after the dynamic test of the propensity score matching

This table presents the before and after dynamic test of the propensity score matching. Implied cost of equity (*COC_AVG*) is measured as the average of four implied cost of equity measures based on four methods. *COW* equals 1 for firms in the adopted COW law state in the post-COW law periods, and 0 otherwise. The treated group (i.e., firms incorporating in the states adopting COW law) and the control group (i.e., firms incorporating in the states non-adopting COW law) are matched based on all control variables, industry, and year in the one year prior to COW law adoption. We use the nearest neighboring method with a level less than 0.01% and the non-replacement method. Panel A reports the differences in means of firm characteristics between treatment and control groups. Panel B reports the logit regression before and after matching. Firm fixed effects, state fixed effects, and year fixed effects are included. *T*-statistics computed using standard errors clustered at the state of incorporation level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions and data sources are in Appendix C1.

Panel A: Differences in mean of characteristics

	Before matching		After matching	
	Difference	*T*-statistics	Difference	*T*-statistics
	(1)	(2)	(3)	(4)
Lnsize	-0.18***	(-14.48)	-0.04	(-0.36)
Leverage	-0.01***	(-11.66)	0.01	(0.71)
Btme	0.12***	(34.61)	0.01	(0.38)
Roa	0.00***	(5.11)	0.00	(-0.01)
Ivol	0.00	(-1.30)	0.00	(0.29)
Brm	-0.08***	(-17.77)	0.01	(0.41)
Return	0.00	(-0.23)	-0.04	(-1.39)
Dispersion	-0.07***	(-4.25)	-0.05	(-0.74)
Ltg	-0.70***	(-5.55)	-0.54	(-1.02)

Panel B: Logit model before and after matching

	COW	*COW*
	(1)	(2)
Lnsize	0.2465***	0.0051
	(7.57)	(0.11)
Leverage	1.2430***	-0.2804
	(4.32)	(-0.73)
Btme	-0.2505*	0.0570
	(-1.85)	(0.29)
Roa	-0.6207	-0.4818
	(-0.93)	(-0.53)
Ivol	54.1071***	-3.5162
	(12.39)	(-0.52)
Brm	0.0810	-0.0414
	(1.02)	(-0.40)
Return	-0.0297	0.1755
	(-0.33)	(1.32)
Dispersion	0.0867*	0.0570
	(1.95)	(0.90)
Ltg	0.0224***	0.0077
	(4.21)	(0.94)
Firm fixed effects	Yes	Yes
State fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
S.E. clustered	State	State
Observations	8,092	1,098
Adjusted R^2	0.0672	0.0033

Appendix C.6. Before and after the dynamic test of the entropy balancing

This table presents the before and after dynamic tests of the entropy balancing. Implied cost of equity (*COC_AVG*) is measured as the average of four implied cost of equity measures based on four methods. *COW* equals 1 for firms in the adopted COW law states in the post-COW law periods, and 0 otherwise. The treated group (i.e., firms incorporating in the states adopting COW law) and the control group (i.e., firms incorporating in the states non-adopting COW law) are matched based on all control variables, industry, and year in the year prior to COW law adoption with the entropy balancing method. Panel A reports the differences in means of firm characteristics between treatment and control groups. Panel B reports the logit regression before and after balancing. Firm fixed effects, state fixed effects, and year fixed effects are included. *T*-statistics computed using standard errors clustered at the state of incorporation level are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variable definitions and data sources are in Appendix C1.

Panel A: Differences in means of characteristics

	Before balancing		After balancing	
	Difference	*T*-statistics	Difference	*T*-statistics
	(1)	(2)	(3)	(4)
Lnsize	-0.18***	(-14.48)	0.00	(0.00)
Leverage	-0.01***	(-11.66)	0.00	(0.00)
Btme	0.12***	(34.61)	-0.00	(-0.00)
Roa	0.00***	(5.11)	-0.00	(-0.00)
Ivol	0.00	(-1.30)	0.00	(0.00)
Brm	-0.08***	(-17.77)	0.00	(0.00)
Return	0.00	(-0.23)	0.00	(0.00)
Dispersion	-0.07***	(-4.25)	0.00	(0.00)
Ltg	-0.70***	(-5.55)	0.00	(0.00)

Panel B: Logit model before and after balancing

	COW	*COW*
	Before balancing	After balancing
Lnsize	0.2465***	0.0001
	(7.57)	(0.00)
Leverage	1.2430***	0.0004
	(4.32)	(0.00)
Btme	-0.2505*	0.0000
	(-1.85)	(0.00)
Roa	-0.6207	0.0004
	(-0.93)	(0.00)
Ivol	54.1071***	0.0076
	(12.39)	(0.00)
Brm	0.0810	0.0000
	(1.02)	(0.00)
Return	-0.0297	-0.0000
	(-0.33)	(-0.00)
Dispersion	0.0867*	0.0000
	(1.95)	(0.00)
Ltg	0.0224***	0.0000
	(4.21)	(0.00)
Firm fixed effects	Yes	Yes
State fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
S.E. clustered	State	State
Observations	8,092	8,092