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Impact of Banker-Directors on Corporate Governance

by

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Abstract

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The 2008 global financial crisis served as a stark revelation of deep-rooted flaws in corporate governance, especially within financial institutions. These governance failures not only amplified the risks but also triggered a chain reaction of economic instability, shaking the foundations of global markets and eroding trust in the financial system. The crisis underscored the urgent need for reforms to address the systemic vulnerabilities that had long gone unchecked. In response, the Dodd-Frank Wall Street Reform and Consumer Protection Act (DFA) of 2010 was introduced to strengthen corporate governance and enhance risk management in U.S. financial institutions, primarily through the creation of risk committees. This thesis explores the broader impact of the banker-directors on corporate governance, focusing on three critical areas: director quality after the DFA, research and development (R&D) investment decisions, and Environmental, Social, and Governance (ESG) performance. The study uses quasi-natural experiments and difference-in-differences methodologies to analyse how banker-directors, those who serve on the boards of both financial and non-financial firms, influence these areas. The findings reveal that, despite the DFA's aim to enhance corporate governance and promote the appointment of high-quality directors, the Act has had limited impact on the overall improvement of director quality. Moreover, the involvement of banker-directors tends to foster conservative decision-making, particularly in relation to R&D investments where risk aversion hampers innovation. However, during periods of regulatory enforcement, non-financial firms tend to make more substantial ESG-related improvements when banker-directors are preoccupied with their main bank enforcement actions. The results indicate the need for balanced governance structures that consider both financial discipline and long-term strategic goals like innovation and sustainability. This thesis contributes to the literature by shedding light on the nuanced role of banker-directors and the broader consequences of regulatory reforms on corporate behaviour.

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Research Thesis: Declaration of Authorship

Print name: Abdurrahim Altunisik

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I declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

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7. None of this work has been published before submission. However, portions of this thesis have been submitted and presented at various academic conferences:
    - A version of Chapter 3 was presented at the following conferences:
        - 2024 International Conference in Finance, Accounting, and Banking (ICFAB), Southampton, UK.
        - 2024 International Conference in Banking and Financial Studies (ICBFS), Catania, Italy.
        - 2024 PhD Conference at Southampton Business School, Southampton, UK.

Signature: Abdurrahim Altunisik Date: 26.02.2025

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Chapter 1 Introduction

1.1 Introduction

The global financial crisis of 2008 exposed critical weaknesses in corporate governance, particularly within financial institutions, leading to widespread economic instability and a loss of confidence in financial markets (Conyon, 2014). In response, governments and regulatory bodies around the world implemented sweeping reforms aimed at restoring stability and preventing future crises (Laeven, 2013). Among these, the Dodd-Frank Wall Street Reform and Consumer Protection Act (DFA) of 2010 stands out as one of the most comprehensive and impactful regulatory overhauls in U.S. financial history (Acharya et al., 2012; Kristin, 2011). The DFA sought to address systemic risks, enhance transparency, and improve the governance structures of bank holding companies (BHCs) by mandating significant changes, including the establishment of risk committees on boards.

Christopher John Dodd and Barney Frank played pivotal roles in the creation and implementation of the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010, a landmark piece of financial regulation enacted in response to the 2008 financial crisis. Christopher Dodd, a Democratic politician, lawyer, and lobbyist, represented Connecticut in the United States Senate from 1981 to 2011. As Chairman of the Senate Banking Committee, Dodd was instrumental in shaping financial regulation, despite concerns over his close ties to the financial services industry, as highlighted by OpenSecrets. Dodd's tenure was marked by his leadership in financial reform, culminating in the passage of Dodd-Frank, which sought to enhance financial stability through regulatory oversight and consumer protection.

Similarly, Barney Frank, a Democratic Congressman from Massachusetts, was a key architect of the legislation. Serving in the U.S. House of Representatives from 1981 to 2013, Frank chaired the House Financial Services Committee between 2007 and 2011, a period during which he played a critical role in drafting and advocating for the Dodd-Frank Act. Recognised for his expertise in financial policy, Frank sought to implement structural safeguards aimed at preventing systemic risks in the financial system. His leadership in Congress was instrumental in shaping the regulatory provisions of the Act, including the creation of the Consumer Financial Protection Bureau (CFPB) and enhanced oversight of financial institutions. Together, Dodd and Frank's legislative efforts represent a defining moment in post-crisis financial regulation, reinforcing market discipline and consumer protection through comprehensive oversight mechanisms.

The DFA's provisions, particularly those mandating the creation of risk committees within BHCs, were designed to ensure that these institutions could better manage their exposure to various types of financial risks. These committees were intended to bring specialised expertise to board-level

discussions on risk management, thereby enhancing the overall quality of governance. However, more than a decade after its implementation, questions remain about the effectiveness of the DFA in achieving its goals, particularly concerning the quality of corporate governance and the broader strategic decisions of firms.

Although the Dodd-Frank Act was enacted over a decade ago, its implications for corporate governance and director quality remain both current and consequential. Major legislative frameworks often pilot in structural shifts whose effects extend well beyond their initial passage; the ensuing years provide a window for researchers to observe how these regulations reshape board composition and strategic oversight in a sustained manner. In the case of Dodd-Frank, requirements such as the institution of mandatory risk committees and heightened disclosure standards continue to influence firm practices, director responsibilities, and stakeholder expectations. Indeed, finance scholarship frequently underscores the enduring impact of older regulations, consider the Gramm-Leach-Bliley Act or the Sarbanes-Oxley Act, precisely because later periods allow for more precise estimation of long-term outcomes and potential unintended consequences. By exploring director quality in the wake of Dodd-Frank's sustained enforcement, this study contributes new insights into how mature legislation can shape governance structures, providing evidence that remains highly relevant to policymakers and market participants seeking to evaluate the enduring costs and benefits of large-scale financial reform.

A prominent illustration of how Dodd-Frank Act requirements reshaped corporate governance can be drawn from TD Bank, a major North American financial institution with over 26 million customers globally. As a subsidiary of the Toronto-Dominion Bank, TD Bank operates approximately 1,200 branches along the East Coast of the United States. TD Bank faced considerable pressure to implement Dodd-Frank reporting systems swiftly to comply with post-crisis federal regulations. The sudden need for expanded risk committees and enhanced disclosure frameworks forced TD Bank to assemble specialised teams, technologies, and advisors. These measures not only diverted managerial focus but also underscored the Act's lasting influence on board structures. As we explore in Chapter 2, such structural changes underscore the enduring relevance of "older" legislation—like Dodd-Frank—by revealing how critical governance shifts continue to unfold long after an act's original passage.

Similar dynamics are visible when focusing on banker-directors and their role in steering firm-level innovation, a core subject in Chapter 3. Take, for example, the case of a midsized technology manufacturer that recently sought financing advice from an executive who concurrently sat on a commercial bank's board. As new banking regulations heightened the demands on the director's time, the technology firm seized an opportunity to push through a long-delayed R&D initiative, bolstering product development despite short-term funding constraints. This anecdote foreshadows the empirical patterns we will document, illustrating how enforcement actions and other regulatory pressures may

inadvertently free manufacturing firms to make bolder R&D investments in the director's temporary absence.

Lastly, Chapter 4 explores how this interplay extends to ESG (Environmental, Social, and Governance) performance. Anecdotes from major institutions like Wells Fargo, which are subject to multibillion-dollar settlements, highlight how banker-directors can find themselves consumed by compliance reforms, potentially reducing their ability to constrain non-financial firms' sustainability initiatives. While the bank's leadership grapples with mounting administrative burdens, the affiliated non-financial boards can realign corporate priorities toward social impact and stakeholder engagement. These real-world examples underscore the thesis's central argument: that regulatory pressures, when channelled through interlocking directorates, have far-reaching consequences for firm strategies, which range from change in corporate governance structures to shifts in innovation and sustainability.

The body of literature has extensively explored the diffusion of corporate practices and strategic objectives facilitated by inter-organizational networks and the interpersonal relationships among board members (Kaczmarek et al., 2011; Zhong et al., 2017). In particular, the role of financial professionals, notably banker-directors, in corporate governance has garnered considerable academic attention. Mizruchi et al. (1993, cited in Mizruchi, 1996) documented that over 70% of the 456 Fortune 500 manufacturing firms in 1981 had at least one executive serving concurrently on the board of a financial institution, underscoring the deep interconnection between non-financial firms and financial institutions during that period. In more recent research, Hilscher and Şişli-Ciamarra (2013) provided contemporary insights into the composition of corporate boards, analysing S&P 500 firms from 2002 to 2007. Their findings revealed that approximately 28.9% of the boards had commercial bankers, while about 10% included investment bankers. Together, these statistics indicate that nearly 39% of the firms had at least one banker-director on their board, highlighting the continued significance of banker-director presence in corporate governance.

Banker-directors are often lauded for their ability to bring financial discipline and a wealth of industry-specific knowledge to corporate boards. Their expertise in financial markets (Guner, Malmendier, and Tate, 2008), capital allocation, and risk management can be particularly beneficial during periods of financial uncertainty or economic downturns. Kroszner and Strahan (2001) argue that banker-directors' access to extensive networks of financial institutions enables them to secure capital more effectively, helping firms navigate liquidity crises. Their understanding of credit markets allows firms to obtain favourable lending terms, lowering the cost of borrowing and enhancing liquidity. Banker-directors can also improve a firm's credit rating by implementing conservative financial practices, which in turn may increase the firm's ability to attract investment capital.

Furthermore, Guner, Malmendier, and Tate (2008) emphasise that banker-directors may introduce a more analytical and data-driven approach to decision-making. By focusing on detailed

financial metrics and modelling, these directors can guide firms toward more profitable, risk-adjusted strategies, ensuring that corporate growth is sustainable. The ability of banker-directors to forecast economic cycles and identify financial risks is invaluable in helping firms avoid costly mistakes, such as over-leveraging or pursuing excessively risky investments (Kroszner and Strahan, 2001; Guner, Malmendier and Tate, 2008).

Despite the financial benefits banker-directors bring, their presence can create significant conflicts of interest, particularly when they represent lending institutions with vested interests in the firm's debt management. Kroszner and Strahan (2001) and Guner, Malmendier and Tate (2008) argue that these directors may prioritise creditors' interests, often at the expense of shareholders. For instance, when a firm faces financial difficulties, banker-directors may advocate for decisions that protect debt repayments over shareholder returns or limiting share repurchases. This focus on debt repayment can constrain the firm's ability to reinvest profits into growth initiatives, limiting long-term competitiveness.

Moreover, banker-directors' inclination toward risk aversion can have significant implications for a firm's financial policies. Kroszner and Strahan (2001) suggest that firms with banker-directors typically maintain lower cash and liquid asset ratios, while paying out a larger portion of their net income as dividends. Although these firms may appear less "cash constrained" they exhibit lower interest coverage and sales growth, reflecting a more conservative financial approach that could limit their capacity to invest in high-risk, high-reward projects. Their cautious stance, while beneficial in terms of financial stability, can hinder the firm’s ability to engage in bold innovation or capitalise on emerging market opportunities. This risk aversion can lead to missed opportunities in industries where rapid innovation is essential for staying competitive, such as manufacturing, technology or pharmaceuticals.

One of the most significant areas affected by the presence of banker-directors might be R&D investment. R&D is inherently risky, as it involves long-term commitments of capital to projects that may not yield immediate or guaranteed returns. Banker-directors, driven by their financial conservatism, may view R&D expenditures as too speculative, particularly if the firm operates in an industry with volatile revenue streams or high capital intensity (Balkin et al., 2000; David et al., 2001; Han et al., 2015). Their focus on maintaining stable financial performance often leads them to favour short-term projects with more predictable outcomes over long-term, uncertain ventures like R&D.

Graham, Harvey, and Rajgopal (2005) found that financial executives(CFO, Chief Accounting Officer, Treasurer, Assistant Treasurer, Controller, Assistant Controller, or Vice President (VP), Senior VP or Executive, VP of Finance) are likely to reduce discretionary spending, such as on R&D, ESG commitments and maintenance, to meet short-term financial targets, especially in periods of economic uncertainty. This emphasis on short-term profitability can have detrimental effects on a firm's long-term competitiveness, as innovation is key to maintaining a competitive edge in many industries. For example,

in technology-driven sectors, firms that underinvest in R&D may fall behind their competitors in product development and market share.

Additionally, Ghosh (2016) observed that in Indian manufacturing firms, banker-directors were associated with a marked reduction in R&D probability. While this finding provides important insights, its applicability to other regions, such as the U.S. or Europe, remains underexplored. Pugachev and Schertler (2021) show that during regulatory enforcement actions (EAs), banker-directors tend to shift their focus away from nonfinancial firms (NFFs) and attend fewer board meetings of these firms while attending more board meetings of their banks, inadvertently creating opportunities for firms to allocate more resources toward long-term investments like R&D. These dynamic highlights the complex and sometimes contradictory influence banker-directors exert on corporate strategy.

Moreover, the role of banker-directors in shaping Corporate Social Responsibility (CSR) investments within non-financial firms (NFFs) presents a nuanced and often conflicting dynamic. Positioned at the intersection of finance and corporate governance, banker-directors leverage their financial expertise to influence CSR strategies, providing critical resources and insights that can enhance the effectiveness of sustainability initiatives (Hasan et al., 2021). However, the literature suggests that their dual roles may lead to conflicting priorities ((Kroszner and Strahan, 2001; Guner, Malmendier and Tate, 2008), particularly when short-term financial performance is at odds with long-term CSR objectives (Balkin et al., 2000; David et al., 2001; Graham, Harvey, & Rajgopal, 2005; Han et al., 2015). The tension is often exacerbated by compensation structures that align banker-directors' interests with immediate financial outcomes, potentially diverting attention away from sustainable, long-term CSR commitments (Ayadi, Arbak, & Pieter De Groen, 2012). As a result, the effectiveness of banker-directors in promoting CSR varies depending on the extent to which they prioritise short-term financial gains over enduring sustainability practices.

Additionally, research indicates that the broader financial implications of CSR remain subject to varying interpretations, with some studies linking strong CSR practices to long-term financial benefits (Baron, 2001; Lins, Servaes, & Tamayo, 2017), while others find limited short-term value (Rojo-Suárez & Alonso-Conde, 2023). Our study contributes to this ongoing debate by broadening the scope of existing literature, incorporating all banker-directors—executives and independents alike—into a Difference-in-Differences (DID) analysis. Through this methodology, we examine the impact of banker-directors on ESG performance, particularly in periods when their focus shifts toward their banking responsibilities. Moreover, our research challenges the assumption that banker-directors uniformly enhance CSR efforts (Hasan et al., 2021), highlighting the potential for their short-termist tendencies to undermine the long-term value creation typically associated with effective ESG policies. This critical evaluation provides a fresh perspective on the complex role banker-directors play in balancing short-term financial pressures with long-term sustainability goals.

Overall, this thesis investigates the broader impact of the banker-directors on corporate governance, focusing on three interrelated areas: the quality of directors within BHCs after the DFA, the influence of banker-directors on research and development (R&D) investments of NFFs, and the impact of banker-directors on Environmental, Social, and Governance (ESG) performance during periods of regulatory enforcement. Through a detailed analysis using quasi-natural experiments and difference-in-differences methodologies, this thesis sheds light on the nuanced and sometimes counterintuitive effects of regulatory mandates on corporate behaviours.

This thesis is organized into five main chapters, each addressing a critical facet of the overarching research questions. Chapter 1 establishes the foundation by introducing the research problem, situating the study within the broader corporate governance literature, and articulating the key objectives. It also describes the methodological framework employed and underscores the thesis's principal contributions to the field. Chapter 2 explores the influence of the Dodd-Frank Act on director quality, paying particular attention to whether the mandated establishment of risk committees led to measurable improvements in corporate governance. Through the use of difference-in-differences (DiD) and regression discontinuity design (RDD) analyses, this chapter investigates how changes in the regulatory environment impacted governance practices within Bank Holding Companies (BHCs). In Chapter 3, the focus shifts to the role of banker-directors in shaping R&D investment decisions, especially under conditions in which enforcement actions direct these individuals' attention away from their concurrent responsibilities in non-financial firms. Employing a quasi-natural experimental setting, this chapter probes the interplay between regulatory pressures, board composition, and long-term corporate innovation. Chapter 4 continues the theme of banker-directors, but situates it within the context of Environmental, Social, and Governance (ESG) performance. Utilizing the DiD approach, this chapter examines how ESG metrics evolve when financial oversight takes precedence, thereby influencing the strategic priorities of the board. By detailing shifts in ESG scores during enforcement actions, it highlights how governance structures interact with broader sustainability imperatives. Finally, Chapter 5 synthesizes the findings from all preceding chapters, offering an integrative discussion of their policy implications and proposing avenues for corporate governance reforms. This concluding chapter also articulates directions for future research, emphasizing the delicate balance firms must maintain between robust financial oversight and sustainable, innovation-driven strategic objectives.

1.1.1 Chapter 1: The Impact of the Dodd-Frank Act on Director Quality

Chapter 1 of this thesis examines whether the DFA's requirement for BHCs to establish a risk committee composed of board members with expertise in risk management has led to an improvement in the overall quality of directors. The intention behind this mandate was to enhance the governance of financial institutions by ensuring that decisions related to risk management were informed by individuals with the necessary expertise and experience. The logic was straightforward: by bringing more knowledgeable and experienced individuals onto the boards of BHCs, the overall decision-making

process would improve, leading to better oversight and a reduction in risky behaviours that could threaten financial stability.

To investigate this, the study analyses a sample of 188 BHCs, employing both difference-in-differences and regression discontinuity approaches to assess changes in director quality following the implementation of the DFA. Contrary to expectations, the findings suggest that the requirement for a separate risk committee has not significantly impacted director quality. This result is consistent with earlier studies that have questioned the effectiveness of regulatory mandates that focus solely on structural changes without addressing the underlying issues of director incentives and capabilities (Balasubramanyan et al., 2019; Degl'Innocenti et al., 2023).

One possible explanation for this finding is that while the DFA mandated the creation of risk committees, it did not adequately address the qualifications or motivations of the individuals appointed to these committees. As a result, many BHCs may have complied with the letter of the law by establishing risk committees without necessarily enhancing the expertise or effectiveness of their boards. This could explain why there has been little observable improvement in director quality or in the risk management practices of BHCs since the DFA's implementation (Balasubramanyan et al., 2019; Degl'Innocenti et al., 2023) Moreover, this chapter raises important questions about the limitations of regulatory interventions that focus primarily on structural reforms without considering the broader context in which these reforms are implemented.

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Chapter 2 explores the influence of the Dodd-Frank Act on director quality, paying particular attention to whether the mandated establishment of risk committees led to measurable improvements in corporate governance. Through the use of difference-in-differences (DiD) and regression discontinuity design (RDD) analyses, this chapter investigates how changes in the regulatory environment impacted governance practices within Bank Holding Companies (BHCs).

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Chapter 4 continues the theme of banker-directors, but situates it within the context of Environmental, Social, and Governance (ESG) performance. Utilizing the DiD approach, this chapter examines how ESG metrics evolve when financial oversight takes precedence, thereby influencing the strategic priorities of the board. By detailing shifts in ESG scores during enforcement actions, it highlights how governance structures interact with broader sustainability imperatives.

Finally, Chapter 5 synthesizes the findings from all preceding chapters, offering an integrative discussion of their policy implications and proposing avenues for corporate governance reforms. This concluding chapter also articulates directions for future research, emphasizing the delicate balance firms must maintain between robust financial oversight and sustainable, innovation-driven strategic objectives.

1.1.2 Chapter 2: The Role of Banker-Directors in R&D Investments

Building on the insights from Chapter 1, Chapter 2 shifts focus to the role of banker-directors, those who hold independent or executives board positions in financial institutions, on the strategic decisions of non-financial firms, particularly their investments in R&D. Banker-directors are often valued for their financial expertise and their ability to provide sound advice on matters related to corporate finance and risk management. Their presence on the boards of non-financial firms is intended to bring a level of financial discipline and risk awareness that can help these firms make more informed and prudent decisions.

However, the influence of banker-directors on R&D investment is less straightforward. On one hand, their financial expertise and experience in managing risk can provide valuable guidance to firms navigating the uncertainties and complexities of R&D. On the other hand, their inherent risk aversion and potential conflicts of interest stemming from their dual roles (Kroszner and Strahan, 2001; Guner, Malmendier and Tate, 2008) as lenders and board members may discourage firms from engaging in high-risk, high-reward activities such as R&D (Han et al., 2015). This conservative approach to risk management, while beneficial in some contexts, can stifle innovation and long-term growth, particularly in industries where R&D is a critical driver of competitive advantage.

To explore this dynamic, the chapter utilises a quasi-experimental setup with a difference-in-differences approach, examining how enforcement actions (EAs) against banks, which distract banker-directors, affect the R&D investment decisions of the firms they oversee. The findings indicate that during EA periods, when banker-directors are preoccupied with addressing regulatory issues at their financial institutions, there is a significant increase in R&D investments by the non-financial firms they govern. This suggests that banker-directors might typically discourage R&D investment due to their conservative risk preferences or conflicts of interest, but when their focus is diverted, firms are more willing to pursue innovative and potentially lucrative projects.

The implications of these findings are significant. They suggest that the presence of banker-directors on the boards of non-financial firms can have a dampening effect on R&D investment, which may be detrimental to the long-term growth and competitiveness of these firms. At the same time, the results highlight the importance of understanding the broader context in which corporate governance decisions are made, particularly the influence of external factors such as regulatory enforcement. By recognising the potential trade-offs between financial oversight and innovation, firms can make more informed decisions about the composition of their boards and the roles of banker-directors within their governance structures (Ghosh, 2016; Kroszner & Strahan, 2001).

1.1.3 Chapter 3: Banker-Directors and ESG Performance

Chapter 3 extends the investigation to assess the impact of banker-directors on the ESG performance of non-financial firms (NFFs) during periods associated with regulatory enforcement actions. With increasing attention to corporate social responsibility and sustainability, understanding the role of board members in shaping ESG initiatives is crucial. ESG performance has become an increasingly important metric for evaluating the long-term viability and social impact of firms, particularly in light of growing stakeholder expectations and regulatory pressures.

This chapter employs a quasi-natural experimental design and a difference-in-differences methodology to assess the impact of banker-directors on the ESG performance of non-financial firms during enforcement periods. The analysis shows significant enhancements in overall ESG scores and in the individual environmental, governance, and social pillars during enforcement periods. These improvements suggest that when banker-directors are less involved in the governance of non-financial firms due to their preoccupation with regulatory issues, these firms may be better positioned to focus on and advance their ESG initiatives.

The findings of our study stand in contrast to those of Hasan et al. (2021), who found that affiliated banker-directors positively influence firms' corporate social performance (CSR). While their research suggests that banker-directors can enhance CSR efforts, particularly when aligned with socially responsible banks, our results reveal a different dynamic. We found that when banker-directors are absent or diverted due to enforcement actions, the ESG performance of non-financial firms (NFFs) actually improves. This suggests that the presence of banker-directors may impede ESG advancements, as their focus on risk management in financial institutions might detract from long-term sustainability goals in NFFs. These findings underscore the complex and sometimes counterproductive role that banker-directors play in shaping ESG outcomes. While banker-directors bring valuable financial expertise, their focus on short-term financial performance and risk management may sometimes conflict with the long-term goals of ESG initiatives. This complexity suggests that the impact of banker-directors on ESG performance is influenced by multiple dimensions, including whether they serve as executive or independent directors, their status as affiliated or non-affiliated members of the board, the

industry in which the firm operates, the firm's existing governance structures, and the broader regulatory environment (Hasan et al., 2021; Rojo-Suárez & Alonso-Conde, 2023).

The broader implications of these findings are significant for both corporate governance and regulatory policy. The findings of this study suggest that while banker-directors can play a valuable role in enhancing the financial discipline and risk management practices of non-financial firms, their involvement may need to be carefully balanced with the firm's broader strategic objectives, particularly in areas such as innovation and sustainability. Policymakers and regulators may also need to consider the potential unintended consequences of regulatory interventions that inadvertently shift the focus of banker-directors away from their governance responsibilities within non-financial firms.

1.2 Research Background and Literature Review

The board of directors plays a pivotal role in shaping firm strategies, influencing decision-making, and ensuring effective governance. Recent literature has emphasised the importance of board characteristics in steering firms toward or away from long-term investment projects like R&D and corporate social responsibility (CSR) initiatives. This literature review synthesizes key research that explores how various board characteristics, including the presence of banker-directors, gender diversity, and interlocking directorships, affect firm R&D investments and environmental, social, and governance (ESG) performance.

This study draws on two principal empirical strategies, namely difference-in-differences (DiD) and regression discontinuity design (RDD), both of which are well-suited for establishing causal relationships within quasi-experimental settings and evaluating the impact of regulatory interventions. DiD is particularly effective for comparing outcomes between treated and control groups over time, thus isolating changes attributable to the intervention itself. Accordingly, Chapter 2 (The Impact of the Dodd-Frank Act on Director Quality) employs DiD to determine whether the formation of risk committees, mandated by the Dodd-Frank Act, has measurably improved director quality by comparing firms subject to this legislation with those that remain unaffected. Chapter 3 (Director interlocks and banker-directors' board advising role on R&D investment: evidence from Enforcement Actions) likewise leverages DiD to assess how enforcement-driven shifts in banker-directors' attention influence research and development decisions in non-financial firms. In parallel, Chapter 4 (Chapter 4 The Role of Banker-Directors in ESG Performance: Insights from Enforcement Actions and Interlocking Directorships) uses a similar DiD framework to capture the changes in ESG outcomes that arise when these directors become preoccupied with financial oversight in the face of regulatory pressures.

In contrast, RDD capitalizes on policy thresholds to identify causal effects by comparing units just above and below a specified cutoff, thereby approximating a randomized experiment. In Chapter 2, this method reinforces the DiD findings by zooming in on firms that narrowly satisfy or fail to satisfy Dodd-Frank requirements, enhancing the credibility of the conclusions about director quality. By interweaving

DiD and RDD, the thesis not only mitigates potential biases inherent in observational data but also ensures a more robust and nuanced evaluation of how governance structures adapt in response to regulatory changes. Taken together, these complementary methodological approaches underpin the thesis's central arguments, offering a rigorous empirical basis for drawing policy-relevant insights and identifying new avenues for corporate governance research.

1.2.1 Board Diversity and Corporate Governance

1.2.1.1 The Role of Gender Diversity in Corporate Governance

Board diversity, particularly gender diversity, has gained considerable attention in recent years as a means of improving corporate governance and decision-making processes. Adams and Ferreira (2008) suggest that gender-diverse boards are more diligent in their monitoring roles, partly because women directors tend to have different risk perceptions and ethical considerations compared to their male counterparts. Women are often seen as more conservative in their risk assessment, making them valuable contributors to discussions on long-term sustainability and governance.

Moreover, research by Carter, Simkins, and Simpson (2003) shows that firms with gender-diverse boards tend to achieve better financial performance. Their study suggests that diversity brings broader perspectives and a more comprehensive approach to problem-solving, which enhances corporate decision-making and, in turn, boosts firm value. Diverse boards are more likely to consider the interests of a wider range of stakeholders, including employees, customers, and the broader community, which can enhance a firm's social license to operate. This broader consideration aligns with the principles of ESG, where firms are evaluated not only on financial performance but also on their environmental and social impact.

The impact of diversity on firm performance, however, is not universally positive. Adams and Ferreira (2008) found that the effect of gender diversity on performance is context-dependent. In firms with strong shareholder rights, gender-diverse boards may engage in more rigorous monitoring, which could slow down decision-making processes and stifle managerial initiative. This increased scrutiny can lead to over-caution, particularly in industries where agility and rapid decision-making are critical to success, such as technology or retail. As a result, the relationship between diversity and performance must be evaluated in light of the specific governance context and industry dynamics.

1.2.1.2 ESG Performance and Banker-Directors

When it comes to ESG initiatives, banker-directors may be reluctant to fully embrace sustainability practices due to the perceived short-term costs associated with such initiatives. Rojo-Suárez & Alonso-Conde (2023) notes that while CSR and other ESG activities can enhance a firm's reputation, they often involve significant upfront expenditures that may not yield immediate financial returns. Banker-directors, driven by their conservative financial outlook, may view these initiatives as too costly or uncertain, especially if the firm operates in a highly competitive industry with thin profit margins.

However, as ESG considerations become more central to investor expectations and regulatory frameworks, boards are under increasing pressure to integrate sustainability into their strategic decisions. Investor demand for transparency in ESG performance, coupled with growing societal expectations for corporate responsibility, is forcing firms to reassess how they balance financial prudence with long-term sustainability goals. Boards that fail to adapt to this shift may face reputational damage, regulatory fines, or loss of investor confidence. Consequently, the presence of diverse board members who are more attuned to ESG issues can help counterbalance the conservative tendencies of banker-directors, ensuring that the firm takes a more forward-looking approach to sustainability.

1.2.2 Interlocking Directorates and Corporate Governance

Interlocking directorates, where a single individual serves on multiple corporate boards, can provide significant strategic advantages for firms. Mizruchi (1996) found that interlocking directorates are a common feature of corporate America, with over 70% of Fortune 500 manufacturing firms having at least one executive who also serves on the board of a financial institution. These interlocks can create valuable synergies by providing firms with access to a broader network of resources, industry insights, and strategic partnerships. Directors who sit on multiple boards can facilitate the transfer of knowledge and best practices across industries, helping firms innovate and improve governance standards.

For instance, a director serving on the boards of both a technology company and a financial institution may introduce innovative perspectives from the fast-paced tech sector to the traditionally risk-averse financial industry, potentially fostering the development of new financial products or services. Likewise, board interlocks between firms in complementary industries can lead to strategic partnerships, joint ventures, or mergers and acquisitions, all of which have the potential to enhance firm value.

However, interlocking directorates and board faultlines present significant risks to firm performance. Nam and An (2018) found that interlocking director networks can negatively impact firm value and performance, as directors may face conflicts of interest, especially when serving competing firms or those with opposing strategic objectives. Such conflicts can impair the board's decision-making processes, favouring one firm over another and ultimately leading to suboptimal outcomes. Similarly, Kaczmarek, Kimino, and Pye (2011) highlight that task-related faultlines, arising from differences in directorship type, education, tenure, and financial backgrounds, can create divisions within boards. These divisions, or "faultlines," can undermine board cohesiveness, further deteriorating firm performance. The negative effects are exacerbated in firms with busy boards oversight function, leading to suboptimal decisions that favour one firm over another.

Moreover, directors who are overextended—due to serving on too many boards—may struggle to devote sufficient time and attention to each firm. This dilution of focus can reduce the quality of governance and increase the risk of oversight failures. For instance, a director who is juggling multiple

board appointments may not have the time to thoroughly review financial statements or engage in detailed discussions on strategic initiatives, leading to a superficial understanding of the firm's challenges and opportunities.

Despite these risks, some studies suggest that interlocking directorates can have positive spillover effects. Zhong, Liu, and Yuan (2017) found that directors with experience in navigating regulatory sanctions are more likely to be diligent in their monitoring roles, both for the firms they directly serve and for those they interlock with. This heightened diligence can improve governance across multiple firms, as directors apply the lessons learned from one board to others. For example, a director who has overseen a firm through a regulatory investigation may bring valuable insights into compliance and risk management to other boards, helping them avoid similar pitfalls.

Additionally, interlocking directorates can promote a more collaborative approach to governance, as directors who serve on multiple boards are often more experienced and better equipped to manage complex governance challenges. These directors may be more effective at mediating conflicts, fostering consensus, and driving long-term strategic decisions that benefit the firm and its stakeholders.

1.2.3 Board Characteristics and Board Composition

Upper Echelons Theory, introduced by Hambrick and Mason (1984), suggests that the characteristics of top management teams—including demographics, experiences, and personal values—play a crucial role in shaping firm performance. The theory posits that executives and directors make decisions not solely based on objective facts but rather through the lens of their personal experiences and cognitive biases (Tversky & Kahneman, 1974). Milliken and Martins (1996) emphasise that both observable characteristics (such as gender, race, and age) and non-observable traits (such as education, values, and cognitive style) influence the effectiveness of boards in guiding corporate strategy.

Hambrick and Mason (1984) argue that experience and expertise are critical components of effective board leadership. Directors with experience in a specific industry bring valuable insights into market trends, competitive dynamics, and regulatory challenges. For instance, a board composed of directors with similar professional backgrounds such as finance or law may be more risk-averse and focused on compliance, while a board with directors from diverse fields, such as technology, marketing, or entrepreneurship may be more willing to pursue innovative and bold strategies. This diversity of perspectives can enhance the board’s ability to adapt to changing market conditions and capitalize on new opportunities, particularly in dynamic industries where innovation is key to success.

In addition to industry expertise, directors with a background in finance, law, or technology can provide specialized knowledge that complements the firm’s strategic goals. For instance, a director with

financial expertise can help the firm optimise its capital structure (Xie, Davidson, and DaDalt, 2003; Ciamarra, 2006), reduce its cost of capital (Ciamarra, 2006), and improve its financial reporting practices(Krishnan and Visvanathan, 2007), while a director with legal expertise can help navigate complex regulatory environments and mitigate legal risks.

However, diversity can also lead to slower decision-making, as directors with different backgrounds and perspectives may struggle to reach a consensus (Adams and Ferreira, 2009). This can be particularly problematic in fast-paced industries where quick decisions are critical to maintaining a competitive edge. As a result, firms must strike a balance between fostering diversity and ensuring that the board can make timely, effective decisions.

The size of the board is an important factor in determining its effectiveness (Hermalin and Weisbach, 2003). Yermack (1996) argues that smaller boards are more effective because they allow for better communication and more cohesive decision-making. In smaller boards, directors are more likely to engage in meaningful discussions and reach consensus on strategic initiatives. This can lead to more agile decision-making, particularly in industries where rapid response to market changes is critical.

Coles, Daniel, and Naveen (2008) argue that complex firms—such as those that are diversified, large, or reliant on debt financing—have greater advising needs, which can make larger boards beneficial. However, transaction costs may lead these firms to deviate from the optimal board structure. Under certain conditions, complex firms may end up with smaller boards than what is ideal. Similarly, R&D-intensive firms may have fewer insiders on their boards than optimal. In these cases, firm performance tends to improve with an increase in board size for complex firms and a higher proportion of insiders for R&D-intensive firms. For example, a large manufacturing firm that operates across multiple regions and deals with complex supply chains may benefit from having directors with expertise in logistics, international trade regulations, and advanced manufacturing technologies. A larger and more diverse board can provide the firm with the specialised knowledge necessary to navigate these complexities and remain competitive.

Despite the potential benefits of larger boards, Yermack (1996) cautions that overly large boards may suffer from inefficiencies, such as the diffusion of responsibility and slower decision-making processes. When too many directors are involved, it can become difficult to reach a consensus, leading to indecision and delayed action. Moreover, directors in larger boards may feel less accountable for the board's overall performance, leading to a reduction in the quality of governance.

Independent directors play a crucial role in mitigating agency problems where the interests of management may not align with those of shareholders. Board independence is widely regarded as a key factor in ensuring effective governance. Independent directors are more likely to provide objective oversight and challenge management decisions. However, Bhagat and Black (2002) find that the

relationship between board independence and firm value is more nuanced, with board independence being particularly valuable in complex firms where diligent oversight is crucial.

Moreover, Hermalin and Weisbach (2003) caution that the relationship between board independence and firm performance is not uniformly positive. While independent boards may be more effective in monitoring management, they may also struggle to provide strategic direction if they lack insider knowledge of the firm's operations. In certain cases, overly independent boards may become disconnected from the firm's day-to-day operations, making it difficult to provide effective guidance on strategic initiatives.

Board diversity, particularly in terms of gender, ethnicity, and professional background, has been increasingly recognised as a driver of improved corporate outcomes. Carter, Simkins, and Simpson (2003) provide empirical evidence that gender-diverse boards are associated with higher firm value, suggesting that diverse perspectives enhance decision-making quality. Diverse boards are more likely to consider a wider range of options, engage in more rigorous debates, and make decisions that are better aligned with long-term strategic goals.

In addition to gender diversity, Hillman, Cannella, and Harris (2002) argue that professional diversity can also lead to more innovative thinking and problem-solving. For example, a board composed of directors with backgrounds in finance, marketing, technology, and law may be better equipped to guide the firm through complex strategic challenges, such as entering new markets, developing new products, or navigating regulatory environments.

However, Adams and Ferreira (2009) caution that while diversity can improve governance through enhanced monitoring, it may also slow down decision-making processes (Yermack, 1996), leading to potential inefficiencies. In industries where quick decisions are critical, such as technology or retail, the slower pace of decision-making in diverse boards may be a disadvantage.

1.2.4 Board of Directors and Corporate Innovation

R&D investments are crucial for firms seeking long-term growth and innovation, particularly in industries where technological advancements drive competitive advantage. However, banker-directors, characterised by their risk-averse nature and preference for financial conservatism (Graham, Harvey, & Rajgopal, 2005; Krishnan and Visvanathan, 2007), often discourage investments in high-risk projects like R&D (Alessandri & Pattit, 2014). This is because banker-directors typically prioritize financial stability and short-term profitability over the uncertain and long-term benefits of R&D (Francis, Hasan, & Wu, 2012).

Aghion, Van Reenen, and Zingales (2013) argue that directors are more likely to view R&D investments as too speculative, particularly in industries with high volatility or where returns on innovation are uncertain. This conservative approach to financial management can lead to

underinvestment in R&D, limiting the firm's ability to innovate and compete in dynamic industries such as technology, pharmaceuticals, and energy.

Beyond banker-directors, broader board characteristics also influence R&D investment decisions. Kor (2006) suggests that more diverse boards, in terms of both gender and professional background, are more likely to support innovative projects. Diverse boards bring a wider range of perspectives and risk tolerances, facilitating a more balanced approach to R&D investment. For example, a board with directors from both financial and technical backgrounds may be better equipped to assess the risks and benefits of R&D projects, leading to more informed decisions.

Baysinger, Kosnik, and Turk (1991) find that independent boards are positively associated with R&D intensity, as independent directors are less beholden to short-term financial pressures and may prioritize long-term value creation. Independent directors, who are not directly involved in the firm's day-to-day operations, may be more willing to support R&D projects that have long-term potential but may not yield immediate financial returns.

However, boards must carefully manage a balancing act. Boards that are overly risk-averse may underinvest in innovation, while excessively aggressive boards may approve projects that are not financially viable. According to Kor (2006), the influence of the board on R&D investments is moderated by factors such as the firm's industry, market competition, and long-term strategic goals. In highly competitive industries, boards must find the right balance between promoting innovation and managing financial risk.

1.2.5 Board of Directors and ESG Performance

ESG performance has become a critical component of corporate strategy, reflecting a firm's commitment to sustainable and socially responsible practices. The board of directors plays a pivotal role in setting ESG priorities, ensuring their implementation, and balancing them with financial performance objectives.

Several studies have examined the relationship between board characteristics and ESG performance. Post, Rahman, and Rubow (2011) find that gender-diverse boards are more likely to prioritize sustainability initiatives, possibly because women tend to be more attuned to social and environmental issues. Gender-diverse boards are also more likely to consider the interests of a wider range of stakeholders, including employees, customers, and the community, when making strategic decisions. This broader perspective aligns with the principles of ESG, which aim to balance financial performance with social and environmental responsibility.

Similarly, studies by Bear, Rahman, and Post (2010) and Fernandez-Feijoo, Romero, and Ruiz (2012) indicate that firms with gender-diverse boards tend to have more robust ESG policies and stronger sustainability performance. These boards are more likely to invest in initiatives that promote

environmental sustainability, social equity, and ethical governance practices, all of which contribute to long-term value creation.

Independent directors, as noted by Khan, Muttakin, and Siddiqui (2013), also play a vital role in enhancing a firm's ESG performance. Independent directors, who are not directly involved in the firm's day-to-day operations, are more likely to prioritize ethical standards and align corporate goals with societal expectations. This alignment can help firms avoid reputational damage, regulatory fines, and other risks associated with poor ESG performance.

The relationship between banker-directors and ESG performance tends to be less favorable. While Ioannou and Serafeim (2012) highlight that analysts increasingly consider the long-term value of ESG initiatives in their recommendations, banker-directors, driven by their focus on financial metrics and short-term performance, may undervalue these initiatives. Banker-directors often prioritize financial risk management and may view ESG efforts as costly and uncertain, particularly in industries with thin profit margins and intense competition. This short-term focus can lead to a misalignment between corporate governance and the long-term benefits associated with sustainable and socially responsible practices.

For example, a banker-director may oppose investments in renewable energy projects or social responsibility programs if they believe that these initiatives will reduce short-term profitability or increase financial risk. This conservative approach can hinder the firm's ability to adapt to changing market conditions, particularly in industries where ESG considerations are becoming increasingly important for maintaining a competitive edge.

However, as ESG becomes more integral to firm value and investor expectations, boards are under increasing pressure to incorporate sustainability into their decision-making processes, even in traditionally risk-averse environments. Firms that fail to prioritize ESG may face backlash from investors, regulators, and consumers, all of whom are placing greater emphasis on corporate responsibility and sustainability. As a result, the presence of independent and diverse directors on the board can help counterbalance the conservative tendencies of banker-directors, ensuring that the firm takes a more holistic and forward-looking approach to ESG performance.

1.2.6 ESG and Corporate Performance

A growing body of literature highlights the role of ESG in driving sustainable financial performance. Eccles, Ioannou, and Serafeim (2014) argue that firms with strong ESG governance structures tend to outperform their peers on both financial and non-financial metrics. These firms are better able to manage environmental and social risks, build stronger relationships with stakeholders, and enhance their overall corporate reputation.

For instance, a firm with strong ESG governance may be better equipped to navigate regulatory changes related to environmental sustainability, such as carbon emissions or waste management

regulations. By proactively addressing these issues, the firm can mitigate its exposure to regulatory fines, legal liabilities, and reputational damage. Likewise, firms that prioritize social responsibility often foster stronger relationships with customers, employees, and suppliers, which contributes to long-term financial stability and growth.

Friede, Busch, and Bassen (2015) conducted a meta-analysis of over 2,000 empirical studies and found a positive correlation between ESG and corporate financial performance. Their findings suggest that firms with strong ESG governance are better equipped to manage risk, innovate, and create long-term value for shareholders. These firms tend to experience lower volatility, higher employee engagement, and stronger customer loyalty, all of which contribute to improved financial performance.

Strong ESG governance structures, including board oversight, are critical for ensuring that ESG goals are integrated into the firm's overall strategy. Boards that actively engage in setting and monitoring ESG priorities can help the firm balance short-term financial performance with long-term sustainability goals. This balance is essential for firms seeking to navigate the complexities of today's business environment, where ESG considerations are becoming increasingly important for maintaining a competitive edge.

1.3 Synthesis and Contributions

The literature on board characteristics and firm outcomes highlights the multifaceted role that directors play in influencing corporate strategy, particularly in areas like R&D investment and ESG performance. Banker-directors, while bringing valuable financial expertise, often encourage conservative strategies that may constrain innovation and long-term growth. Conversely, board diversity and interlocking directorates present both opportunities and challenges for firms aiming to balance financial prudence with innovation and sustainability.

This thesis has examined how various facets of board composition and regulatory dynamics shape firm behaviour, especially in risk management, innovation, and environmental, social, and governance (ESG) practices. The analysis encompassed three key areas of governance change, contextualised by the post-Dodd-Frank Act (DFA) environment, the firm-level emphasis on research and development (R&D), and the growing prominence of ESG considerations. By systematically integrating these components, the thesis offers a cohesive narrative on how board-level financial expertise, diversity of perspectives, and regulatory pressures converge to influence corporate strategic directions.

First, through an in-depth exploration of the Dodd-Frank Act's implications (Chapter 2), this study investigates how the regulatory push for more rigorous oversight and formal risk committees has both broadened and complicated the responsibilities of banker directors. While the Act aimed to enhance director quality, strengthen accountability, and mitigate systemic risks through the introduction of formal risk committees, our findings indicate that these regulatory changes did not lead to measurable

improvements in director quality. Instead, the increased compliance burden has significantly expanded the workload of banker-directors, potentially diverting their focus away from effective monitoring and strategic oversight. Paradoxically, rather than fostering stronger governance, the additional regulatory demands may have reduced the time available for directors to effectively monitor risk, leading to unintended consequences. This aligns with Degl'Innocenti et al. (2023), who find that bank risk-taking actually increased in the aftermath of Dodd-Frank. Our findings suggest that while the regulatory framework was designed to enhance governance standards, the resulting pressure on directors may have had the opposite effect, inadvertently shifting their attention away from proactive risk oversight and toward meeting compliance requirements. This raises important questions about the trade-offs associated with stringent governance reforms and their long-term implications for financial stability.

Second, the examination of banker-directors and R&D investments (Chapter 3) provides a nuanced perspective on the role of financial expertise within corporate boards. On one hand, banker-directors can serve as valuable stewards of fiscal stability, leveraging their risk aversion and familiarity with sophisticated financial instruments to prevent overexposure in volatile markets. On the other hand, an excessive focus on near-term risk management may constrain a firm's ability to invest in transformative innovation, curtailing the potential for long-run competitive advantage. This tension underscores the importance of balancing financial caution with the need for strategic agility, a consideration that is increasingly vital for firms operating in fast-paced, innovation-driven industries.

Third, the focus on ESG performance (Chapter 4) reveals that governance structures can significantly moderate how firms integrate sustainability goals alongside traditional financial objectives. The findings demonstrate that financial regulators and compliance requirements can inadvertently foster more robust ESG outcomes when banker directors find themselves preoccupied with immediate oversight tasks. In such instances, other board members with diverse expertise—be it related to sustainability, social responsibility, or stakeholder engagement—can play a more prominent role in guiding sustainability initiatives. This dynamic accentuates the synergy that can emerge when board composition is sufficiently varied to accommodate multiple viewpoints, ensuring that sustainability considerations are not overshadowed by a singular focus on financial risk.

The synergy between these themes is central to understanding the broader contributions of this thesis. By empirically and theoretically linking post-crisis regulatory structures, board-level financial expertise, and the drive toward innovation and sustainability, the research provides a comprehensive assessment of how governance mechanisms operate in contemporary corporate contexts. The findings are pertinent not only to academics but also to practitioners and policymakers. From a theoretical standpoint, this thesis contributes to the literature by highlighting the complexity of trade-offs inherent in modern governance: stronger risk controls can increase the burden on directors and lead to greater risk-taking, while the spillover effects of enforcement actions through interlocking directors may

inadvertently elevate ESG commitments and help increase in R&D investments. From a practical viewpoint, corporate leaders can glean insights into how best to tailor board composition to their strategic objectives, recognising that a one-size-fits-all approach may be insufficient when balancing short-term financial stewardship with long-term growth and societal impact. Regulators and policy architects, meanwhile, are urged to consider the multifaceted ramifications of compliance-oriented mandates, which, while beneficial for curbing systemic risks, can create tensions that potentially hinder innovation-driven competitiveness.

Ultimately, the thesis demonstrates that the interaction between regulation, board composition, and firm priorities is neither static nor straightforward. Instead, it is a dynamic process wherein directors' expertise and time allocation crucially mediate corporate outcomes. By systematically examining how banker-directors, regulatory reforms, and ESG strategies intersect, this work advances the discourse in corporate governance and financial economics, showing that governance frameworks must be holistically designed to optimise both financial resilience and forward-looking innovation. These conclusions hold considerable promise for guiding future investigations. Scholars may build upon this work by employing more granular datasets that capture the real-time evolution of board discussions or by expanding the scope to different regulatory environments and cultural contexts. Practitioners, for their part, can apply the insights herein to refine board appointments, committee structures, and performance incentives in ways that promote both fiscal responsibility and strategic innovation. Its insights have relevance for policymakers seeking effective regulatory design, corporate leaders aiming to balance innovation with responsibility, and scholars of governance striving to understand the evolving intersections of finance, strategy, and sustainability.

Chapter 2 The Impact of the Dodd-Frank Act on Director Quality

2.1 Abstract

In this paper, we investigate the impacts of the Dodd-Frank Act (DFA) on director quality. We use the DFA as a quasi-natural experiment to measure the effect of the legislation on director quality, which we define as a combination of experience and educational and professional background. The intention of the DFA legislation was to create a more risk-averse and experienced board of directors for Bank Holding Companies (BHCs). To study this, we analyse a sample of 188 BHCs and their director quality changes after the DFA. We employ a difference-in-differences and regression discontinuity approach to our analysis. Our results suggest that the DFA's requirement for a separate risk committee has no significant impact on director quality, whether it is measured by experience or educational and professional background. These findings are important as they provide further insight into why there has been no significant change in bank risk-taking after the DFA.

Keywords: Dodd-Frank Act, Director Quality, Risk management, Bank Holding Companies, Risk committee, Board of directors, Bank risk-taking.

2.2 Introduction

The Dodd-Frank Wall Street Reform and Consumer Protection Act, which was passed in 2010 as a response to the 2008 financial crisis, is a crucial piece of financial regulation in the United States (Acharya et al., 2012; Kristin, 2011). It covers a wide range of issues related to the financial industry, including consumer protection, transparency, and the reduction of systemic risk (Laeven, 2013). Its main goal is to prevent future financial crises by increasing oversight and regulation in the financial sector. One of the most important provisions of this Act requires certain financial institutions to establish a risk committee consisting of board members who understand risk management (Balasubramanyan et al. (2019). This committee is responsible for monitoring the institution's risk-taking activities and ensuring that they align with the institution's overall risk management strategy. This involves thoroughly assessing the institution's exposure to various types of risks, such as credit, market, liquidity, and operational risks (www.newyorkfed.org, 2022). As a result, the committee is responsible for overseeing the institution's risk management practices and providing recommendations to the board of directors on how to manage these risks effectively.

The competence and availability of the members constituting the risk committee represent critical factors influencing the committee's effectiveness in discharging its duties (Adams, 2003). In a context where director incentives remain unchanged, high-quality individuals are expected to make

more valuable and smart corporate decisions. This is especially relevant when decisions are complex and demand substantial judgment (Masulis et al. 2020). High-quality members of the committee are typically individuals with a profound understanding of risk management and the financial industry, complemented by the requisite expertise and experience to make informed decisions concerning the institution's risk-taking activities. Moreover, the members of the risk committee must be able to allocate the necessary time and resources to fulfil their responsibilities expertly. If committee members are overburdened with other obligations, their capacity to perform their role effectively may be compromised (De Andres and Vallelado, 2008). Expanding committee structures without proper workload adjustments can result in role overload, ultimately weakening oversight functions (Ashraf, Choudhary & Jaggi, 2024). Research indicates that excessive board monitoring through committees can hinder innovation and CEO effectiveness (Faleye, Hoitash & Hoitash, 2011), while busy boards struggle to provide effective oversight, often leading to negative firm outcomes (Fich & Shivdasani, 2006). Directors with multiple responsibilities tend to be less effective in governance, impairing board monitoring (Field, Lowry & Mkrtchyan, 2013). Moreover, when firms introduce new oversight committees without adjusting governance structures, financial reporting quality can decline due to board busyness (Al-Yahyaee & Al-Hadi, 2016).

This scenario could lead to the institution taking on excessive risk, potentially jeopardising both the institution and its shareholders (Ellul and Yerramilli, 2013). Based on a recent study conducted by Stulz et al. (2021), the effectiveness of having a board risk committee in minimising the risk-taking behaviour of banks may not be as widely believed. The research utilised exclusive interview data to evaluate the performance of bank risk committees and their capacity to achieve their intended objectives.

Additionally, according to the findings of Balasubramanyan et al. (2019), the presence of mandated Risk Committees and Chief Risk Officers in public banks does not appear to have reduced risk. The study found that there was no significant impact from the Risk Committees and, in some cases, having a Chief Risk Officer may even increase risk. These results imply that there may be other factors that are more critical in managing risk, or that banks with these roles in place prior to the Dodd-Frank Act may have already been effectively managing risk.

In summary, the calibre and availability of risk committee members exert significant influence over the institution's ability to manage risk and adhere to the Dodd-Frank Act's requirements. This paper aims to investigate whether the introduction of the separate risk committee mandated by the Dodd-Frank Act has had any discernible impact on overall director quality. Furthermore, it delves into the broader implications of director quality and its potential consequences for companies, highlighting the need for further investigation. This research was inspired by a study conducted by Balasubramanyan et al. (2019), which examined the impact of the Dodd-Frank Act on bank risk-taking. The study found that

there was no significant change in risk-taking behaviour following the legislation. The main motivation of this research is to determine whether the regulation has a meaningful impact on the overall quality of directors on the board of BHCs. If the quality of directors has not changed after the implementation of the Act, this could explain why there is no significant impact on banks' risk-taking. In this research, we adopt a more recent and multi-dimensional approach based on the methodology of Masulis et al. (2020) to measure director quality.

Our study contributes to the existing literature on the Dodd-Frank Act and its impact on the financial industry in several ways. First, it provides new evidence on the effects of the Act on director quality and relates it with risk-taking at financial institutions. Our study adds to this body of research by using a difference-in-differences approach to assess the impact of the Act on director quality more accurately. Second, our study also contributes to the existing literature by using a more comprehensive and nuanced approach to measuring director quality. Previous research on this topic has often relied on a limited set of indicators to assess these variables, which may not capture the full range of factors that impact director quality. Our study addresses this limitation by using a broader set of measures and applying principal component analysis to extract the underlying factors that explain the variation in these measures (Callahan et al., 2003; Dey, 2008; Qin et al., 2018; and Masulis, 2020). Overall, our study adds to the existing literature on the Dodd-Frank Act by providing new evidence on the effects of the Act on director quality and risk-taking, using a more comprehensive and nuanced approach to measuring these variables, and controlling for the effects of other factors that could impact these variables. These contributions can help policymakers and researchers better understand the impact of the Act and inform future research on this topic.

While the body of research on the Dodd-Frank Act is constrained, a noteworthy facet of investigation revolves around the additional regulatory expenses incurred, particularly in the context of additional recruitment scenarios. Feldman, Heinecke, and Schmidt (2013) have significantly contributed to this line of inquiry by evaluating the costs imposed on community banks. Through simulations portraying the impact of heightened regulatory expenses attributed to expanded staffing, their study unveils a nuanced relationship between employment expansion, overall remuneration, and profitability. Feldman et al. (2013) quantify the cost implications of additional regulation on small banks, presenting a comprehensive assessment of varying employment scenarios. Specifically, they calculate the consequences of personnel increases on banks with less than USD50 million in assets. The simulated scenarios involving incremental recruitment exhibit a discernible correlation between recruitment levels and resultant financial outcomes. Notably, increasing personnel by half a person corresponds to a 14-basis-point reduction in profitability, while expanding employment by two workers results in a more substantial 45-basis-point decline in profitability. The repercussions of these staffing increments extend beyond profitability, as evidenced by the findings of Feldman, Heinecke, and Schmidt's (2013) study. Additionally, the study reveals that the modest increase of half a person in staffing contributes to an

additional 6% of banks with less than USD50 million in assets transitioning into an unprofitable status. Contrastingly, the more substantial increase of staffing by two workers leads to a pronounced effect, with 33% more banks of similar size becoming unprofitable.

Moreover, considering studies indicating the adverse effects of the Dodd-Frank Act on small BHCs, our research gains heightened significance. Bordo and Duca (2018) underscore that the Dodd-Frank Act (DFA) has prompted a contraction in lending to small businesses within the banking industry. Their findings present compelling evidence of a discernible shift in the downward trajectory of the small business share of Commercial and Industrial (C&I) loans, coinciding with the enactment of the DFA. Furthermore, employing a difference-in-differences framework, Srivastav and Vallascas (2019) demonstrate that a reduction in regulation, specifically targeting small BHCs, results in an increase of small business lending by affiliated commercial banks, without appropriate impacts on risk-taking or transparency in these subsidiaries.

Additionally, the research by Dolar and Dale (2019) presents compelling evidence indicating that the burden of compliance with the Dodd-Frank Act has been disproportionately borne by small banks in comparison to their larger counterparts. The consequence of this regulatory asymmetry manifests as an intra-industry transfer of wealth, wherein there is a discernible shift from smaller banks to larger ones. Specifically, Dolar and Dale's (2019) findings highlight a decline in the non-interest cost performance of community banks relative to non-community banks in the post-Dodd-Frank Act period, all else being equal. This empirical observation underscores the economic ramifications of regulatory impositions, revealing an adverse impact on the cost dynamics within the community banking sector. The research, thus, contributes to our understanding of the differential effects of regulatory frameworks on distinct segments of the banking industry, emphasizing the disparities in compliance burdens and their subsequent economic implications, and the need for further research to fully understand the impacts of the DFA.

It is essential to note that, while all BHCs with assets surpassing USD10 billion were mandated to establish a risk committee, small banks found themselves disproportionately affected, as they were mostly not in compliance with this rule at the time of the Dodd-Frank law's enactment. In contrast, most large banks had already instituted independent risk committees, thereby serving as a de facto control group in our study. Consequently, despite the primary intention of enhancing the risk management practices of BHCs, the implementation of the Dodd-Frank law had a disproportionately adverse impact on small banks. Paradoxically, the legislation, supposedly aimed at fortifying the risk management fabric of BHCs, imposed an additional burden on small BHCs.

It is also important to underscore that there is no causal effect of risk committee and improvement in risk-taking behaviours among the BHCs after the DFA, studied by Balasubramanyan et al. (2019). In addition to that, we found that the director quality of these BHCs does not exhibit significant

enhancements. These observations substantiate the notion that the Dodd-Frank Act, despite its noble objectives, has failed to yield the intended improvements in risk management or directorial expertise within the scope of small BHCs. The resultant disparity in compliance and impact between small and large BHCs raises pertinent concerns regarding the efficacy and unintended consequences of the Dodd-Frank regulatory framework, particularly in its application to diverse tiers of financial institutions.

These findings shed light on the intricate dynamics between regulatory expenses, employment decisions, and the financial health of small banks under the Dodd-Frank regulatory framework. The demonstrated adverse impact on profitability and the risk of rendering banks unprofitable underscore the need for a nuanced consideration of regulatory policies to ensure a balanced regulatory environment that fosters both financial stability and the viability of smaller financial institutions. Hoskins and Labonte (2015) reported that, despite exemptions, small banks faced increased compliance costs due to the Dodd-Frank Act, affecting their profitability and operational capabilities.

The methodology employed in this study adopts a difference-in-differences approach and involves a sample of 54 BHCs with assets exceeding USD10 billion. The research findings reveal that the Dodd-Frank Act has not induced a significant alteration in overall director quality, a result that could help account for the absence of substantial relationship between the risk committee and banks' risk-taking behaviour post-legislation. This analysis suggests that the provisions of the Dodd-Frank Act related to director quality and risk management may not have been as effective as initially anticipated in enhancing the calibre of directors within financial institutions or in curbing the level of risk assumed by these institutions.

The structure of this paper is organized as follows: Section 2 provides an in-depth discussion of the Dodd-Frank Act, presents a literature review, and develops the hypotheses. Sections 3 and 4 outline the data and research methodology employed, respectively. The empirical results are then presented in Section 5. Section 6 presents the conclusion.

2.3 Dodd-Frank Act, Literature Review, and Hypothesis Development

2.3.1 The Dodd-Frank Act and the Financial Crisis

The systemic risk posed by Large Complex Financial Institutions (LCFIs) was a critical factor in the financial crisis of 2008, highlighting the moral hazards and systemic importance of these institutions (Acharya et al., 2012). In response to the crisis, the Dodd-Frank Wall Street Reform and Consumer Protection Act was enacted, representing the most significant regulatory overhaul of the financial sector since the Great Depression (Acharya et al., 2012; Kristin, 2011). The Act aims to reduce the risk of future crises by imposing stricter regulatory frameworks on heavily indebted financial institutions, thereby enhancing the stability of the financial system (Laeven, 2013). One of the Act's key components is the emphasis on corporate governance in banks, particularly through the establishment of risk committees (RCs) with specific qualifications for their members. This focus reflects the belief that well-designed

corporate governance in banks can lead to more productive capital allocation, ultimately contributing to economic growth.

2.3.2 The Role of Corporate Governance in Mitigating Risk

Corporate governance in banks plays a crucial role in managing risk, as the decisions made by the board of directors directly influence the risk exposure of the entire economy (Laeven, 2013). The Dodd-Frank Act underscores the importance of having qualified individuals on the risk committees of bank holding companies (BHCs), as regulators believe that improving the quality of managerial staff can reduce the risks taken by banks. According to economic theory, regulations such as the Dodd-Frank Act are typically implemented in response to market failures (Acharya et al., 2012). However, there is a concern that if these regulations are not effectively designed or implemented, they could exacerbate the very problems they are intended to solve (Acharya et al., 2012).

The Dodd-Frank Act was introduced in 2010 with the primary goal of promoting financial stability in the U.S. banking sector (Balasubramanyan et al., 2019). By addressing the "too-big-to-fail" problem and other corporate governance issues, the Act seeks to curb excessive risk-taking by bank managers, which was incentivized by government bailouts during the financial crisis (Laeven, 2013). The Act's provisions reflect a congressional belief that the corporate governance regulations in place prior to 2010 were inadequate and that more stringent measures were necessary to prevent future crises (Conyon, 2014).

2.3.3 Director Quality and Corporate Governance

In modern corporate governance, directors are expected to fulfil fiduciary duties to shareholders, including the duties of loyalty and due diligence (Masulis et al., 2020). The quality of a company's directors is a critical factor in its success, as even diligent directors can harm shareholders if they lack experience, competence, or sound judgment (Hermalin and Wisbach, 2017; Masulis et al., 2020). Previous research has suggested that high-quality directors are associated with high-quality firms, as measured by the number of board seats held (Dowen, 1995). However, the number of seats alone may not accurately capture director quality, as the skills and abilities of directors are multi-dimensional. Additionally, directors often serve on multiple committees, making it essential to consider the overall composition and expertise of the board when evaluating director quality.

The Dodd-Frank Act's requirement for BHCs to establish separate risk committees composed of independent directors with deep expertise in risk management has significant implications for board composition. BHCs may need to alter their board structures to comply with these requirements, which could lead to an overall increase in director quality, particularly among institutions heavily impacted by the Act.

2.3.4 Impact of the Dodd-Frank Act on Bank Risk-Taking and Director Quality

Research on the effects of the Dodd-Frank Act on the financial sector is still emerging. Balasubramanyan et al. (2019) found that the presence of a Risk Committee (RC) and Chief Risk Officer (CRO) had no significant impact on bank risk-taking following the Act's implementation. Moreover, Degl'Innocenti et al. (2023) evaluate the Dodd-Frank Act's impact on complex bank holding companies, finding an increase in credit risk after the DFA, consistent with the moral hazard hypothesis. This finding raises questions about the effectiveness of the RC and CRO mandates of DFA. It suggests that while banks may comply with the formal requirements of the Act, they might view these mandates as burdensome or fail to appoint sufficiently qualified individuals to these roles.

This paper builds on the study by Balasubramanyan et al. (2019), which examined the impact of the Dodd-Frank Act on bank risk-taking. However, our research diverges by focusing on the impact of the Act's RC requirements on director quality. While Balasubramanyan et al. (2019) explored the relationship between RCs and risk-taking, our study investigates whether the new RC requirements have led to improvements in director quality, which could, in turn, explain the lack of a significant reduction in bank risk-taking after the Act's enactment.

2.3.5 Hypothesis Development

The Dodd-Frank Act requires BHCs with assets of at least $10 billion to establish a separate RC composed of independent directors with substantial risk management expertise. However, the effectiveness of this requirement depends on the availability of qualified directors. BHCs may either assign existing directors to the RC, increasing their workload, or hire new directors who meet the qualifications. This study hypothesizes that the new RC requirements may indirectly lead to an overall improvement in director quality, especially in BHCs significantly affected by the Dodd-Frank Act.

H1: Bank Holding Companies that were affected by the Dodd-Frank Act experienced a director quality increase in their board of directors via new risk committee requirements.

This hypothesis will be tested to determine whether the Dodd-Frank Act's emphasis on risk management has had the intended effect of enhancing director quality and, consequently, improving the governance and stability of the financial institutions it targets.

2.4 Data and research methodology

2.4.1 Data

The data on Bank Holding Companies from the Federal Reserve National Information Center (NIC) database are employed. Further, we manually gathered biometric information on directors from proxy statements, SEC EDGAR, personal resumes, websites, and the WRDS Boardex database. Banks' financial information was obtained from the WRDS Bank Regulatory database.

Following Balasubramanyan et al. (2019), we classify our treatment and control groups based on whether Bank Holding Companies (BHCs) meet the first three statutory requirements for establishing a separate risk committee, as mandated by the Dodd-Frank Act (DFA). BHCs with total consolidated assets exceeding USD 10 billion but failing to satisfy these prerequisites form the treatment group, while those of comparable asset size that already fulfil the requirements constitute the control group. We initially identified 188 BHCs using publicly accessible regulatory filings, financial statements, and governance databases; however, firms with incomplete information or major structural changes (e.g., mergers, acquisitions, or closures) were excluded to minimise confounding effects. This filtering resulted in 125 BHCs, of which 54 ultimately qualified for the difference-in-differences (DiD) analysis, thereby encompassing the entire relevant population of mid-to-large U.S. financial institutions subject to DFA risk committee mandates.

The sample size in this study may raise concerns regarding its robustness; however, the final sample of 54 Bank Holding Companies (BHCs) is adequate for establishing a robust analysis. The Dodd-Frank Act specifically mandated compliance for BHCs with assets exceeding £10 billion, meaning that the study captures the full population of institutions directly affected by the regulation in a difference-in-differences setting. On the other hand, the entire sample of 125 firms is used in the Regression Discontinuity design. This ensures that the findings are representative of the intended regulatory targets rather than being limited by arbitrary sample constraints.

Moreover, financial regulatory studies often rely on targeted samples rather than broad datasets to maintain relevance and precision. Given that the study focuses on large BHCs subject to Dodd-Frank compliance requirements, the sample provides meaningful insights into the law's impact on these institutions. Additionally, by employing a difference-in-differences methodology, the study effectively isolates the treatment effect of the regulation, mitigating concerns related to sample size by leveraging within-group and across-group comparisons.

Thus, while the sample size appears limited in absolute terms, it remains methodologically sound, given the study's focus on the full universe of large BHCs affected by the regulation. This ensures the validity and robustness of the study's conclusions.

To measure the quality of directors, we follow the methodology of Masulis et al. (2020). First, we manually collect biometric information on directors from EDGAR DEF14A proxy statements, WRDS Boardex, personal resumes, and websites. In addition, we use the WRDS Bank Regulatory database to collect financial data on companies. The quality metrics of directors are then divided and measured into two categories: (i) experience and (ii) educational and professional background. This allows us to obtain a comprehensive understanding of the qualifications and capabilities of directors on the boards of BHCs.

2.4.1.1 Director Quality Metrics and Principal Component Analysis

We used two director quality variables, namely, experience, and educational and professional background, as our dependent variables, and each of these variables consists of five quality metrics; then we applied principal component analysis to extract the dependent variables from each of those five-quality metrics (Detailed description of the Quality metrics provided in Table 2.1 and Table 2.2). The principal component analysis is a statistical technique that is used to reduce the dimensionality of a dataset by identifying a smaller number of underlying factors or components that explain the variation in the data. In this case, we used principal component analysis to extract the dependent director quality variables from the five-quality metrics by identifying the underlying factors that explain the variation in the metrics.

While the current study evaluates director quality based on the level of education attained, it does not differentiate between institutions of varying prestige or rigour. The work of Gounopoulos, Loukopoulos, and Loukopoulos (2020) underscores that CEO educational attainment alone does not necessarily shape investor perceptions; rather, the quality of the education and the surrounding firm-specific uncertainty play crucial roles.

In the context of the Dodd-Frank Act, incorporating institutional quality as a measure of director qualifications could provide deeper insights into how regulatory changes influence board composition. Future research could examine whether the regulation led to shifts in director appointments based on educational prestige, potentially affecting governance outcomes. This would align with human capital and upper-echelon theories by assessing whether firms prioritise directors with degrees from elite institutions as a signal of competence in a more regulated environment. While this aspect is beyond the scope of the current study, it presents a valuable avenue for further exploration in understanding the nuanced impact of financial regulation on director selection.

We follow Callahan et al. (2003), Dey (2008), Qin et al. (2018), and Masulis (2020) to calculate the first principal component of the five quality metrics in each of two main categories—(i) Experience and (ii) Educational and Professional Background. These categories capture distinct aspects of what we term “director quality,” as summarised in Table 2.1. Specifically, the Experience category comprises five indicators of high-level managerial exposure, service on successful or multiple boards, and the breadth of industry knowledge. Meanwhile, Educational and Professional Background encompasses formal degrees, specialised financial and legal training, and sector-specific expertise. By adopting these measures, we ensure consistency with established literature while recognising that intangible factors such as interpersonal skills, leadership style, or ethical orientation may not be fully captured.

2.4.1.1.1 Experience Metrics

Key Executive: We code a director as a key executive (e.g., CEO, COO, CIO) if they have previously held or currently hold a top managerial position. This metric gauges high-level managerial experience and strategic decision-making exposure.

Public Firm High: We assign a value of 1 if a director also serves on a board of another publicly traded firm with above-median industry ROA, reflecting that this individual contributes oversight in a relatively successful corporate setting.

Multiple Seats: Directors holding more than one board seat may demonstrate valuable network connections and strategic insights gained from diverse governance experiences. However, we acknowledge the possibility of "overboarding," wherein too many directorships might dilute the attention paid to any single firm.

S&P 1500: We measure the tier of the firm(s) in which a director serves (S&P 500, MidCap, or SmallCap) as an indicator of large-cap governance exposure. This proxy helps capture the complexity and scale of companies directors are accustomed to overseeing.

Number of Industries: The breadth of a director's industry experience signals the capacity to navigate cross-sector challenges and opportunities. Though broad industry experience may aid strategic thinking, it may also limit sector-specific depth.

2.4.1.1.2 Educational and Professional Background Metrics

Degree: We differentiate directors with Bachelor's, Master's, and Doctoral degrees. While higher education often indicates advanced analytical and leadership skills, we recognize that formal degrees do not always encapsulate practical expertise.

MBA: This binary indicator signifies advanced training in business administration. Although widely acknowledged as beneficial for strategic understanding, an MBA alone may overlook specialized industry knowledge or soft skills.

Financial: Directors with a financial background (e.g., CFO, banker, accountant) bring expertise in capital markets and risk management, aligning with regulatory expectations for financially literate boards. However, an overemphasis on financial skills could overshadow other critical areas such as technology or marketing and innovation.

Legal: Directors with legal training may offer strong compliance and regulatory guidance. Yet, similar to financial expertise, an abundance of legal backgrounds could lead to overly risk-averse decision-making.

Industry: We flag directors serving in the same Fama–French 49 industry, capturing industry-specific acumen. Nonetheless, homogeneity in sector experience might diminish innovative, cross-industry perspectives.

For each category of director quality, we begin by calculating pairwise correlations among the five underlying metrics and then apply principal component analysis (PCA) to extract a single factor that reflects the latent dimension of "director quality." This method reduces data dimensionality and alleviates multicollinearity concerns, allowing us to examine how the Dodd-Frank Act influences various facets of director composition. We acknowledge, however, that certain indicators such as multiple directorships may signify both valuable governance experience and the potential risk of overextension, while advanced degrees may not always translate into practical strategic insight. Nonetheless, employing PCA on this established set of measures provides a robust framework for assessing the impact of legislative mandates on board capabilities. Additionally, we follow Ellul and Yerramilli (2013) and Balasubramanyan et al. (2019) in collecting control variables from the Bank Regulatory system to account for firm-specific attributes that may influence governance outcomes.

Although we include educational attainment in our quality metrics, the current study does not distinguish between institutions of varying prestige or rigor. Gounopoulos, Loukopoulos, and Loukopoulos (2020) suggest that the mere possession of advanced academic credentials does not necessarily affect investor perceptions; rather, the calibre of the educational institution and the presence of firm-specific uncertainty are decisive factors. In the context of the Dodd-Frank Act, incorporating institutional quality into director qualifications could thus reveal deeper insights into how regulatory changes alter board composition. Future research might explore whether more regulated environments prompt firms to prioritise directors from elite institutions as a signal of competence, a perspective that resonates with human capital and upper-echelon theories. While such an investigation extends beyond the scope of this study, it presents a promising avenue for further understanding the nuanced impact of financial regulation on director selection.

2.4.2 Quality metrics variables

Table 2-1 The **Experience** Measure combines five-quality metrics to assess the experience of outside directors

Name	Description
Key Executive	A binary variable that takes the value 1 if the director is a key executive (e.g. CEO, COO, CIO) or holds a similar position, and 0 otherwise.
Public firm high	A binary variable that takes the value 1 if the director is on the board of another publicly traded company with a high return on assets (ROA) relative to the industry median, and 0 otherwise.
Multiple seats	A binary variable that takes the value 1 if the director has seats on more than one board, and 0 otherwise.
S&P 1500	A variable that takes a value based on the S&P index of the company that the director serves on. It takes the value 1 if the company is in the S&P 500, 2/3 if the company is in the S&P MidCap index, and 1/3 if the company is in the S&P SmallCap index.
Number of Industries	A continuous variable that represents the total number of industries that the director serves in.

Note: The Experience Quality Measure combines five quality metrics to assess the experience of outside directors. Table 2.1 presents the description of the quality metrics applied.

Table 2-2 The measure of outside directors' **Educational and Professional Background** combines five quality metrics

Name	Description
Degree	A variable that takes the value 1 if the director has a PhD, 2/3 if the director has a Master's degree, and 1/3 if the director has a Bachelor's degree.
MBA	A binary variable that takes the value 1 if the director has an MBA, and 0 otherwise.
Financial	A binary variable that takes the value 1 if the director has a financial background or holds a position related to finance (e.g., CFO, banker, accountant), and 0 otherwise.
Legal	A binary variable that takes the value 1 if the director has a legal background (e.g., lawyer, attorney, legal advisor), and 0 otherwise.
Industry	A binary variable that takes the value 1 if the director is from a company in the same industry as the Fama–French 49, and 0 otherwise.

Note: The Educational and Professional Background Quality Measure combines five quality metrics to assess the educational attainment of outside directors. Table 2.2 presents the description of the quality metrics applied.

2.5 Summary statistics and Pearson correlations

Table 2.3 presents the summary statistics of the variables (Panel A), table 2.4 presents the Pearson Correlation between Educational and Professional Background and its five-quality metrics (Panel B), and table 2.5 presents the Pearson Correlation between Experience and its five-quality metrics (Panel C). The summary statistics serve as a critical tool for understanding the dataset and shedding light on the underlying patterns and trends in our dataset.

2.6 Summary statistics and Pearson Correlation

2.6.1 Panel A

We started by focusing on our dependent variables. Our first dependent variable is the "Educational and Professional Background" variable, which has been extracted from five quality metrics using principal component analysis (PCA). It exhibits a mean of -0.017 and a median of -0.012. These values indicate that, on average, there is a slightly negative tendency in the educational and professional backgrounds of the individuals in our dataset. It is important to note that the minimum level for this variable is -1.325, suggesting a wide range of educational and professional backgrounds, while the maximum value is 1.342. Moreover, with a standard deviation of 0.460, we can observe a moderate

dispersion of educational and professional backgrounds among the individuals, indicating a certain degree of diversity within the dataset.

For the "Experience" variable, which also represents a combination of five quality metrics, we observe a mean of -0.152 and a median of 0.087. These values suggest that, on average, the directors in our dataset possess almost a neutral level of experience. The minimum experience level recorded is -3.516, indicating the presence of individuals with relatively limited experience, while the maximum level is 1.670, representing highly experienced individuals. Furthermore, the relatively high standard deviation of 1.055 suggests a wide range of experiences among the observed individuals, signifying the presence of both highly experienced and less experienced directors.

A key consideration in the interpretation of the composite dependent variables, Experience and Educational and Professional Background, is the presence of negative mean values. These variables are constructed using principal component analysis (PCA), which generates latent variables which are statistical constructs that do not have a predefined scale or absolute reference point. By design, PCA scores are typically centred at zero, meaning that a score of zero represents an observation with an average level of the underlying attributes in the sample. Consequently, negative PCA values do not indicate an inherent deficiency or error; rather, they simply reflect observations with below-average component scores relative to the sample distribution.

This property arises from the mathematical framework of PCA, which is performed on either a covariance or correlation matrix rather than raw data. Because these matrices inherently remove information about absolute means, PCA-derived component scores are expressed in relative terms rather than on an absolute scale. As a result, any negative mean values observed in the analysis are a natural byproduct of this statistical transformation and should be interpreted as indicating that, on average, firms in the sample have component scores slightly below the zero-centred benchmark. This methodological feature does not affect the validity of the analysis or its conclusions but rather ensures that the principal components accurately capture variation and relative positioning within the dataset.

The binary variables include "Degree," "MBA (0/1)," "Financial (0/1)," "Legal (0/1)," "Industry (0/1)," "Key Executive," "High ROA (Return on Assets) Public Firm," and "Multiple Seats," each offering valuable insights into different aspects within the dataset. The mean values of these variables indicate the proportions of individuals belonging to the respective categories. For instance, the "Degree" variable has a mean of 0.557, implying that a significant proportion of individuals in our dataset hold a Bachelor's degree or higher academic qualification.

On the other hand, when we investigate the specific characteristics of other variables, the "Number of Industries" variable represents a count and exhibits a mean of 0.935. This indicates that, on average, the directors in our dataset are associated with approximately one industry. However, it is worth noting

that the maximum number of industries associated with a director is 13, indicating a wide range of industry involvements. Additionally, the relatively high standard deviation of 1.204 suggests considerable variation in the number of industries among the directors.

Regarding the "Size" variable, which represents a continuous measure, we find a mean value of 17.834 and a standard deviation of 1.540. These statistics provide insights into the distribution of company sizes within the dataset. The mean value suggests that, on average, the companies in our dataset have a size of approximately 17.834. The standard deviation indicates that there is a notable degree of variability in the sizes of the companies, implying the presence of both large and small entities.

Moving on to the financial ratios, the "ROA" variable represents the return on assets. It displays a mean of 0.010 and a standard deviation of 0.020. These statistics offer information about the average profitability and the level of variability among the companies. The mean value of 0.010 indicates the average return on assets for the companies in our dataset. Furthermore, the standard deviation of 0.020 suggests that there is a moderate degree of variability in the profitability of the companies, highlighting differences in their financial performance.

Another financial ratio of interest is the "Tier 1 Capital" variable ratio, which represents the proportion of a bank's core tier 1 capital (equity capital and stated reserves) to total risk-weighted assets. It exhibits a mean of 0.095 and a standard deviation of 0.060. These statistics provide insights into the capital strength and stability of the observed institutions. The mean value of 0.095 suggests that, on average, the banks in our dataset maintain a core tier 1 capital ratio of 0.095. The standard deviation of 0.060 indicates that there is variability in the capital ratios among the banks, indicating differences in their capital adequacy and stability.

Finally, we examine the "Loans Ratio" variable, which indicates the proportion of loans. It displays a mean of 0.584 and a standard deviation of 0.195. These statistics inform us about the average loan exposure and the dispersion of loan ratios among the companies. The mean value of 0.584 suggests that, on average, the companies in our dataset have a loan ratio of 0.584. The standard deviation of 0.195 indicates that there is variation in the loan ratios among the companies, implying differences in their reliance on debt financing.

Table 5.1 in the appendix presents the Variance Inflation Factor (VIF) values for the independent variables included in the regression model. The VIF is used to detect multicollinearity, which occurs when independent variables in a regression are highly correlated, potentially distorting the estimated coefficients and inflating standard errors. Typically, a VIF value exceeding 5 indicates significant multicollinearity concerns.

In this model, all variables exhibit VIF values well below the threshold of 5, with the highest being ROA at 3.953. This suggests that multicollinearity is not a significant issue in this analysis. The mean VIF

for the model is 1.993, further confirming that the variables are sufficiently independent of one another. The inverse of the VIF (1/VIF) values, also shown in the table, corroborates these results, indicating that the presence of other predictors does not excessively inflate the variance of each predictor. Consequently, the regression results based on these variables can be considered reliable and free from substantial multicollinearity distortions.

Table 2.4 and Table 2.5 present the Pearson correlations among variables to explore their relationships and associations. Our focus lies on two panels: Panel B examines the correlations between the "Educational and Professional Background" variable and its five-quality metrics. Panel C investigates the correlations between the "Experience" variable and its five-quality metrics. These correlations give us valuable insights into how different variables are interconnected and their impact on the quality metrics.

Table 2-3: Panel A - Summary statistics of variables

Variable Names	N	Mean	Std. Dev.	min	p25	Median	p75	max
Educational&Profesional Backgr	586	-0.017	0.460	-1.325	-0.322	-0.012	0.327	1.342
Experience	586	-0.152	1.055	-3.516	-0.513	0.087	0.665	1.670
Degree	5807	0.557	0.300	0	0.333	0.667	0.667	1
MBA(0/1)	5807	0.298	0.458	0	0	0	1	1
Financial(0/1)	5807	0.008	0.087	0	0	0	0	1
Legal(0/1)	5807	0.013	0.114	0	0	0	0	1
Industry(0/1)	5807	0.994	0.080	0	1	1	1	1
Key exe	5807	0.767	0.423	0	1	1	1	1
Hp firm	5807	0.815	0.388	0	1	1	1	1
Multiple seats	5807	0.997	0.051	0	1	1	1	1
SP1500	5807	0.784	0.334	0	0.667	1	1	1
Number of Industries	5807	0.935	1.204	0	0	1	2	13
Size	540	17.834	1.540	14.863	16.613	17.407	18.832	21.668
ROA	540	0.010	0.020	-0.067	0.006	0.009	0.012	0.194
Tier1 Capital	470	0.095	0.060	0.041	0.074	0.086	0.099	0.568
Loans Ratio	540	0.584	0.195	0.016	0.497	0.659	0.718	0.852
Bad Loans Ratio	540	0.012	0.014	0	0.004	0.008	0.016	0.102

Note: In this sample of 54 BHCs spanning from 2005 to 2015, Table 2.3 showcases summary statistics for key variables, both continuous and binary, including educational and professional background and experience. These metrics were extracted using principal component analysis (PCA) from five quality metrics. The experience variable is a combination of five quality metrics. Binary variables such as "Degree," "MBA (0/1)," "Financial (0/1)," "Legal (0/1)," "Industry (0/1)," "Key executive," "Hp(High ROA public) firm," and "Multiple seats" are included and reflect the proportions in each respective category. The number of industries indicates an average industry association of directors in the sample, while size describes the distribution of company sizes. The ROA (Return on Assets) variable provides insights into the average profitability, while the Tier 1 Capital Variable Ratio reflects the capital strength and stability of banks. The Loans Ratio describes the average loan exposure and dispersion of loan ratios among BHCs.

2.6.2 Panel B

Table 2-4: Panel B The Pearson Correlation between Educational & Professional Background and its five-quality metrics

Variable Names	Education	Degree	MBA	Financial	Legal	Industry
Education	1.000					
Degree	0.322***	1.000				
MBA	0.301***	0.297***	1.000			
Financial	-0.067***	0.047***	-0.057***	1.000		
Legal	-0.036**	0.084***	-0.075***	0.182***	1.000	
Industry	0.021	0.009	-0.005	0.007	0.009	1.000

Note: Table 2.4 Panel B examines the correlations between the "Educational and Professional Background" variable and its five-quality metrics

2.6.3 Panel C

Table 2-5: Panel C The Pearson Correlation between Experience and its five-quality metrics

Variable Names	Experience	Key executive	Public firm high	Multiple seats	S&P1500	Number of industries
Experience	1.000					
Key executive	-0.075***	1.000				
Public firm high	0.506***	-0.010	1.000			
Multiple seats	0.004	0.004	0.037**	1.000		
S&P1500	0.809***	-0.054***	0.342***	0.018	1.000	
Number of industries	0.343***	-0.091***	0.284***	0.040**	0.358***	1.000

Note: Table 2.5 Panel C investigates the correlations between the "Experience" variable and its five-quality metrics.

The correlations in Panel B provide intriguing insights into the relationship between "Educational & Professional Background" and the associated quality metrics. The "Education" variable, which shows a statistically significant positive correlation of 0.322 with "Degree" ($p < 0.01$). This indicates a moderate association between educational background and degree attainment. In other words, as expected, individuals with a higher education level are more likely to hold a degree. Continuing with the "Education" variable, we find a similar positive correlation of 0.301 with "MBA" ($p < 0.01$), suggesting that individuals with a stronger educational background are more inclined to pursue an MBA degree. This finding emphasises the potential influence of educational qualifications on pursuing higher levels of education.

Moreover, we observe negative correlations between "Education" and both "Financial"(-0.067, $p < 0.01$) and "Legal" (-0.036, $p < 0.05$) metrics. These results imply a weak inverse relationship between educational background and attributes related to financial or legal aspects. In simpler terms, individuals with a higher educational background may exhibit lower financial or legal indicators, pointing to a complex interplay between education and these specific metrics. However, the correlation between "Education" and "Industry" is negligible (0.021), indicating a weak or no association between educational background and industry involvement. Thus, educational qualifications may not exert a strong influence on the number of industries that individuals are associated with.

Panel C examines the correlations between "Experience" and its associated quality metrics. The correlation between "Experience" and "Key executive" is -0.075 ($p < 0.01$), suggesting a weak negative association. In simpler terms, as experience increases, the likelihood of holding a key executive position slightly diminishes. However, the magnitude of this correlation suggests that other factors may have a more substantial influence on key executive positions. On the other hand, we find a significant positive correlation of 0.506 ($p < 0.01$) between "Experience" and "Public firm high," indicating that individuals with more experience are more likely to hold positions in high-ROA public firms. This highlights the importance of experience in attaining senior positions within the public sector. The correlations between "Experience" and "Multiple seats" (0.004) and "S&P1500" (0.018) are negligible, suggesting weak or no associations between experience and these specific quality metrics. This means that experience may not significantly influence the number of board seats or holding a seat in a company in the S&P1500 index. Last, we observe a positive correlation of 0.343 ($p < 0.01$) between "Experience" and "Number of industries" This indicates that individuals with more experience tend to be associated with a higher number of industries, indicating a broad professional network and diverse industry involvement.

2.7 Research methodology

This study employs two primary quasi-experimental techniques, namely difference-in-differences (DiD) and regression discontinuity design (RDD), to investigate how the Dodd-Frank Act influences director quality. Both methods are well-established in the finance literature for

identifying policy-driven changes while minimizing endogeneity concerns (Angrist and Krueger, 1999; Imbens and Lemieux, 2008).

DiD compares outcomes before and after a policy intervention in both a "treatment" group (firms subject to the regulatory change) and a "control" group (firms not affected). In this context, we examine whether the introduction of risk committees mandated by the Dodd-Frank Act leads to discernible improvements in director quality. By focusing on how the trajectory of director quality diverges between affected and unaffected firms over time, DiD enables us to attribute observed changes more confidently to the legislation rather than to any unrelated macroeconomic or firm-specific factors.

RDD complements the DiD framework by exploiting a discrete threshold, specifically, the USD 10 billion asset cutoff, at which the Dodd-Frank Act imposes additional requirements. Firms marginally above this threshold form the treatment group, while those slightly below serve as the control group. By comparing outcomes just around the cutoff, RDD sharpens the causal interpretation, controlling for continuous variables that might otherwise confound the results.

Applying both DiD and RDD enhances the robustness of our findings in two key ways. First, DiD captures broader temporal shifts by analysing how director quality evolves across the entire sample of treated and control firms. Second, RDD provides a localised view of how the Act's stipulations affect firms that narrowly cross the regulatory threshold. Together, these methods reduce the likelihood of spurious correlations and bolster the internal validity of our results, yielding a more comprehensive understanding of how legislative mandates reshape governance practices in the banking sector.

2.8 Difference-in-differences

We used a difference-in-differences approach to test the impact of the Dodd-Frank Act on director quality. The difference-in-differences method involves comparing groups exposed to the variable of interest with those not exposed. This method is well-suited for estimating the impact of economic or government policy changes (Angrist and Krueger, 1999).

To initiate the comparison between the change in director quality at affected banks (treatment group) and unaffected banks (control group), we follow the approach outlined by Balasubramanyan et al. (2019). Our first step involves identifying appropriate bank samples from both groups based on the specific provisions of the Dodd-Frank Act. For the treatment group, we carefully examine the provisions of the Dodd-Frank Act to determine which banks were directly affected by the legislation. We focus on selecting banks subject to these specific provisions and which experienced regulatory changes due to the Dodd-Frank Act. Conversely, for the control group, we identify banks that were not impacted by the Dodd-Frank Act. These banks serve as a benchmark for comparison, allowing us to assess any changes

in director quality that may have occurred independently of the legislation's influence. By considering the provisions of the Dodd-Frank Act and categorizing banks into treatment and control groups accordingly, we establish a solid foundation for conducting a comprehensive and accurate analysis of the legislation's impact on director quality within the banking sector. This method enables us to discern whether any observed changes in director qualifications and appointments are attributable to the RC requirements of the Dodd-Frank Act or other external factors.

We used the following regression model:

$$Director\ Quality_{ji,t} = \beta_0 + \beta_1 * Treated_i + \beta_2 * After_t + \beta_3 * Dodd\text{-}Frank\ (Treated_i \times After_t) + Controls + Firm\ FE + Year\ FE + \varepsilon \quad (1)$$

Treated = 1 if assets ≥ $10 billion and the BHC is not compliant

= 0 otherwise

After = 1 if year > 2010 or year of compliance

= 0 otherwise,

where:

In this model, the dependent variable is Director Quality, measured either by Experience or Educational and Professional Background. The intercept term is represented by β_0. β_1 is the coefficient for the treated dummy variable, which captures whether Bank Holding Companies (BHCs) were affected by the Dodd-Frank Act, taking a value of 1 if the BHCs were impacted by the legislation and 0 otherwise. β_2 represents the coefficient for the year following compliance with the Dodd-Frank Act, taking a value of 1 for years after the BHCs comply with the Act and 0 otherwise.

The interaction term, β_3, combines the treatment and the post-legislation periods, taking a value of 1 for BHCs affected by the Dodd-Frank Act in the years after its enactment and 0 for those that were not. The model also includes a set of Controls, which represent the effect of other factors that could influence director quality. These control variables include the size of the bank, return on assets, tier 1 capital, the loans-to-assets ratio, and the ratio of bad loans, among others. These are critical in isolating the effect of the Dodd-Frank Act from other potential influences on director quality.

Additionally, the model includes Firm Fixed Effects (Firm FE) to capture unobservable, time-invariant characteristics across firms that may affect director quality, ensuring that comparisons are made within firms over time. Year Fixed Effects (Year FE) are incorporated to control for time-varying factors that could influence all firms equally, such as macroeconomic or

regulatory changes. Finally, ε represents the error term, accounting for unexplained variations in director quality.

In this specification, the inclusion of the interaction term for the Dodd-Frank Act allows us to measure its differential impact on director quality for treated and non-treated BHCs over time. Control variables are included to account for other relevant factors that may influence director quality, while fixed effects for firms and years are incorporated to address heterogeneity across firms and temporal changes.

2.9 Regression discontinuity

In addition to our difference-in-differences setup, we have employed a regression discontinuity research design as a robustness test. In a regression discontinuity research design, the treatment and control groups are determined based on a predetermined cut-off value for the treatment variable. In this design, we use the cut-off value of a 10-billion-dollar asset size to create a "discontinuity" in the treatment variable, allowing us to compare the outcomes of the treatment and control groups and estimate the causal effect of the treatment. Thus, in this study examining the effects of the Dodd-Frank Act on BHCs, we used the 10-billion-dollar asset size threshold as the cut-off value for assigning BHCs to the treatment and control groups. Those BHCs with assets equal to or greater than 10 billion dollars are assigned to the treatment group, while BHCs with assets less than 10 billion dollars are assigned to the control group. By comparing the outcomes of the BHCs in the treatment and control groups, we estimate the causal effect of the Dodd-Frank Act on BHCs, and this allows us to draw conclusions about the effectiveness of the Act in this specific asset size range.

The regression discontinuity approach stands as the sole robustness test employed in our study. We primarily adopted the methodology proposed by Balasubramanyan et al. (2019), who also emphasised the use of regression discontinuity as the primary means of assessing the robustness of their findings. By aligning with their approach, we ensured consistency and reliability in our research methodology.

Following Balasubramanyan et al.'s (2019) regression discontinuity research design, we also choose a bin size of 7 billion dollars. In their study, they chose a bin size of 7 billion dollars to study the effects of the treatment on banks. The minimum size for a bank to be included in the Federal Reserve System is 3 billion dollars, so the below-threshold point for this study is 3 to 10 billion dollars. Banks above the threshold point have assets worth 10 to 17 billion dollars. This USD10 billion threshold creates a "discontinuity" in the data, because BHCs just above and below the threshold may be very similar in all other respects, but only those above the threshold receive the treatment. This means that any differences in the outcomes of these BHCs can be attributed to the treatment itself. This allows us to estimate the effects of the treatment while controlling for other factors that might affect the outcome.

The treatment pool consists of BHCs with assets of USD10 billion to USD17 billion that do not meet the first three of the Risk Committee requirements of the Dodd-Frank Act when the law is signed; in other words, BHCs are affected by the law. On the other hand, the control group is simply the BHCs with assets of USD3 billion to USD10 billion already in compliance with the Dodd-Frank Act. The following presents the regression discontinuity.

$$\textit{Director Quality} = \alpha 0 + \alpha 1\ \textit{Above Threshold} + \alpha 2\ \textit{Size} + \textit{Controls} + \textit{Firm FE} + \varepsilon)$$

$$\textit{Treated} = 1\ \textit{if \$10 billion} \leq \textit{assets} \leq \textit{\$17 billion \& do not comply with law}$$

$$= 0\ \textit{if \$3 billion} \leq \textit{assets} < \textit{\$10 billion \& compliance of the law} \qquad (2)$$

2.10 Empirical results

2.11 Difference-in-differences

Table 2.6 shows Univariate Difference-in-Differences results both for Experience and Educational & Professional Background. The results of the univariate difference-in-differences analysis show that there was a decrease in the mean educational and professional background of directors in treatment firms after the implementation of the Act, with a change of -0.027. In contrast, there was an increase in the mean educational and professional background of directors in control firms, with a change of 0.124. The difference in the change between treatment and control firms in the educational and professional background was -0.151, with a t-statistic of 1.66.

Additionally, the analysis reveals that there was an increase in the experience mean of directors in treatment firms after the Act, with a change of 0.026. In contrast, there was a decrease in the experience mean of directors in control firms, with a change of -0.051. The difference in the change between treatment and control firms in experience was 0.077, with a t-statistic of 0.37. These results suggest that treatment firms may have prioritised hiring directors with more experience over those with stronger educational and professional backgrounds. However, the results are not significant.

Table 2-6:Univariate difference-in-differences

	Mean of the change from Difference-in-Differences Pre-event to Post-event Period		**Difference-in-Differences**	
	Treated Firms (T)	Control Firms (C)	Difference in Change (T)-(C)	t-statistics for (T) - (C)
Educational & Professional Background	-0.027	0.124	-0.151	1.66
Experience	0.026	-0.051	0.077	0.37

Note: Table 2.6 presents the univariate difference-in-differences analysis results, comparing the mean change in the quality of outside directors before and after the Dodd-Frank Act for the treatment and control groups of BHCs. The analysis calculates the mean change in director quality for each group from pre- to post-event, and the difference between these mean changes yields the difference-in-differences estimate. The significance of this estimate is tested using a t-test.

The results of our analysis suggest a nuanced impact of the Dodd-Frank Act on director quality, particularly in terms of educational and professional backgrounds as well as experience. As depicted in Figure 2.1, there is a slight increase in the mean educational and professional backgrounds of directors at both treated and control firms over the sample period. However, it is noteworthy that the increase is more modest in the treated firms, those directly subject to the Dodd-Frank Act regulations, relative to their control counterparts. This divergence implies that the regulatory pressure exerted by the Act may not have substantially elevated educational or professional qualifications across the board.

Moreover, Figure 2.2 illustrates the evolution of director experience, revealing a more pronounced difference between treated and control firms in the years surrounding the implementation of the Dodd-Frank Act. Specifically, treated firms exhibit a marked increase in director experience, particularly in the two years leading up to the compliance deadline. This suggests that firms likely prioritised hiring directors with extensive experience to meet the risk management requirements mandated by the legislation.

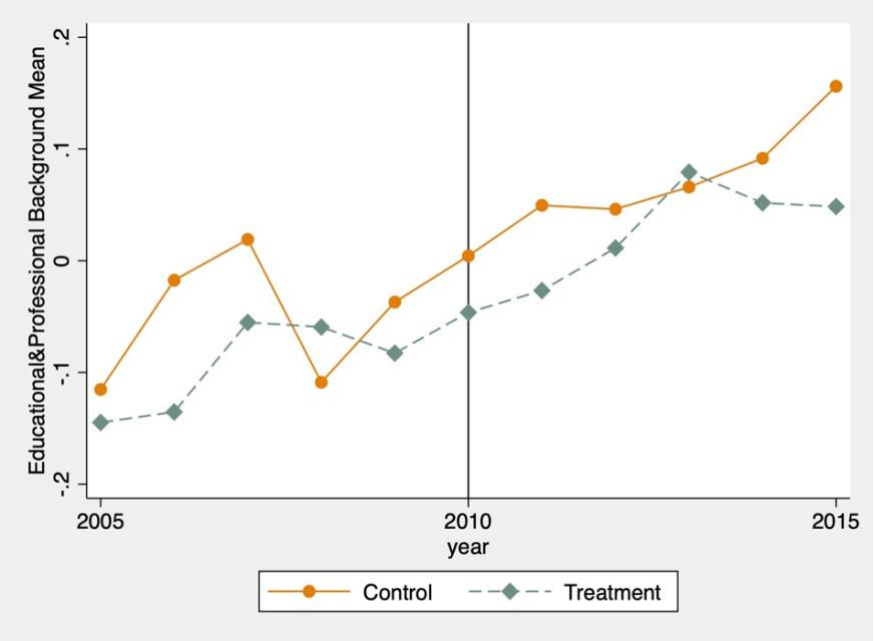

Figure 2.1: Educational & Professional background mean of treated and control firms

Note: Figure 2.1 indicates the Educational & Professional background mean of treated and control firms during the sample period from 2005 to 2015.

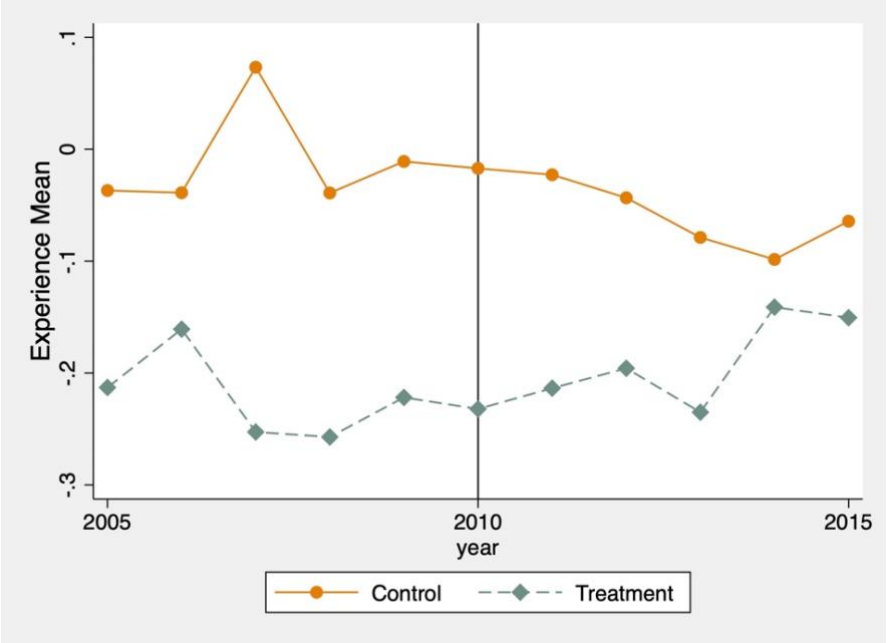

Figure 2.2: Experience mean of treated and control firms

Note: Figure 2.2 indicates the Experience mean of treated and control firms during the sample period from 2005 to 2015.

While these results provide preliminary insights, the mixed findings, especially when accounting for multivariate analysis, warrant further scrutiny. The educational and professional background differences, though observable, are not statistically significant, with even weaker effects when adjusting for firm-level controls. In contrast, the increase in experience, while more consistent, raises important

questions about the trade-offs involved in director recruitment post-DFA. One possible interpretation is that BHCs have opted to recruit more experienced directors at the expense of hiring individuals with advanced educational or professional credentials. This aligns with the theory that institutions may focus on compliance with the technical requirements of risk management, even if it means foregoing broader expertise.

Although this study presents and discusses insignificant results, this does not imply a failure to achieve meaningful insights. In fact, the insignificance of the findings itself tells a compelling story. This study highlights that, while the Dodd-Frank Act was intended to increase the number of directors with a strong understanding of risk—thereby enhancing overall director quality—our analysis finds no significant improvement in director quality. This lack of substantial improvement is, in itself, a key finding of the research.

Alternatively, these findings may reflect a more ambivalent stance by BHCs toward the Dodd-Frank Act, potentially viewing its regulatory stipulations as a formality rather than a transformative governance requirement. This is consistent with previous research, such as Balasubramanyan et al. (2019), which highlights the limited impact of the DFA on tangible risk management improvements within the banking sector. In this context, the slight enhancements in director experience could represent a superficial adjustment to meet compliance thresholds without fostering substantive improvements in overall governance quality.

Experience includes metrics such as key executive roles, board positions in high-ROA public firms, multiple board seats, S&P 1500 index status, and number of industries the directors serve in. Educational & Professional Background comprises educational attainment, MBA presence, financial expertise, legal background, and industry based on the Fama–French 49 classification.

Table 2-7: Multivariate difference-in-differences

Variable Names	(1) Educational l& Professional Background	(2)	(3) Experience	(4)
Dodd-Frank (0/1)	-0.001	0.089	0.131*	0.068
	(0.099)	(0.102)	(0.076)	(0.069)
Size		0.103		0.118
		(0.094)		(0.129)
Roa		3.764**		1.91
		(1.441)		(1.286)
Tier1capital		-0.37		1.191
		(1.693)		(1.316)
Loans Ratio		0.317		0.344
		(0.368)		(0.391)
Bad loans Ratio		-0.605		1.639
		(1.709)		(2.245)
Constant	0.416***	-1.66	1.047***	-1.346
	(0.055)	(1.836)	(0.045)	(2.475)
Observations	586	470	586	470
R-squared	0.725	0.78	0.957	0.972
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Standard errors are in parentheses. *** p<.01, ** p<.05, * p<.1

Note: Table 2.7 presents baseline multivariate regression results for director quality measures, incorporating firm and year fixed effects. The analysis focuses on two key variables: Experience and Educational & Professional Background, both derived through principal component analysis from five underlying quality metrics.

The results of the multivariate difference-in-differences analysis in 2.7 column 2 suggest that the Dodd-Frank Act had a positive impact on director quality, as measured by educational and professional background. The coefficient for the treatment indicator (Dodd-Frank Act) is 0.089, which means that firms affected by the Dodd-Frank Act had an average increase in director quality of 0.089 units compared to firms that were not affected by the Act. However, this coefficient is not statistically significant. The size of the firm, as measured by the size coefficient, had a positive impact on director quality, with a coefficient of 0.103. This means that, on average, a one-unit increase in size was associated with a 0.103-unit increase in director quality. This coefficient is also statistically not significant at the 95% confidence level.

The return on assets (ROA) had a large and statistically significant positive impact on director quality, with a coefficient of 3.764. This means that, on average, a one-unit increase in ROA was associated with a 3.764-unit increase in director quality. The Tier 1 capital ratio had a negative impact on director quality, with a coefficient of -0.37. This means that, on average, a one-unit increase in the Tier 1 capital ratio was associated with a 0.37-unit decrease in director quality. However, this coefficient is not statistically significant at the 95% confidence level. The loan and bad loan ratios had positive and negative impacts on director quality, respectively, but these coefficients were not statistically significant at the 95% confidence level. Overall, the model explains 78% of the variance in director quality, as indicated by the R-squared statistic. The model also controls for firm and year fixed effects, which means that the estimates are adjusted for any time-invariant differences between firms and for any

common trends within firms over time. Based on these results, it can be concluded that the Dodd-Frank Act had a positive impact on director quality, as measured by educational and professional background; however, the results are not statistically significant. Other factors, such as ROA, also had significant impacts on director quality. However, the effects of the Tier 1 capital ratio and the loan and bad loan ratios were not statistically significant.

The results of the multivariate difference-in-differences analysis in Table 2.7 column 4 suggest that the Dodd-Frank Act had a positive but insignificant impact on director experience. The coefficient for the treatment indicator (Dodd-Frank Act) is 0.068, which means that firms affected by the Dodd-Frank Act had an average increase in director experience of 0.068 units compared to firms that were not affected by the Act. This coefficient is not statistically significant at the 95% confidence level. The size of the firm, as measured by the size coefficient, had a positive impact on the director experience, with a coefficient of 0.118. This means that, on average, a one-unit increase in size was associated with a 0.118-unit increase in director experience. This coefficient is also not statistically significant at the 95% confidence level. The return on assets (ROA) had a positive impact on director experience, with a coefficient of 1.91. This means that, on average, a one-unit increase in ROA was associated with a 1.91-unit increase in director experience. This coefficient is not statistically significant at the 95% confidence level. The Tier 1 capital ratio had a positive impact on director experience, with a coefficient of 1.191. This means that, on average, a one-unit increase in the Tier 1 capital ratio was associated with a 1.191-unit increase in director experience. This coefficient also is not statistically significant at the 95% confidence level. The loan and bad loan ratios had positive impacts on director experience, with coefficients of 0.344 and 1.639, respectively. However, these coefficients are not statistically significant at the 95% confidence level.

Overall, the model explains 97.2% of the variance in director experience, as indicated by the R-squared statistic. The model also controls for the firm and year-fixed effects, which means that the estimates are adjusted for any time-invariant differences between firms and for any common trends within firms over time. Based on these results, it can be concluded that the Dodd-Frank Act had a small positive but insignificant impact on director experience.

Table 2-8: Multivariate dynamic difference-in-differences for Educational & Professional background

Variable Names	(1) Educational&Professional Background
Dodd-Frank (0/1)	0.089
	(0.096)
Size	0.103
	(0.088)
Roa	3.764***
	(1.356)
Tier1 Capital	-0.370
	(1.593)
Loans ratio	0.317
	(0.346)
Bad loans ratio	-0.605
	(1.608)
2006	0.040
	(0.039)
2007	0.067
	(0.045)
2008	0.064
	(0.065)
2009	0.157**
	(0.072)
2010	0.140*
	(0.075)
2011	0.191**
	(0.073)
2012	0.189*
	(0.091)
2013	0.23***
	(0.078)
2014	0.249***
	(0.077)
Constant	-2.183
	(1.678)
Observations	470
R-squared	0.143
Firm FE	YES
Year FE	YES

Robust standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

Note: Table 2.8 presents dynamic multivariate regression results for director quality, focusing on Educational & Professional Background across 2006 and 2014, with firm and year fixed effects. This variable, derived via principal component analysis, encompasses educational attainment, MBA presence, financial expertise, legal background, and industry alignment as per the Fama–French 49 classification.

Table 2-9: Multivariate dynamic difference-in-differences for Experience

	(1)
Variable Names	Experience
Dodd-Frank(0/1)	0.066
	(0.064)
Size	0.228***
	(0.083)
Roa	2.124*
	(1.152)
Tier1 capital	2.013*
	(1.107)
Loans ratio	0.224
	(0.340)
Bad loans ratio	1.015
	(2.251)
2006	0.028
	(0.038)
2007	-0.001
	(0.038)
2008	-0.079
	(0.049)
2009	-0.088
	(0.064)
2010	-0.125**
	(0.058)
2011	-.0110*
	(0.065)
2012	-0.105
	(0.080)
2013	-0.160*
	(0.088)
2014	-0.081
	(0.099)
Constant	-4.481***
	(1.485)
Observations	470
R-squared	0.373
Firm FE	YES
Year FE	YES

Robust standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Note: Table 2.9 presents dynamic multivariate regression results for director quality, focusing on Experience over the years 2006 and 2014, with firm and year fixed effects. The Experience variable, derived via principal component analysis, includes key executive roles, board positions in high-ROA public firms, multiple board seats, S&P 1500 index status, and the number of industries in which directors serves.

2.12 Robustness tests

2.12.1 Cross-sectional and dynamic analysis

To validate the robustness of our core findings, we conducted a comprehensive cross-sectional analysis, focusing on both the educational and professional backgrounds of directors, as well as experience metrics. This multi-faceted approach enables a deeper understanding of how director quality has evolved under the regulatory pressures imposed by the Dodd-Frank Act. Recognising the profound impact of the 2008 financial crisis, we excluded this year from our analysis to mitigate any potential distortions in the results caused by the global financial upheaval. The exclusion of 2008 in Tables 2.10 and 2.11 further strengthens the robustness of our core results by isolating the effects of the Act from broader market dislocations.

Table 2-10: Multivariate dynamic difference-in-differences for Educational & Professional background—excluded 2008

	(1)
Variable Names	Educational&Professional Background
Dodd-Frank(0/1)	0.076
	(0.098)
Size	0.064
	(0.045)
Roa	3.639**
	(1.606)
Tier1 Capital	-0.125
	(1.048)
Loans ratio	0.016
	(0.242)
Bad loans ratio	-0.198
	(1.563)
2006	0.048
	(0.038)
2007	0.081*
	(0.042)
2009	0.148**
	(0.066)
2010	0.132**
	(0.063)
2011	0.191***
	(0.070)
2012	0.197***
	(0.078)
2013	0.245***
	(0.063)
2014	0.269***
	(0.056)
Constant	-1.331
	(0.943)
Observations	426
R-squared	0.055
Firm FE	YES
Year FE	YES

Standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

Note: Table 2.10 presents multivariate dynamic difference-in-differences results for Educational & Professional Background, excluding 2008, and covering the years 2006 and 2014 with firm and year fixed effects. This variable, derived via principal component analysis, includes metrics such as educational

attainment, MBA presence, financial expertise, legal background, and industry alignment according to the Fama–French 49 classification.

Despite the theoretically predicted improvements in director quality following the Dodd-Frank Act, the results from Table 2.10 indicate no significant effect of the regulation on educational and professional qualifications. The coefficient for the Dodd-Frank Act is positive but not statistically significant (Coef. = 0.076, p-value = 0.440), suggesting that the Act did not materially impact this dimension of director quality. Moreover, other firm-specific variables, such as firm size (Coef. = 0.064, p-value = 0.159) and Tier 1 capital (Coef. = -0.125, p-value = 0.905), similarly show no significant effects on the educational and professional background dimension.

Interestingly, the control variables for return on assets (Roa) are positively associated with educational and professional background quality (Coef. = 3.639, p-value = 0.023), suggesting that more profitable firms tend to attract directors with stronger educational and professional credentials. Additionally, there are notable increases in educational and professional backgrounds in the years following the implementation of the DFA, as indicated by the positive coefficients for the post-2010 period, with statistically significant effects in 2011 (Coef. = 0.191, p-value = 0.006), 2012 (Coef. = 0.197, p-value = 0.011), and 2013 (Coef. = 0.245, p-value = 0.000).

Table 2-11: Multivariate dynamic difference-in-differences for Experience—excluded 2008

	(1)
Variable Names	Experience
Dodd-Frank(0/1)	0.069
	(0.066)
Size	0.234***
	(0.084)
Roa	2.356
	(1.465)
Tier1 capital	2.187**
	(1.085)
Loans ratio	0.147
	(0.342)
Bad loans ratio	0.833
	(2.368)
2006	0.028
	(0.039)
2007	0.001
	(0.038)
2009	-0.088
	(0.065)
2010	-0.127**
	(0.058)
2011	-0.110*
	(0.066)
2012	-0.104
	(0.079)
2013	-0.160*
	(0.088)
2014	0.080
	(0.098)
Constant	-4.559
	(1.516)
Observations	426
R-squared	0.377
Firm FE	YES
Year FE	YES

Robust standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Note: Table 2.11 presents multivariate dynamic difference-in-differences results for Experience, excluding 2008, and covering the years 2006 and 2014 with firm and year fixed effects. The Experience variable, derived via principal component analysis, includes key executive roles, board positions in high-ROA public firms, multiple board seats, S&P 1500 index status, and the number of industries in which directors serve.

Table 2.11 shifts the focus to the Experience variable, which reflects key executive roles, board positions in high-ROA public firms, multiple board seats, S&P 1500 index status, and the number of industries in which directors serve. This dimension of director quality is critical in understanding whether the Dodd-Frank Act has prompted banks to prioritise seasoned professionals to navigate the complexities of heightened risk governance.

The results from Table 2.11 also reveal the limited impact of the Dodd-Frank Act on director experience (Coef. = 0.069, p-value = 0.293), with the coefficient remaining statistically insignificant. Firm

size, however, emerges as a significant factor in determining director experience (Coef. = 0.234, p-value = 0.005), consistent with the notion that larger firms attract more experienced directors to manage heightened regulatory scrutiny and governance demands. Furthermore, Tier 1 capital shows a statistically significant and positive relationship with director experience (Coef. = 2.187, p-value = 0.044), indicating that banks with higher capital buffers are more likely to appoint experienced directors.

Interestingly, while there is no significant difference in director experience for most post-DFA years, 2010 and 2011 exhibit negative coefficients (2010: Coef. = -0.127, p-value = 0.028; 2011: Coef. = -0.110, p-value = 0.096), suggesting a possible reshuffling of director roles during the immediate aftermath of the Act's implementation. This could reflect transitional dynamics as firms adjusted to new regulatory mandates.

Overall, the findings from both the educational/professional background and experience variables suggest that while there were some adjustments in director quality following the Dodd-Frank Act, these changes were not as significant or widespread as initially expected. The observed effects appear more concentrated in firm-specific characteristics, such as size and profitability, rather than being directly attributable to the regulatory provisions of the Act itself.

Subsequently, we expanded the robustness of our analysis by also excluding the year 2010, coinciding with the enactment of the Dodd-Frank Act, in Table 2.12 and Table 2.13. This was a critical step, as 2010 represents the year in which the legislation formally took effect, potentially introducing confounding factors. Notably, even with the exclusion of this year, our main conclusions remained unchanged, indicating that the passage of the Act did not materially affect our estimates of director quality.

The purpose of this adjustment was to ensure that our results were not driven by this extreme market event or transitional period. Remarkably, this exclusion did not produce any discernible changes in director quality, reinforcing the stability and consistency of our findings. This result underscores the limited direct influence of the Act on the educational, professional, and experiential dimensions of directors, suggesting that other firm-level characteristics may have had a more significant role in shaping governance during this period.

Table 2-12: Multivariate dynamic difference-in-differences for Educational & Professional background—excluded 2008 and 2010

Variable Names	**(1)** Educational&Professional Background
Dodd-Frank(0/1)	0.093
	(0.102)
Size	0.076
	(0.047)
Roa	3.154*
	(1.622)
Tier1 Capital	0.183
	(1.121)
Loans ratio	0.026
	(0.252)
Bad loans ratio	-0.633
	(1.723)
2006	0.045
	(0.038)
2007	0.080*
	(0.043)
2009	0.142**
	(0.069)
2011	0.192***
	(0.073)
2012	0.197**
	(0.081)
2013	0.242***
	(0.066)
2014	0.268***
	(0.056)
Constant	-1.567
	(1.001)
Observations	375
R-squared	0.055
Firm FE	YES
Year FE	YES

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1*

Note: Table 2.12 presents multivariate dynamic difference-in-differences results for Educational & Professional Background, excluding 2008 and 2010, which correspond to the financial crisis and the passage of the Dodd-Frank Act, respectively. The analysis covers the years 2006 and 2014, incorporating firm and year fixed effects. The Educational & Professional Background variable, derived via principal component analysis, includes metrics such as educational attainment, MBA presence, financial expertise, legal background, and industry alignment according to the Fama–French 49 classification.

Table 2.12 presents the multivariate dynamic difference-in-differences results for the Educational and Professional Background variable, excluding 2008 and 2010. This exclusion allowed us to isolate the potential effects of the financial crisis and the enactment of the Dodd-Frank Act. Despite the theoretical expectation that regulatory pressure would enhance director quality, the coefficient for the Dodd-Frank Act remains statistically insignificant (Coef. = 0.093, p-value = 0.358), consistent with

earlier analyses. As with previous results, firm profitability (Roa) is positively associated with educational and professional backgrounds (Coef. = 3.154, p-value = 0.052), indicating that more profitable firms tend to attract directors with stronger qualifications. Other variables, such as size (Coef. = 0.076, p-value = 0.111) and Tier 1 capital (Coef. = 0.183, p-value = 0.871), remain insignificant.

Notably, the time dummies for post-DFA years continue to exhibit positive coefficients, with significant increases in educational and professional background in 2011 (Coef. = 0.192, p-value = 0.009), 2012 (Coef. = 0.197, p-value = 0.015), and 2013 (Coef. = 0.242, p-value = 0.000). These results suggest that improvements in educational and professional background were more pronounced in the years immediately following the financial crisis, though these changes are year based and we do not see overall significant impact of DFA on directors Educational and Professional Background.

Table 2-13: Multivariate dynamic difference-in-differences for Experience—excluded 2008 and 2010

	(1)
Variable Names	Experience
Dodd-Frank (0/1)	0.050
	(0.072)
Size	0.233***
	(0.084)
Roa	2.801*
	(1.486)
Tier1 capital	1.971*
	(1.087)
Loans ratio	0.222
	(0.364)
Bad loans ratio	1.398
	(3.290)
2006	0.028
	(0.039)
2007	-0.003
	(0.038)
2009	-0.088
	(0.073)
2011	-0.110*
	(0.064)
2012	-0.101
	(0.076)
2013	-0.153*
	(0.085)
2014	-0.072
	(0.097)
Constant	-4.579***
	(1.539)
Observations	375
R-squared	0.373
Firm FE	YES
Year FE	YES

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Note: Table 2.13 presents multivariate dynamic difference-in-differences results for Experience excluding 2008 and 2010, which correspond to the financial crisis and the passage of the Dodd-Frank Act, respectively. The analysis covers the years 2006 and 2014, incorporating firm and year fixed effects. The Experience variable, derived via principal component analysis, includes key executive roles, board positions in high-ROA public firms, multiple board seats, S&P 1500 index status, and the number of industries in which directors serve.

Turning to Table 2.13, which focuses on the Experience variable, the results show a similarly limited impact of the Dodd-Frank Act. Excluding 2008 and 2010, the coefficient for the Dodd-Frank variable remains insignificant (Coef. = 0.050, p-value = 0.490), indicating no material effect on director experience as a result of the regulatory change. However, firm size continues to play a significant role (Coef. = 0.233, p-value = 0.006), reinforcing the notion that larger firms tend to recruit more experienced

directors. Interestingly, Tier 1 capital also emerges as a significant factor (Coef. = 1.971, p-value = 0.070), suggesting that better-capitalized firms are more likely to attract experienced directors.

The results for the post-DFA years, represented by the time dummies, exhibit mixed effects. In 2011, the experience variable shows a marginally significant negative coefficient (Coef. = -0.110, p-value = 0.087), which may indicate a reshuffling of board composition as firms adjusted to the new regulatory requirements. However, by 2013, the experience coefficients remain negative but less significant (Coef. = -0.153, p-value = 0.074), signalling a potential normalization of board composition following the initial adjustments to the Dodd-Frank Act.

Overall, the exclusion of the financial crisis and the Dodd-Frank implementation years did not materially alter our findings. The robustness of these results suggests that the observed changes in director quality, particularly in terms of experience, were driven more by firm-specific characteristics than by the regulatory changes introduced by the Dodd-Frank Act.

Moreover, we expanded our analysis by introducing additional board characteristics, specifically, directors' gender and age, as control variables in Table 2.14 and Table 2.15. The incorporation of these factors allows for a more comprehensive understanding of the potential drivers behind director quality. Despite the inclusion of these control variables, our baseline results persisted, revealing no significant improvement in director quality when measured in terms of educational and professional attributes or experience. This suggests that while certain board characteristics, such as gender and age, may affect governance dynamics, they do not appear to be central to the changes in director quality following the implementation of the Dodd-Frank Act.

Table 2-14: Multivariate dynamic difference-in-differences for Educational & Professional background —with board characteristics

Variable Names	(1) Educational&Professional Background
Dodd-Frank(0/1)	0.090
	(0.094)
Size	0.065
	(0.047)
Roa	3.735***
	(1.419)
Tier1 Capital	-0.279
	(0.997)
Loans ratio	0.045
	(0.248)
Bad loans ratio	-0.919
	(1.466)
Female	0.011
	(0.091)
Age	-0.004
	(0.004)
2006	0.040
	(0.039)
2007	0.072*
	(0.043)
2008	0.070
	(0.057)
2009	0.155**
	(0.064)
2010	0.132**
	(0.067)
2011	0.173**
	(0.074)
2012	0.180**
	(0.083)
2013	0.237***
	(0.067)
2014	0.250***
	(0.057)
Constant	-0.988
	(1.007)
Observations	467
R^2	0.062
Firm FE	YES
Year FE	YES

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Note: Table 2.14 presents multivariate dynamic difference-in-differences results for Educational & Professional Background, incorporating board characteristics, with firm and year fixed effects for the years 2006 and 2014. The key variable, Educational & Professional Background, is derived via principal component analysis from five underlying quality metrics, including educational attainment, MBA presence, financial expertise, legal background, and industry alignment based on the Fama–French 49 classification. Additional board characteristics, such as gender and age, are also included in the analysis.

The results from Table 2.14 indicate that the introduction of board characteristics such as gender (Coef. = 0.011, p-value = 0.904) and age (Coef. = -0.004, p-value = 0.374) has no significant impact on the educational and professional backgrounds of directors. The coefficient for the Dodd-Frank variable remains insignificant (Coef. = 0.090, p-value = 0.340), suggesting that the Act did not contribute to a material improvement in these dimensions of director quality. However, the Roa variable continues to show a strong positive association with educational and professional backgrounds (Coef. = 3.735, p-value = 0.008), consistent with earlier findings that more profitable firms attract directors with stronger credential.

Table 2-15: Multivariate dynamic difference-in-differences for Experience—with board characteristics

Variable Names	(1) Experience
Dodd-Frank(0/1)	0.063
	(0.067)
Size	0.224***
	(0.082)
Roa	1.924*
	(1.123)
Tier1 capital	2.021*
	(1.153)
Loans ratio	0.143
	(0.323)
Badl oans ratio	0.865
	(2.226)
Female	0.037
	(0.106)
Age	0.008
	(0.006)
2006	0.030
	(0.04)
2007	0.006
	(0.040)
2008	-0.074
	(0.052)
2009	-0.081
	(0.065)
2010	-0.114*
	(0.061)
2011	-0.100
	(0.072)
2012	-0.090
	(0.088)
2013	-0.150
	(0.095)
2014	-0.072
	(0.102)
Constant	-4.864***
	(1.403)
Observations	467
R-squared	0.382
Firm FE	YES
Year FE	YES

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Note: Table 2.15 presents multivariate dynamic difference-in-differences results for Experience, incorporating board characteristics, with firm and year fixed effects for the years 2006 and 2014. The key variable, Experience variable, derived via principal component analysis, includes key executive roles, board positions in high-ROA public firms, multiple board seats, S&P 1500 index status, and the number of industries in which directors serves.

Table 2.15 shifts the focus to the Experience variable, derived from the same principal component analysis approach. This analysis also incorporates gender and age as control variables. The results show a similarly limited impact of the Dodd-Frank Act on director

experience, with the coefficient for the Dodd-Frank variable remaining statistically insignificant (Coef. = 0.063, p-value = 0.344). Gender (Coef. = 0.037, p-value = 0.727) and age (Coef. = 0.008, p-value = 0.207) do not significantly influence director experience, aligning with the findings for educational and professional backgrounds.

It is worth noting that firm size (Coef. = 0.224, p-value = 0.006) continues to play a significant role in determining director experience, reinforcing the idea that larger firms are more likely to recruit experienced directors. Tier 1 capital also shows a positive and significant relationship with director experience (Coef. = 2.021, p-value = 0.080), indicating that firms with stronger capital buffers tend to attract more experienced directors.

The time dummies for post-Dodd-Frank years show some variation, particularly in 2010 (Coef. = -0.114, p-value = 0.061), where a marginally significant decrease in director experience was observed. This may reflect a temporary restructuring of boards as firms adjusted to the new regulatory environment. However, the coefficients for later years, such as 2014, remain statistically insignificant (Coef. = -0.072, p-value = 0.479), suggesting that any adjustments in board composition following the Act were short-lived and did not lead to long-term changes in director experience.

In summary, the dynamic regression analysis provided valuable insights into the evolving nature of directors' educational and professional backgrounds over the period studied. Notably, we observed a steady increase in these aspects, particularly in the years following the enactment of the Dodd-Frank Act. However, the data also revealed a decrease in director experience after the Act, particularly in the years immediately following its implementation, such as 2011 and 2013. This suggests that while the Dodd-Frank Act may have contributed to improvements in the formal qualifications of directors, it concurrently led to a reduction in practical experience, which could have important implications for board effectiveness. Importantly, the overall impact of the Act on director quality remains statistically insignificant, indicating that regulatory interventions alone may be insufficient to drive substantive improvements in corporate governance.

These findings underscore the need for further investigation into the multifaceted effects of regulatory changes on corporate governance, particularly in terms of the trade-offs between formal qualifications and practical experience.

2.12.2 Regression discontinuity

The regression discontinuity analysis leverages the natural experiment created by the Dodd-Frank Act, particularly the $10 billion asset threshold, to assess its impact on the educational and professional background, as well as the experience of directors at BHCs. This method relies on the assumption that BHCs just above and just below the $10 billion threshold are inherently similar and would exhibit comparable trends in the absence of regulatory

intervention (Schneider and McDonald, 2010). The analysis thus isolates the effect of the Dodd-Frank Act on director quality.

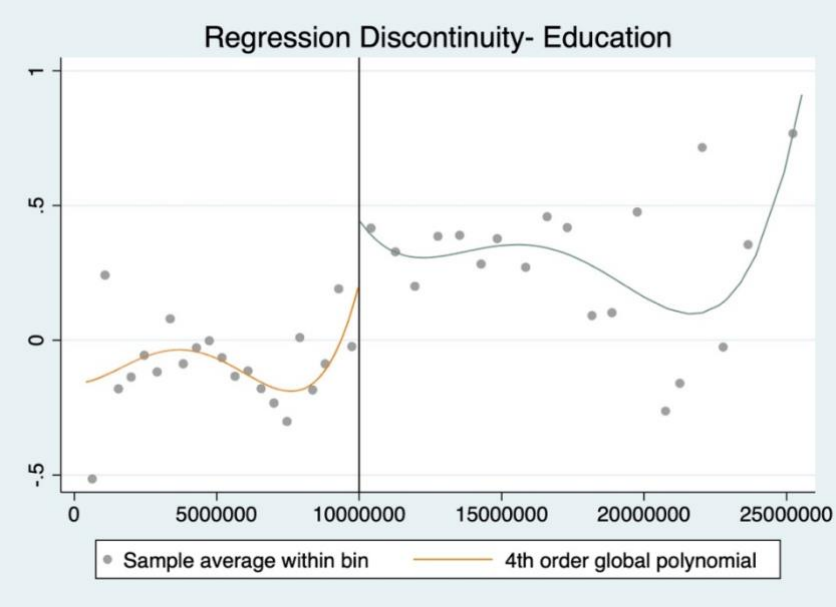

Figure 2.3: Regression discontinuity: Educational & Professional background

Note: Figure 2.3 represents the regression discontinuity for Educational & Professional background, showing changes around the $10 billion threshold.

In Figure 2.3, we observe a notable discontinuity in the Educational and Professional Background of directors at the $10 billion threshold. Specifically, there is an upward shift in educational and professional qualifications, which continues consistently up to the $15 billion mark. This is followed by a modest decline between $15 billion and $20 billion, before a marked upswing occurs at higher levels of asset size. While these patterns suggest a potential regulatory impact, it is important to emphasise that these results are statistically insignificant. This implies that while there may be observable trends, BHCs on either side of the threshold do not exhibit statistically significant differences in the educational and professional qualifications of their directors.

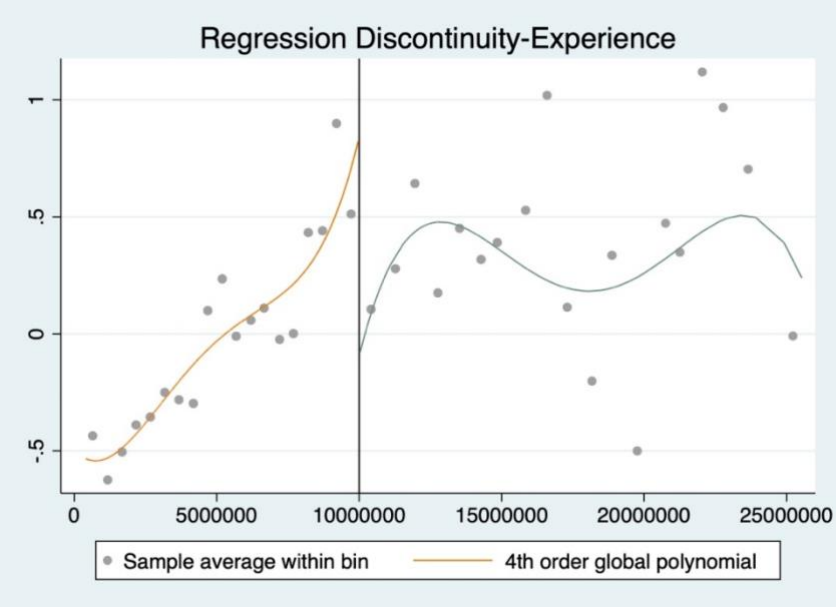

Figure 2.4: Regression discontinuity: Experience

Note: Figure 2.4 represents the regression discontinuity for Experience, showing changes around the $10 billion threshold.

Figure 2.4 reveals a different pattern concerning director experience. At the $10 billion threshold, a sharp decrease in director experience is observed, followed by a fluctuating, horizontal pattern. The results suggest that firms may have encountered difficulties in appointing directors with substantial experience, potentially due to the need to comply with the legal requirements imposed by the Dodd-Frank Act. However, as with the educational and professional background results, the discontinuities observed in director experience are not statistically significant.

These findings lead to several important interpretations. The discontinuity in educational and professional qualifications suggests that while BHCs may have improved these attributes in response to regulatory pressure, the observed changes are not statistically significant enough to draw definitive conclusions. Similarly, the decline in director experience at the threshold, though notable, does not provide conclusive evidence that the Dodd-Frank Act led to a meaningful reduction in director experience.

In conclusion, the results of the regression discontinuity analysis highlight potential shifts in director quality around the $10 billion threshold, but they should be interpreted with caution. The lack of statistical significance in both educational and professional background, as well as experience, implies that while observable patterns exist, they cannot be conclusively linked to the Dodd-Frank Act's impact. Therefore, while the Act may have influenced board composition decisions at BHCs, its overall effect on director quality remains uncertain.

2.13 Conclusion

The vulnerability of the financial sector has been a highly discussed topic since the 2008 financial crisis. Weak corporate governance structures and failures in risk management were seen as the main triggers for the crisis (Ellul, 2015). In response, the Dodd-Frank Act (DFA) was signed into law by Congress in 2010 to mitigate the financial sector's vulnerability. The excessive risk-taking by boards and lack of expertise were identified as some of the vulnerabilities of the financial system.

We employed a difference-in-differences approach using a sample of 188 Bank Holding Companies and their director quality changes after the Dodd-Frank Act. The research indicates that the Act, which was enacted to mitigate vulnerabilities in the financial sector, did not significantly improve director quality or reduce risk-taking behaviour in banks. This suggests that the provisions of the Act relating to director quality and risk management may not have been effective in achieving their intended goals. This finding raises questions about the overall effectiveness of the Dodd-Frank Act in addressing the vulnerabilities of the financial sector.

The lack of improvement in director quality and risk-taking behaviour after the enactment of the Dodd-Frank Act points to weak corporate governance structures and failures in risk management as ongoing issues in the financial sector. These underlying issues may persist, highlighting the need for stronger corporate governance mechanisms and more effective risk management practices to enhance the stability and resilience of financial institutions.

Despite regulatory mandates requiring financial institutions to have risk-averse and high-quality directors, there may be limitations in finding sufficiently qualified individuals to meet these requirements. This shortage of skilled directors capable of effectively managing risk poses a challenge to the implementation of the Dodd-Frank Act. Additionally, some financial institutions may only comply with the regulatory mandates as legal requirements without fully embracing the intended spirit of the regulations. This emphasises the importance of not only setting regulatory mandates but also ensuring their proper implementation and enforcement.

The research findings call for further investigation to understand better the reasons behind the lack of improvement in director quality and risk-taking behaviour after the enactment of the Dodd-Frank Act. This highlights the need for more in-depth studies to identify the underlying factors contributing to these findings and to develop potential policy interventions that can effectively address the weaknesses in corporate governance and risk management in the financial sector. Thus, policymakers and researchers should work together to assess the effectiveness of existing regulations and explore alternative approaches to enhance the stability and resilience of the financial system.

On the other hand, there is a possibility that financial institutions may view regulatory requirements as mere formalities without fully embracing the intended goals and principles behind the regulations.

This gap between regulatory expectations and actual implementation emphasises the importance of ensuring that regulations are not only properly designed but also effectively communicated and enforced to encourage genuine compliance and positive changes in behaviour.

Furthermore, the lack of significant improvement in director quality after the Dodd-Frank Act suggests that the presence of directors with skills and expertise in risk management may not necessarily translate into better risk management practices and reduced risk-taking. The alignment of our findings with the research conducted by Degl'Innocenti et al. (2023) provides valuable insights into the broader implications of regulatory interventions, particularly the Dodd-Frank Act (DFA), across different facets of corporate governance. In their examination of the impact of the DFA on the credit risk behaviour of complex BHCs, they specifically assess whether the regulatory measures effectively reduce the credit riskiness of these institutions.

Interestingly, our findings resonate with the moral hazard hypothesis articulated by Degl'Innocenti et al. (2023). They observed that complex BHCs subject to the DFA tended to increase their credit risk, a result that may be attributed to the lack of improvement in directors' quality and risk management qualifications. This aligns with our own observations, where, despite the Dodd-Frank Act leading to an enhancement in the educational and professional backgrounds of directors, there was a simultaneous decrease in their experience, ultimately resulting in an insignificant overall impact on director quality.

This convergence in outcomes underscores the intricate interplay between regulatory initiatives, director characteristics, and corporate behaviours. The implications extend beyond a singular focus on one aspect of governance, shedding light on the complex dynamics that can unfold because of regulatory measures. As such, the combined insights from our study and the work of Degl'Innocenti et al. (2023) contribute to a more holistic understanding of how regulatory interventions can shape corporate risk-taking behaviour and governance practices. Further research in this area could continue to unveil the multifaceted effects of such regulatory frameworks on diverse aspects of corporate decision making.

Although our findings indicate that Dodd-Frank's risk committee mandates exert a substantial influence on director quality, several alternative explanations merit consideration. First, broader governance reforms such as evolving SEC disclosure requirements or heightened institutional investor activism may coincide with the change in board composition. While this study implements robustness checks designed to isolate the effects of the Act from parallel governance trends, further research could systematically analyse these influences by incorporating additional control variables and cross-sectional testing. Second, macroeconomic shifts following the 2008 financial crisis might also inform changes in director recruitment and board dynamics, separate from regulatory directives. Incorporating broader economic indicators and detailed firm-level data could aid future analyses in disentangling such confounding factors. Finally, firm-specific practices such as self-regulatory initiatives or shareholder-driven reforms could likewise contribute to a change in director quality. To partially address this, we

employ firm fixed effects to mitigate the risk that unobserved, time-invariant heterogeneity drives the observed changes.

Limitations in the measurement of director quality and the chosen empirical designs further qualify our conclusions. Although difference-in-differences (DiD) and regression discontinuity (RDD) offer robust quasi-experimental frameworks, DiD relies on the assumption of parallel trends between treated and control groups, and RDD presumes minimal strategic behaviour around the asset threshold. Violation of these assumptions may introduce bias, despite our efforts to test for pre-treatment trends, conduct sensitivity checks around the cutoff, and adopt alternative bandwidths. In addition, director quality remains inherently multifaceted, extending beyond quantifiable proxies of education, experience, and board interlocks to encompass soft skills, ethical judgment, and intangible leadership attributes. While these proxies align with prior governance research, they cannot fully capture the complexity of board effectiveness. Consequently, a richer, mixed-methods approach, potentially incorporating qualitative surveys or direct evaluations of board members, presents a promising avenue for refining our understanding of how regulatory interventions shape governance practices.

In conclusion, one of the main issues with the Dodd-Frank Act is that it is not always properly implemented. While the Act includes several provisions aimed at improving director quality and reducing risk-taking in the financial sector, these provisions are not always enforced in a consistent and effective manner. This can lead to a situation where the Act is not achieving its intended goals. After a thorough analysis of the Dodd-Frank Act, it is clear that the Act has some limitations and potential shortcomings when it comes to improving director quality and reducing risk-taking in the financial sector. These limitations and potential shortcomings include issues with the implementation of regulations, the need for further research, and the need for alternative policy interventions.

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Chapter 3 Director interlocks and banker-directors' board advising role on R&D investment: evidence from Enforcement Actions

3.1 Abstract

We investigate by employing a quasi-experimental setup and difference-in-differences approach whether interlocked banker-directors impact manufacturing companies' Research and Development(R&D) investments by using Enforcement Actions (EAs). We find that during the enforcement action years (when banker-directors are distracted), the possibility of bank-linked manufacturing firms' Research and Development investment increases. The evidence suggests that the presence of a banker-director lowers the chance of R&D investment in US manufacturing firms. By examining US manufacturing firms, we explore the corporate governance channel by which bank shocks are transmitted to the real economy. However, in our context, adverse shocks to banks help to upsurge the probability of firms' R&D investments. These findings provide fresh insight into the negative impact of banker-directors in disseminating advising initiatives by interconnected boards.

Key words: Director interlocks; Banker-directors; R&D investment; Enforcement Actions; Spillover effect

3.2 Introduction

When a member of a firm's board of directors also sits on the board of another firm, this governance arrangement, often referred to as an "interlocking directorate", becomes a key channel through which corporate practices, strategic initiatives, and managerial perspectives can diffuse across organisations (Mizruchi, 1996). Such interlocks are abundant in the contemporary corporate environment, reflecting both the labour market for directorships and the intricate social networks that develop among top executives. Scholars have documented how these networks enable the transfer of information and resources, shape firms' competitive behaviours, and even propagate shared strategic goals (Kaczmarek et al., 2011; Zhong et al., 2017). Within this broader background, one form of interlocking directorate has garnered heightened scrutiny: the presence of banker-directors or financial professionals occupying directorships at both financial institutions and non-financial firms.

Classic work by Mizruchi et al. (1993, cited in Mizruchi, 1996) illustrates the longstanding prevalence of banker-directors. Their study revealed that, as early as 1981, more than 70% of Fortune 500 manufacturing firms had at least one executive concurrently serving on the board of a financial institution, a finding that underscores the scale of interconnectivity between corporate and financial sectors. More recent research by Hilscher and Şişli-Ciamarra (2013) reinforces this notion,

showing that nearly 39% of S&P 500 firms between 2002 and 2007 boasted at least one banker-director. These data points collectively highlight the enduring role of banker-directors in shaping firm outcomes, from leveraging specialised financial expertise to guiding credit decisions and risk management policies.

Alongside interlocking directorships, the composition of corporate boards, particularly the proportion of independent or specialised directors, emerges as a critical determinant of strategic decision-making. For instance, Osma (2008) examines independent directors in the context of United Kingdom (UK) firms, demonstrating that greater independence can curb managerial myopia regarding research and development (R&D) spending. By mitigating opportunistic cuts in R&D, independent boards can safeguard a firm's long-term innovation capacity. Nevertheless, tension emerges when we recognise that R&D, while foundational for sustained competitive advantage, involves significant uncertainty and delayed returns. Managers feeling pressure to achieve near-term performance benchmarks may cut R&D budgets to meet short-term earnings targets, as evidenced by studies on accrual management and target-beating behaviour (Bushee, 1998; Bange and De Bondt, 1998). Empirical analyses further reveal that R&D investments, despite yielding high potential returns over extended horizons (Sougiannis, 1994), can depress short-run earnings (Balkin et al., 2000; David et al., 2001; Han et al., 2015). Correspondingly, a well-documented trade-off arises between short-term profitability metrics and longer-term value creation, putting corporate boards in a delicate position to balance these competing priorities.

The tension becomes even more pronounced when banker-directors are involved. Their background often brings heightened sensitivity to credit risk, with an emphasis on stability and reduced volatility (Kang and Kim, 2017). In particular, Kang and Kim (2017) show that commercial banker directors (CBDs) can realign CEO incentives to reflect creditors' interests, thus dampening a firm's appetite for risk. While a conservative posture may enhance financial prudence, it also risks stifling growth-oriented investments, including R&D. The presence of banker-directors can, therefore, reinforce a bias toward caution, potentially leaving high-risk but high-reward projects underfunded. Such dynamics resonate with the broader literature on corporate governance and risk-taking, where financially oriented directors may prioritise the firm's solvency and short-term earnings stability at the expense of more ambitious ventures (Gormley and Matsa, 2016).

Despite the documented tendency of banker-directors to constrain risk, relatively few studies have explored how this dynamic may fluctuate when banker-directors are themselves subject to external shocks, specifically, enforcement actions at their affiliated banks. Enforcement actions can manifest as a quasi-exogenous shock that demands urgent attention from banker directors, diverting their focus from non-financial firms to compliance and crisis management within the banking institution. By investigating the implications of such regulatory interventions, this chapter sheds new light on how

external constraints placed on banker-directors may inadvertently relax their oversight of manufacturing firms' R&D expenditures.

Recent work in finance underscores the importance of understanding how board behaviour adapts to external pressures (Acharya and Ryan, 2016). Here, we propose that enforcement actions function as a time-sensitive disruption to a banker-director's usual role. Rather than uniformly enforcing prudential risk management across all their directorships, banker-directors experiencing regulatory scrutiny are compelled to reallocate their bandwidth, leaving comparatively less capacity to monitor R&D strategies in manufacturing firms. This redirection of attention has concrete implications: if banker-directors are critical gatekeepers for risk-intensive investments, their temporary distraction may open an avenue for managers to pursue projects with more uncertain payoffs, like R&D, that might otherwise be discouraged.

By foregrounding enforcement actions as a quasi-exogenous shock, the chapter complements existing research in two ways. First, it enriches our understanding of how board composition interacts with regulatory events, illustrating that the influence of financial expertise on corporate decisions is not static but rather contingent upon directors' external obligations. Unlike earlier studies that predominantly view banker-directors as consistently risk-averse actors (Kang and Kim, 2017), we emphasize the fluidity of their impact under conditions of heightened regulatory scrutiny. Second, it contributes to innovation research by highlighting a mechanism through which regulatory pressures can ironically foster greater R&D activity, thereby complicating the conventional narrative that regulation primarily serves to curtail risk-taking. This perspective resonates with broader corporate governance debates, which underscore the multifaceted role of external shocks in shaping strategic decisions at the board level.

Motivated by this reasoning, the central question of this chapter revolves around whether banker-directors genuinely deter R&D investment or whether certain external factors (in our case, enforcement actions) can override their natural inclination toward risk aversion. To address this puzzle, we exploit a quasi-experimental setup in which Enforcement Actions (EA) create treatment windows that isolate the effects of regulatory distractions. We adopt a difference-in-differences approach to mitigate endogeneity concerns and control for confounding influences. Specifically, we track how R&D spending within manufacturing firms evolves when their banker directors become preoccupied with enforcement actions at an affiliated bank. The identification strategy thereby allows us to assess whether the short-term diversion of a banker-director's attention unlocks a window for higher-risk, potentially more profitable investments.

Empirically, our findings confirm that the presence of banker-directors correlates with more conservative R&D spending which is a result consistent with the hypothesis that financial oversight discourages uncertain, long-horizon projects. Crucially, however, this conservative effect diminishes

once enforcement actions divert banker-directors back to their primary roles in the financial sector. As these directors respond to regulatory inquiries, manage crisis-control measures, or undertake additional compliance duties, we observe a meaningful uptick in R&D expenditures by the affected manufacturing firms. This outcome indicates that enforcement actions can undermine the usual constraints on innovation imposed by banker-directors, opening up new avenues for corporate risk-taking and R&D advancement.

The remainder of this chapter proceeds as follows. Section 2 reviews the theoretical foundations for linking banker-directors' risk preferences and board composition to corporate innovation outcomes, with particular emphasis on the interplay between regulatory and firm-level governance. Section 3 outlines the study's research design, including data sources, sample construction, and empirical methodology, detailing how we identify enforcement actions as the key exogenous shock. In Section 4, we present our main results and conduct a series of robustness checks to verify the causal interpretation. Finally, Section 5 concludes, summarising the core insights, discussing practical implications for corporate governance and regulatory policy, and highlighting avenues for future research.

In sum, this chapter proposes that while banker-directors traditionally encourage conservatism in corporate strategy, often at the expense of R&D, regulatory scrutiny at their affiliated banks can relieve such constraints by momentarily shifting their focus away from the non-financial firm. This novel angle not only addresses a previously underexplored dimension of interlocking directorates but also expands our understanding of how external governance pressures can inadvertently stimulate firms to invest in high-value, long-term innovation.

3.3 Literature Review and Hypothesis Development

3.3.1 The Role of R&D in the Knowledge-Based Economy

The 21st century has heralded the era of the "knowledge-based economy" characterized by an increased emphasis on Research and Development (R&D) as a critical driver of economic growth. This shift is particularly evident in the proliferation of high-tech industries that rely heavily on scientific advancements. R&D activities are integral to the process of knowledge production, diffusion, and application, necessitating innovations in management, social and political structures, and scientific technologies (Wang, 2010). Investment in R&D is, therefore, a strategic imperative for firms seeking to maintain and enhance their market positions, as it fosters innovation and enables entry into new product-market domains (Alessandri and Pattit, 2014; He and Wong, 2004; Katila and Ahuja, 2002). The capital allocated to R&D is closely linked to a firm's capacity for innovation and sustainability, contributing significantly to its competitive advantage (Faber and Hesen, 2004; Lai et al., 2015; Lee & Marvel, 2009). Notably, a significant portion of all R&D activities is conducted by private companies, primarily aimed at boosting profitability (Wang, 2010).

Despite the critical role of R&D in driving innovation and sustaining competitiveness, corporate executives often display reluctance to commit to long-term R&D projects. This hesitation stems from the high risk associated with R&D activities, where the potential for significant breakthroughs is counterbalanced by a high failure rate and the lack of immediate returns (Mansfield, 1968, as cited in Baysinger, 1991). Increased R&D investment is frequently viewed as a high-risk, high-reward strategy, with its inherent unpredictability and substantial costs posing challenges to short-term financial performance (Balkin et al., 2000; David et al., 2001; Han et al., 2015). The pressure to meet earnings targets may further exacerbate this issue, as managers might opt to reduce R&D spending to bolster short-term profits, thus sacrificing potential long-term gains (Osma, 2008).

3.3.2 Managerial Risk Aversion and Stockholder Expectations

R&D investment differs from other strategic decisions due to the acute conflicts of interest it can create between managers and stockholders. Stockholders generally favour high R&D investment due to its potential to enhance long-term performance, and they can mitigate associated risks through diversified investment portfolios (Baysinger et al., 1991). However, the risk-bearing characteristics tied to stock ownership and managerial compensation structures,particularly those reliant on short-term incentives,can drive managers towards either risk aversion or excessive risk-taking. The European Commission and the G20 have highlighted that the prevalent pay structures in banking, which emphasise short-term bonuses or narrowly defined performance metrics, can encourage risk-taking behaviour that may undermine long-term objectives (Ayadi, Arbak, & Pieter De Groen, 2012). This dynamic is especially pertinent to R&D investments, where the high risks involved necessitate careful consideration by firm managers (Alessandri and Pattit, 2014).

3.3.3 Board Structure, Director Interlocks, and Firm Performance

The impact of interlocking directorates, where directors serve on multiple boards, has been a topic of significant academic debate. The literature presents mixed findings on whether these interlocks positively or negatively affect firm performance. For example, Nam et al. (2017) found that interlocking director networks negatively influence company performance in Korean-listed firms, while Zhong et al. (2017) suggested that board interlocks could enhance monitoring, particularly in response to regulatory sanctions. Despite potential benefits, empirical evidence often paints a less favourable picture of interlocking directorates, with concerns about compromised director independence and diminished board effectiveness due to overcommitment (Larcker et al., 2005; Fich and Shivdasani, 2006).

The presence of banker-directors on boards introduces additional complexities, especially concerning potential conflicts of interest. Agency theory posits that managers will act in shareholders' best interests when their incentives align, making decisions that enhance firm value (Jensen and Meckling, 1976). However, the presence of banker-directors may create conflicts between the interests of banks and those of non-financial firms (Kroszner and Strahan, 2001). Studies show that while banker-directors may provide valuable oversight and access to financing, they can also prioritize the bank's

interests over those of the firm, potentially leading to suboptimal outcomes for shareholders (Guner et al., 2008; Dittman et al., 2009).

3.3.4 R&D Investment and the Influence of Banker-Directors

The relationship between R&D investment and the presence of banker-directors has been underexplored, particularly in the context of U.S. manufacturing firms. Previous research by Ghosh (2016) in Indian manufacturing firms suggests that banker-directors may reduce the likelihood of R&D investment, owing to the high risk and uncertain returns associated with such activities. Banker-directors, given their fiduciary responsibilities to both the bank and the firm, may be more risk-averse, particularly in firms with significant debt burdens, leading to reduced support for R&D initiatives.

Ghosh (2016) proposes several mechanisms through which banker-directors might influence R&D investment, including information, debt monitoring, capital market, and equity monitoring channels. According to the information channel, firms with strong profitability are more likely to invest in R&D. In contrast, the debt monitoring channel suggests that banker-directors may discourage risky investments, including R&D, in highly leveraged firms. The capital market channel posits that banker-directors could encourage R&D in firms with robust sales growth, while the equity monitoring channel implies that banker-directors are more likely to support R&D when the firm has strong growth potential, as indicated by a higher Tobin's Q.

In this study we seek to address the gap in the literature by examining the causal effect of banker-directors on R&D investment in U.S. manufacturing firms. Utilizing Enforcement Actions (EA) as an exogenous shock and a difference-in-differences approach, this research aims to provide a clearer understanding of how banker-directors influence long-term investments like R&D.

3.3.5 Enforcement Actions as an Exogenous Shock

Pugachev and Schertler (2021) explore how financial shocks, such as Enforcement Actions, impact the behaviour of banker-directors. These shocks increase the responsibilities of banker-directors, potentially distracting them from their duties on non-financial firm (NFF) boards. Building on their work, this study investigates whether such distractions influence R&D investment decisions in non-financial firms. The use of Enforcement Actions as an external shock is particularly relevant, as these actions directly affect corporate governance by highlighting deficiencies in bank oversight and demanding significant director resources.

By examining the interaction between banker-directors and R&D investment under these conditions, this study contributes to the broader understanding of how corporate governance structures and external pressures shape strategic investment decisions. The findings have important implications for firms seeking to balance the risks and rewards of R&D investment in an environment where financial oversight and managerial incentives are increasingly scrutinized.

Based on these considerations, we propose the following hypothesis:

H1: Manufacturing firms with enforcement-linked banker-directors are more inclined to invest in Research and Development (R&D) than other manufacturing firms.

In our hypothesis, we tested whether adverse shocks to the banks may spread between firms via shared bank-linked directors by using Enforcement Actions (EAs) as exogenous shocks using exclusive data at the individual-director level from the US manufacturing firms. We propose that non-financial firms with enforcement-linked bank interlocks and banker-directors attending more bank meetings are more likely to invest in R&D. This is because the distractions of the banker-directors provide opportunities for NFFs to invest in long-term projects, such as R&D.

Although this study is restricted to U.S. manufacturing firms, such a focus carries both benefits and limitations. On one hand, manufacturing companies typically undertake sizable and trackable R&D expenditures, providing a clear lens through which to gauge how enforcement-linked banker-directors influence long-term investments. This sector-specific consistency also helps isolate the core governance mechanisms under examination. On the other hand, concentrating on a single industry inevitably constrains the study's generalizability, as the dynamics of interlocked directorships and R&D decision-making may differ in service-oriented or technology-driven sectors. Future research could expand upon these results by exploring a broader cross-section of industries or international contexts to examine whether the observed effects persist under diverse regulatory and competitive environments.

3.4 Research Design and Data

Our study on the impact of enforcement actions on R&D activity in non-financial firms (NFFs) with banker-directors on their boards, utilised a difference-in-differences design for R&D probability and alternative R&D intensity model. We focused on the R&D probability model and its impact rather than R&D intensity, which is consistent with previous research. Our approach effectively addressed selection bias and endogeneity concerns, by using a difference-in-differences method with enforcement-linked manufacturing firms in the US as our treatment variable, and US manufacturing firms without banker-directors thus no enforcement-linked directors on their boards, as our control group. We verified the validity of our approach by examining the existence of parallel trends through visual representations of control and treatment group trends and slopes (as shown in Figure 2.1).

Further to our testing exclusively on manufacturing firms with banker-directors, we used alternative subsample control groups. First, we again choose enforcement-linked NFFs as the treatment group and bank-linked but non-enforcement-linked counterparts as controls. We also chose subsamples bank-linked-years as a control group and enforcement-linked-years as the treatment group. Additionally, we used propensity score matching to construct a control group, which revealed a statistically significant

positive difference between treatment and control groups, but this has not been reported in this paper. These findings underscore the effectiveness of our approach in highlighting the nuanced impact of banker-directors on R&D activities within NFFs amid enforcement actions. Our study demonstrates the crucial role of banker-directors in shaping R&D activities within NFFs during enforcement actions.

3.4.1 Data

The data were collected from the BoardEx universe, a database that contains information on the directors of companies. From this data, we analysed the start and end dates of board appointments from 1990 to 2021 to identify directors who held positions with both financial institutions and non-financial firms simultaneously. We used this dataset to identify "bank-linked NFF" firms that have directors who also hold positions with financial institutions.

To further refine our sample, we merged enforcement action data from the Federal Reserve Bank and SNL Financial with the existing BoardEx dataset. This allowed us to identify “enforcement-linked non-financial firms”, which are manufacturing firms that have directors who also hold positions with financial institutions and have been the subject of enforcement actions. We then combined this information with financial data from Compustat to create a dataset that includes directors, company financials, and enforcement-linked-year data for each firm.

The final dataset included 7,280 unique manufacturing firms and 72,816 firm-years (as shown in Table 3.1). Of these firms, 689 were identified as bank-linked NFF firms, accounting for 6,095 firm-years. Additionally, 150 of these firms were classified as enforcement-linked NFF firms, comprising a total of 596 firm-years (as presented in Table 3.2).

Table 3-1:Bank-linked firms and years data

Category	**Not Linked to Banks (0)**	**Linked to Banks (1)**	**Total**
Number of Firms	6591	689	7,280
Firm-Years	66,721	6,095	72,816

Note: Table 3.1 which presents a detailed breakdown of Non-Financial Firms (NFFs) according to their bank affiliations. The companies are classified as for those without any banking relationships and for those that have bank ties. The table specifies the total number of companies in each group, as well as the duration of their operations from 1990 to 2021.

Table 3-2:Enforcement-linked firms and years data

Category	Not Linked to Enforced Banks (0)	Linked to Enforced Banks (1)	Total
Number of Firms	539	150	689
Firm-Years	5,499	596	6,095

Note: Table 3.2 describes the distribution of enforcement-linked years relative to bank-linked years for Non-Financial Firms. It outlines the count of years during which firms were unlinked or linked to banks, and subsequently, the distribution of enforcement-linked years within these allocated categories. The total count of years observed is also exposed in this tabulation from 1990 to 2021.

3.4.2 Model Selection

In examining the influence of banker-directors on R&D decisions, we adapt the framework established by Ghosh (2016), who explored the relationship between banker-directors and innovative activity. In our analysis, we employ two models: the first assesses the probability that a firm engages in R&D, while the second measures the intensity of R&D expenditures relative to sales. This dual approach allows us to test both the likelihood of R&D activity and its magnitude, serving as a robustness check on our findings.

To rigorously isolate the effect of banker-directors on R&D investment, we specify an empirical model that integrates several essential control variables grounded in the corporate finance literature. Firm Size (Log Assets) is included to account for the fact that larger firms typically enjoy more substantial financial resources, which may independently drive R&D outlays. Industry R&D Intensity serves to capture sector-specific norms, recognising that industries with inherently higher innovation trajectories often encourage more extensive research activities.

Additionally, Financial Constraints (Leverage Ratio) gauge how capital structure can shape a firm's risk appetite since highly leveraged firms may be more reluctant to invest in long-term, uncertain projects. Market Conditions (GDP Growth and Interest Rates) enter the model to account for broader macroeconomic factors that might otherwise confound the relationship between banker-directors and R&D. Finally, we include Firm-Specific Fixed Effects to account for time-invariant characteristics, such as culture or strategic orientation, and Year Fixed Effects to absorb economy-wide shocks that could alter innovation spending in any given year. By controlling for these variables, the specification mitigates the risk that observed changes in R&D are driven by factors unrelated to enforcement actions or the presence of banker-directors.

Despite these precautions, certain omitted variables may still influence the estimated effects. Industry Shocks, such as abrupt technological changes or new regulatory developments unique to a given sector, might affect R&D investment in ways not fully captured by industry-fixed effects.

Managerial Risk Preferences, which remain largely unobservable, could further bias the results if more risk-seeking managers systematically select into or remain in firms with banker-directors. Finally, Board Dynamics and Decision Processes may amplify or dampen banker-directors' influence, yet such nuanced boardroom interactions are notoriously difficult to quantify. Recognising these limitations, the study implements additional sensitivity tests (e.g., placebo analyses and alternative model specifications) to verify that the findings are robust and not merely artefacts of unobserved confounders.

3.4.2.1 R&D Selection Model

Our main model, Model 1, estimates the probability of a firm engaging in R&D (D_RD), focusing on key firm-level characteristics and the role of enforcement-linked banker-directors. The model is specified as follows:

$$\text{Probability of R\&D(D\_RD)}_{ij,t} = \beta_0 + \beta_1(\text{Industry R\&D Intensity})_{j,t-1} + \beta_2(\text{Enforcement} - \text{linked years})_{i,t} + \beta_3(\text{Sales Growth})_{ij,t-1} + \beta_4(\text{Sales})_{ij,t-1} + \beta_5(\text{Liquidity})_{ij,t-1} + \beta_6(\text{Tobin's Q})_{ij,t-1} + \beta_7(\text{Leverage})_{ij,t-1} + \beta_8(\text{Capex})_{ij,t-1} + \beta_9(\text{ROA})_{ij,t-1} + \beta_{10}(\text{Solvency})_{ij,t-1} + q_j + \varepsilon_{i,jt} \quad (1)$$

3.4.2.2 R&D Outcome Model

In Model 2, we extend the analysis to assess the impact of banker-directors on R&D intensity, defined as the ratio of R&D expenditures to sales (R&D/Sales). This model serves as a robustness test to determine whether enforcement-linked banker-directors influence not only the decision to engage in R&D but also the level of investment in innovation. The model is specified as follows:

$$\text{R\&D Intensity(R\&D/Sales)}_{ij,t} = l_0 + l_1(\text{Enforcement} - \text{linked years})_{i,t} + l_2(\text{Sales Growth})_{ij,t-1} + l_3(\text{Sales})_{ij,t-1} + l_4(\text{Liquidity})_{ij,t-1} + l_5(\text{Tobin's Q})_{ij,t-1} + l_6(\text{Leverage})_{ij,t-1} + l_7(\text{Capex})_{ij,t-1} + l_8(\text{ROA})_{ij,t-1} + l_9(\text{Solvency})_{ij,t-1} + q_j + \gamma_t + \varepsilon_{i,jt} \quad (2)$$

Where dependent variable D_RD denotes a dummy variable whether firm *i* in industry *j* undertakes R&D investment in the year t or not, on the other hand, to examine the effect of banker-directors on the R&D decisions of non-financial firms (NFFs), we construct an interaction variable, Enforcement-linked years. We begin by defining a binary variable, Bank-linked director, which takes the value of 1 if a director on the board of an NFF also holds a position at a bank. To capture the regulatory implications, we introduce an additional binary variable, Enforcement-linked banker-director, which equals 1 if the bank where the director serves has been subjected to enforcement actions.

Our primary variable of interest is the interaction term, which indicates the presence of an enforcement-linked banker-director on the board of a non-financial firm. This interaction variable takes the value of 1 if the NFF has a director linked to an enforcement-affected bank and if the observation year occurs after the enforcement action (Year after = 1). This setup allows us to isolate the impact of

regulatory penalties on the governance and strategic decision-making of NFFs, specifically in relation to R&D investments.

Control variables are one year lagged and are represented in Table 3.3 (Also see definitions of variables in Table 5.2 in Appendix B). Sales growth, defined as the logarithm of sales growth, reflects the rate of change in a firm's revenue over a specific period. The mean value of sales growth in the sample is -1.821, with a standard deviation of 1.522. Sales, represented by the logarithm of sales, measures a company's total revenue during a given period. The mean value of sales in the sample is 5.112, with a standard deviation of 2.52. Liquidity, represented by the current asset to total asset ratio (act/at), indicates the proportion of current assets that a company can use to meet its current obligations. The mean value of liquidity in the sample is 0.222, with a standard deviation of 0.95. Tobin's Q, calculated as ((prcc_f*csho)+at–ceq)/at, measures a company's market value relative to its assets' replacement cost, in our case, used as growth opportunities proxy. The mean value of Tobin's Q in the sample is 2.916, with a standard deviation of 5.58. Leverage, represented by the total debt to total asset ratio (dt/at), reflects the proportion of a company's assets financed by debt. The mean value of leverage in the sample is 0.045, with a standard deviation of 0.23. Capital expenditures (capex) to total assets (at) ratio (capx/at) reflects the proportion of a company's total assets used for capital expenditures. The mean value of capex in the sample is 0.048, with a standard deviation of 0.05.

Return on assets (ROA), calculated as operating income after depreciation to total assets (oiadp/at), indicates the amount of profit generated by a company's total assets. The mean value of ROA in the sample is -0.057, with a standard deviation of 0.70. Solvency is defined as the ratio of a company's earnings before interest and taxes to its interest and related expenditures (ebit/xint)/1000, which evaluates the company's capacity to make interest payments. The mean value of Solvency in the sample is 0.007, with a standard deviation of 0.25. q_j denotes the industry dummy, and γ_t denotes the year dummy. Lastly, $\varepsilon_{i,jt}$ shows the random error of the model.

In Appendix Table 5.3, we report the Variance Inflation Factor (VIF) results, employed to evaluate potential multicollinearity among the independent variables in the regression model. A commonly accepted threshold for concern is a VIF value exceeding 5. Since all reported VIFs fall below this benchmark, the results suggest that multicollinearity is not a concern in this analysis.

3.4.3 Summary Statistics

This section presents a thorough examination of the summary statistics extracted from our dataset, about various financial and operational metrics. Each variable provides valuable insights into the behaviour and performance of manufacturing firms, offering a nuanced understanding of their characteristics and dynamics.

The “Probability of R&D” variable reveals that approximately 75.30% of manufacturing firms engage in research and development (R&D) activities. This statistic indicates a prevalent inclination towards innovation and investment in R&D initiatives within the industry. Moreover, while the mean probability suggests a dominant presence of R&D initiatives among the sampled firms, the moderate level of variability signifies differing levels of commitment to R&D across the dataset.

Examining the “R&D Intensity” variable uncovers that firms allocate an average of about 11.30% of their sales towards research and development activities. This metric underscores the significance of R&D investment in driving innovation and technological advancement within the manufacturing industry. However, the notable variability in R&D intensity suggests varying strategic approaches adopted by firms, ranging from conservative to aggressively innovative strategies.

The "Sales Growth" variable provides Insights into the performance dynamics of manufacturing firms, indicating an average negative growth rate of approximately -1.8213%. This statistic highlights the challenges and fluctuations experienced by firms in generating revenue and expanding their market presence. The considerable dispersion in growth rates reflects the diverse trajectories of sales growth, encompassing both periods of contraction and expansion, influenced by market conditions and strategic decisions.

Analysis of the “Sales” variable reveals an average log of sales value of 5.1115, indicating the scale and magnitude of revenue generated by manufacturing firms. The notable variability in sales figures underscores the diverse nature of business operations and market positioning among the sampled firms. This diversity encompasses both declines and substantial growth in sales, reflecting the dynamic nature of the manufacturing industry.

The "Liquidity" variable, reflecting the proportion of liquid assets within total assets, demonstrates an average liquidity ratio of approximately 22.16%. This statistic provides insights into the financial health and liquidity positions of manufacturing firms. However, the significant variability in liquidity ratios highlights differing liquidity management strategies and financial resilience among the sampled firms, with implications for risk management and operational stability. “Tobin’s Q” signifies the valuation of firms relative to their book value, with an average ratio of approximately 2.9163. This metric offers insights into market perceptions of firm value and growth potential within the manufacturing sector. The significant variability in Tobin’s Q ratios reflects varying degrees of market sentiment and investor confidence, influenced by factors such as industry competitiveness and growth prospects.

The "Leverage" variable reveals an average leverage ratio of approximately 4.55%, indicating the extent of debt financing utilised by manufacturing firms. The notable variability in leverage ratios suggests differing capital structures and risk profiles among the sampled firms, with implications for financial stability and cost of capital.

Analysis of “Capex” reflects the allocation of capital expenditures as a percentage of total assets, with an average ratio of approximately 4.85%. This statistic highlights the investment priorities and strategic allocation of resources by manufacturing firms towards enhancing productivity and capacity expansion. The moderate variability in capital expenditure ratios underscores differing investment appetites and growth strategies across the industry.

The "ROA" variable portrays an average return on assets of approximately -0.0566%, indicating the profitability and efficiency of asset utilisation within manufacturing firms. The significant variability in ROA underscores varying levels of operational performance and financial efficiency across the dataset, reflecting factors such as cost management and revenue generation capabilities. ”Solvency” exhibits an average solvency ratio of approximately 0.69%, reflecting the ability of manufacturing firms to meet their long-term financial obligations. The notable variability in solvency ratios highlights differences in financial health and debt management practices among the sampled firms, with implications for creditworthiness and long-term viability.

Table 3-3: Summary statistics

Variable Names	N	Mean	SD	Min	p25	Median	p75	Max
Probability of R&D (0/1)	31348	0.7530	0.4313	0	1	1	1	1
R&D Intensity(R&D/Sales)	24121	0.1130	0.2213	0	0.0166	0.0470	0.1176	2.5336
Sales Growth	31348	-1.8213	1.5222	-11.5960	-2.6436	-1.8336	-1.0106	9.4524
Sales	31348	5.1115	2.5169	-5.5215	3.4353	5.2162	6.8978	12.9797
Liquidity	31348	0.2216	0.9446	-14.4768	0.1461	0.2880	0.4585	0.9270
Tobin's Q	31348	2.9163	5.5830	0.5730	1.2568	1.7533	2.7802	93.0180
Leverage	31348	0.0455	0.2262	0	0	0	0.0184	3.2479
Capex	31348	0.0485	0.0459	0	0.0189	0.0357	0.0622	0.2685
ROA	31348	-0.0566	0.6964	-10.2000	-0.0003	0.0801	0.1353	0.3601
Solvency	31348	0.0069	0.2450	-1.9862	-0.0000	0.0046	0.0149	0.9022

Note: Table 3.3 shows summary statistics for key variables in a sample of 7280 manufacturing firms between 1990 and 2021. Probability of R&D (0/1): This variable represents the likelihood of a company engaging in Research and Development (R&D) activities, with values of 0 indicating no R&D and 1 indicating R&D involvement. R&D Intensity (R&D/Sales): R&D Intensity measures the proportion of a company's sales revenue allocated to Research and Development expenses, reflecting the commitment to innovation and product development. Industry R&D Intensity: This variable indicates the average Research and Development expenditure as a percentage of sales revenue within the industry to which the company belongs. Sales Growth: Sales Growth represents the percentage change in a company's sales revenue over a specified period, reflecting its ability to expand its market and generate increased sales. Sales: Sales denotes the total revenue generated by a company from its primary business operations, often used as a key indicator of a company's financial performance. Liquidity: Liquidity measures a company's ability to meet its short-term financial obligations, typically assessed using metrics such as current assets and current liabilities. Tobin's Q: Tobin's Q is a financial ratio that compares a company's market value to its replacement cost, providing insight into the efficiency of its investments and assets. Leverage: Leverage represents the extent to which a company uses debt financing in its capital structure, indicating its financial risk and leverage strategy. Capex: Capex stands for Capital Expenditures and represents the money a company invests in long-term assets, such as property, equipment, and technology, to support growth and operations. ROA (Return on Assets): ROA measures a company's profitability by evaluating its ability to generate earnings from its total assets, indicating its operational efficiency and asset utilization.

Summary statistics for key variables in a sample of 7280 manufacturing firms between 1990 and 2021. Probability of R&D (0/1): This variable represents the likelihood of a company engaging in Research and Development (R&D) activities, with values of 0 indicating no R&D and 1 indicating R&D involvement. R&D Intensity (R&D/Sales): R&D Intensity measures the proportion of a company's sales revenue allocated to Research and Development expenses, reflecting the commitment to innovation and product development. Industry R&D Intensity: This variable indicates the average Research and Development expenditure as a percentage of sales revenue within the industry to which the company belongs. Sales Growth: Sales Growth represents the percentage change in a company's sales revenue over a specified period, reflecting its ability to expand its market and generate increased sales. Sales: Sales denotes the total revenue generated by a company from its primary business operations, often used as a key indicator of a company's financial performance. Liquidity: Liquidity measures a company's ability to meet its short-term financial obligations, typically assessed using metrics such as current assets and current liabilities. Tobin's Q: Tobin's Q is a financial ratio that compares a company's market value to its replacement cost, providing insight into the efficiency of its investments and assets. Leverage: Leverage represents the extent to which a company uses debt financing in its capital structure, indicating its financial risk and leverage strategy. Capex: Capex stands for Capital Expenditures and represents the money a company invests in long-term assets, such as property, equipment, and technology, to support growth and operations. ROA (Return on Assets): ROA measures a company's profitability by evaluating its ability to generate earnings from its total assets, indicating its operational efficiency and asset utilization.

3.4.4 Pearson Correlation

Table 2.4 provides the pairwise correlations among our key variables, highlighting several notable patterns. Industry R&D Intensity shows positive correlations with R&D participation (D_RD, 0.384***), R&D/Sales (0.365***), and Sales Growth (0.247***), suggesting that sectors characterized by higher R&D activity tend to feature firms allocating a greater share of sales revenue to R&D and experiencing more robust sales expansion. Meanwhile, Sales Growth is positively correlated with R&D/Sales (0.273***), indicating that firms investing a larger fraction of their sales in R&D often enjoy higher sales growth.

In contrast, Sales exhibits negative correlations with R&D/Sales (−0.429***), Industry R&D Intensity (−0.368***), and Sales Growth (−0.365***), implying that firms devoting more resources to R&D, operating in R&D-intensive industries, or posting rapid sales growth may have relatively lower sales volumes. A similar negative correlation emerges between Liquidity and Sales (−0.279***). Tobin's Q is positively associated with R&D/Sales (0.403***), Industry R&D Intensity (0.163***), and Sales Growth (0.217***), indicating that markets assign higher valuations to firms prioritizing R&D or operating in R&D-intensive, high-growth environments.

Leverage correlates negatively with R&D/Sales (−0.232***), suggesting that firms emphasizing R&D are typically less leveraged. Capex also shows a modest negative relationship (−0.054***) with R&D/Sales, while ROA has negative correlations with R&D/Sales (−0.514***), Industry R&D Intensity (−0.224***), and Sales Growth (−0.225***). Finally, Solvency shows negative correlations with various R&D-related variables, including D_RD and R&D/Sales, underscoring possible effects of investment intensity on a firm's solvency position.

Overall, these correlations underscore the trade-offs among resource allocation, growth, and profitability, and provide a foundation for deeper exploration of how R&D investments and industry attributes shape firm performance.

Table 3-4:Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)D_RD (R&D Dummy)	1.00000										
(2)R&D/Sales	0.089***	1.00000									
(3)Industry R&D Intensity	0.384***	0.365***	1.00000								
(4)Sales Growth	0.091***	0.273***	0.247***	1.00000							
(5)Sales	-0.044***	-0.429***	-0.368***	-0.365***	1.00000						
(6)Liquidity	0.085***	-0.279***	-0.043***	-0.040***	0.211***	1.00000					
(7)Tobin's Q	-0.00200	0.403***	0.163***	0.217***	-0.345***	-0.725***	1.00000				
(8)Leverage	-0.064***	0.232***	0.063***	0.073***	-0.250***	-0.768***	0.556***	1.00000			
(9)Capex	-0.068***	-0.054***	-0.139***	0.027***	0.065***	0.00600	-0.015***	-0.027***	1.00000		
(10)ROA	-0.022***	-0.514***	-0.224***	-0.225***	0.465***	0.744***	-0.794***	-0.567***	0.026***	1.00000	
(11)Solvency	-0.080***	-0.194***	-0.173***	-0.106***	0.222***	0.00400	-0.071***	-0.00600	0.053***	0.154***	1.0000

*** p<0.01, ** p<0.05, * p<0.1

Note:D_RD (R&D Dummy): A binary variable indicating whether a company engages in research and development (R&D) activities or not. R&D/Sales: The ratio of research and development expenses to total sales, representing the company's investment in R&D relative to its revenue. Industry R&D Intensity: A measure of the average R&D intensity within the industry in which the company operates. Sales Growth: The percentage change in sales revenue over a specific period, indicating the company's growth or contraction. Sales: Total revenue generated by the company from its primary business operations. Liquidity: A measure of the company's ability to meet short-term financial obligations, often represented by metrics such as the current ratio. Tobin's Q: A financial ratio that compares the market value of a company's assets to the replacement cost of those assets, indicating the firm's investment efficiency. Leverage: A measure of the company's reliance on debt financing, often represented by the debt-to-equity ratio or other similar metrics. Capex: Capital expenditures, represent the funds used by the company to acquire, upgrade, or maintain physical assets. ROA (Return on Assets): A profitability ratio that assesses how efficiently a company generates profits from its total assets. Solvency: A measure of the company's ability to meet its long-term financial obligations, often assessed using metrics such as the debt ratio or interest coverage ratio.

3.5 Results and Discussion

3.5.1 Baseline Results and Hypothesis Testing

Hypothesis 1 (H1) posits that manufacturing firms with enforcement-linked banker-directors are more inclined to invest in Research and Development (R&D) than other manufacturing firms. To investigate this proposition, Table 3.5 presents our baseline regressions on R&D investment probability, incorporating various specifications that progressively introduce control variables and fixed effects.

3.5.1.1 Sales and Growth Indicators

Our results show that Sales Growth is negatively associated with R&D expenditures, albeit insignificantly. This observation echoes Ghosh (2016), who finds that high-growth firms often reduce their R&D intensity, potentially focusing on scaling existing operations rather than undertaking long-horizon projects. In contrast, the Sales variable exhibits a positive, statistically significant effect on R&D probability: a 10 percent rise in sales corresponds to a 1.49 percent increase in the likelihood of R&D investment (calculated from the mean value of sales 5.1115 multiplied by its estimated coefficient 0.02922). These findings suggest that, while rapid expansion may not spur additional R&D, firms with ample sales revenue are more disposed to commit resources to innovation.

3.5.1.2 Financial Constraints and Opportunities

Liquidity also has a positive and significant coefficient, indicating that firms with stronger liquidity positions are likelier to invest in R&D. Likewise, Tobin's Q, a proxy for growth opportunities, displays a significant positive correlation with R&D, reinforcing the notion that firms with promising prospects channel funds into development initiatives. In contrast, Leverage, Capex, Solvency, and Return on Assets (ROA) are negatively and significantly related to R&D probability. These latter findings deviate somewhat from Ghosh's (2016) study of Indian manufacturing, hinting at possible cross-market variations in how firms balance innovation spending against capital structure or profitability pressures.

3.5.1.3 Enforcement-Linked Banker-Directors and R&D

Turning to the crux of H1, the coefficient on enforcement-linked years, which indicates periods when a bank-linked director is distracted by regulatory enforcement actions, emerges as positive and significant across all model specifications, including those with and without industry/year fixed effects and control variables. In practical terms, manufacturing firms that share directorships with banks under enforcement appear more willing to allocate resources to R&D during these episodes. This finding strongly supports H1, implying that the temporary diversion of banker-directors' attention due to

compliance demands at their affiliated banks may free non-financial boards to pursue more substantial innovation projects.

Overall, these baseline results underscore that while some firm-level attributes (e.g., higher sales, stronger liquidity, better growth prospects) encourage R&D, the decisive factor for this chapter's core hypothesis is the enforcement-linked director relationship. This insight opens avenues for deeper analysis into how governance, risk oversight, and strategic innovation interplay during periods of regulatory scrutiny.

Second, these parsimonious models (Models 1-3) are deliberately presented for comparative purposes to illustrate the incremental effect of adding year and industry-fixed effects and control variables. Indeed, subsequent model specifications (e.g., Model 4) show modestly higher R-squared values (e.g., around 0.039), reflecting the enhanced explanatory power gained from accounting for industry-specific dynamics and temporal fluctuations. In sum, although low R-squared levels may appear counterintuitive, they are not uncommon in finance research,especially for cross-sectional or panel regressions involving complex, multi-dimensional firm outcomes. Our approach follows standard practice in the literature by initially highlighting a baseline specification and then demonstrating how model fit improves when relevant fixed effects and control variables are introduced.

Table 3-5:Baseline Results

Variable Names	Expected Sign	(1) R&D Selection (0/1)	(2) R&D Selection (0/1)	(3) R&D Selection (0/1)	(4) R&D Selection (0/1)
Log (Industry R&D Mean) t-1	+	0.00445**	-0.00358	-0.00167	-0.00587**
		(0.00186)	(0.00277)	(0.00191)	(0.00282)
Enforcement-Linked Years	+	0.16563***	0.06393***	0.14145***	0.05373***
		(0.01504)	(0.01946)	(0.01508)	(0.01953)
Sales Growth	-		-0.00205		-0.00169
			(0.00144)		(0.00145)
Sales	+		0.02922***		0.02747***
			(0.00103)		(0.00107)
Liquidity	+		0.02916***		0.0299***
			(0.00408)		(0.00408)
Tobin's Q	+		0.00299***		0.00289***
			(0.00051)		(0.00051)
Leverage	-		-0.059***		-0.05432***
			(0.01457)		(0.01458)
Capex	-		-0.2373***		-0.13866***
			(0.04465)		(0.04634)
ROA	+		-0.04245***		-0.03834***
			(0.00484)		(0.00488)
Solvency	+		-0.04442***		-0.04422***
			(0.00843)		(0.00844)
Constant	?	0.77307***	0.58681***	0.74207***	0.64038***
		(0.00458)	(0.00999)	(0.0198)	(0.03104)
Observations		67137	31348	67137	31348
R-squared		0.0019	0.03625	0.0078	0.03917
Rho		0.34408	0.40953	0.34782	0.40986
Industry FE		YES	YES	YES	YES
Year FE		NO	NO	YES	YES

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Note: Table 3.5 presents the baseline regression estimates derived from a Difference-in-Difference (DID) framework, analysing the effect of enforcement actions on the R&D investment behaviour of non-financial firms connected to banks through shared directors. The key explanatory variable, Enforcement Action Years, is an interaction term that combines the post-enforcement period with the treatment group, which consists of non-financial firms (NFFs) associated with enforced banks. The dependent variable in the analysis is the Probability of R&D, represented by the binary indicator R&D Selection (0/1), which reflects whether a firm engaged in R&D activities during a given year. The table is structured into four columns. Columns (1) and (3) report the estimated coefficients where the probability of R&D engagement (R&D Selection: 0/1) serves as the dependent variable, excluding control variables. Columns (2) and (4) present the estimates with the inclusion of control variables, again using the Probability of R&D as the dependent variable. The regression models incorporate several control variables to account for firm-specific characteristics. Sales Growth represents the percentage change in sales, expressed logarithmically. Sales denote the natural logarithm of the firm's total sales revenue in a given year. Liquidity is measured as the ratio of current assets to total assets, reflecting the firm's ability to meet short-term obligations. Tobin's Q is included as a measure of the firm's market value relative to its total assets. Leverage represents the ratio of total debt to total assets, indicating the extent of debt financing. Capex is the ratio of capital expenditures to total assets, capturing the firm's investment in new capital assets relative to its asset base. ROA (Return on Assets), defined as the ratio of operating income after depreciation to total assets, assesses the firm's ability to generate earnings from its assets. Finally, Solvency is measured as the ratio of earnings before interest and taxes (EBIT) to interest and related expenses, indicating the firm's capacity to meet its interest obligations

R&D investment during such enforcement periods. Our analysis underscores the intricate interplay between diverse determinants and R&D investment proclivities among manufacturing firms, warranting further scholarly inquiry to decipher these relationships comprehensively.

3.5.2 Robustness Tests

In order to bolster the robustness and reliability of our empirical findings, we conducted a series of robustness tests utilising subsample groups. In Table 5, Columns 1 and 2, our analysis was centred on the Bank-linked Non-Financial Firms (NFFs) subsample, wherein enforcement-linked NFFs constituted the treatment group and non-enforcement-linked bank-linked NFFs served as the control group. Analogously, in Columns 3 and 4, the control group was confined to bank-linked years of manufacturing firms. Our findings supported a statistically significant increase in the probability of R&D investment during enforcement-linked years for both the Bank-linked and bank-linked years samples in Columns 2 and 4, accomplishing significance levels of 10% and 1%, respectively, thereby reinforcing the robustness of our empirical evaluations.

To mitigate potential confounding effects attributable to the 2008 financial crisis, we conducted an additional regression analysis excluding the years spanning from 2007 to 2009. As portrayed in Table 6, our results remained robust and consistent, with the coefficient associated with Enforcement-linked years even exhibiting an amplification in magnitude.

Furthermore, we extended our robustness assessments by employing a Logarithmic regression model, as presented in Table 7. Across all model specifications, a positive and statistically significant impact of enforcement-linked years as the primary explanatory variable was consistently observed, with particularly notable significance levels detected at the 1% threshold. These findings underscore the robustness and reliability of our conclusions pertaining to the influential role of enforcement-linked years in shaping firms' R&D investment decisions.

To further strengthen the robustness of our findings, we conducted a placebo test by creating a placebo treatment variable for the treated group. The rationale behind this test is to determine whether the significant results observed in our main analysis hold when the treatment is randomly assigned to the treatment group during a period where no actual treatment occurred. By doing so, we can assess whether the observed effects in our primary analysis are genuinely attributable to the enforcement-linked banker-director's distraction or simply driven by underlying trends unrelated to the actual treatment.

We replaced the actual enforcement action years with a randomly generated placebo treatment variable and reran our analysis using the same difference-in-differences framework. As expected, the

results of the placebo test, shown in Table 8, indicated no statistically significant impact of the placebo treatment on the probability of R&D investment. This absence of significant results supports the validity of our main findings, confirming that the observed increase in R&D probability during the enforcement action years is not driven by random factors but is directly associated with the distraction of banker-directors.

The non-significant placebo results enhance our confidence in the causal interpretation of the effect of enforcement-linked banker-directors on R&D investment decisions. These findings reinforce the robustness of our original model and mitigate concerns about potential biases or unobserved trends driving our results.

In a final robustness check in Table 9, we recalibrated our dependent variable to R&D Intensity, measured as the ratio of R&D expenditures to sales. The results are articulated in Table 8, wherein we discerned a reduction in R&D intensity among manufacturing firms during enforcement-linked years. Specifically, in Columns 1 and 3, devoid of control variables, a negative and significant coefficient for Enforcement-linked years was evident; however, the significance levels disappeared upon the introduction of control variables.

In summary, our comprehensive robustness tests corroborated the validity of our empirical findings across diverse model specifications while also spotlighting instances of diminished statistical significance. These insights contribute to an enriched understanding of the intricate dynamics governing innovation within the corporate landscape, underscoring the imperative for future research attempts to explore deeper into the underlying mechanisms modulating the relationship between bank-linked directors and R&D investment proclivities in manufacturing firms. Future studies might consider alternative modelling approaches or incorporate additional control variables to further fortify our empirical conclusion's robustness.

Table 3-6:Baseline results excluding financial crisis years (2007-2009)

Variable names	(1) R&D Selection (0/1)	(2) R&D Selection (0/1)	(3) R&D Selection (0/1)	(4) R&D Selection (0/1)
Log (Industry R&D Mean) t-1	0.00434**	-0.00467	-0.0021	-0.00708**
	(0.00196)	(0.00294)	(0.00201)	(0.00299)
Enforcement-Linked Years	0.17041***	0.07364***	0.14421***	0.06206***
	(0.01584)	(0.02096)	(0.01589)	(0.02104)
Sales Growth		-0.00193		-0.00139
		(0.00152)		(0.00153)
Sales		0.0296***		0.0279***
		(0.0011)		(0.00114)
Liquidity		0.03055***		0.03125***
		(0.00449)		(0.00449)
Tobin's Q		0.0031***		0.00294***
		(0.00054)		(0.00054)
Leverage		-0.05913***		-0.05441***
		(0.01571)		(0.01572)
Capex		-0.2399***		-0.13769***
		(0.04687)		(0.04876)
ROA		-0.04231***		-0.03828***
		(0.00523)		(0.00527)
Solvency		-0.04131***		-0.04118***
		(0.00913)		(0.00913)
Constant	0.76952***	0.57889***	0.73965***	0.63415***
	(0.00482)	(0.01062)	(0.01995)	(0.03138)
Observations	61056	28240	61056	28240
R-squared	0.00198	0.03663	0.00788	0.03954
Rho	0.34307	0.41198	0.34763	0.41297
Industry FE	YES	YES	YES	YES
Year FE	NO	NO	YES	YES

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1*

Note: Table 3.6 presents the Baseline results excluding financial crisis years (2007-2009) regression estimates derived from a Difference-in-Difference (DID) framework, analysing the effect of enforcement actions on the R&D investment behaviour of non-financial firms connected to banks through shared directors. The key explanatory variable, Enforcement Action Years, is an interaction term that combines the post-enforcement period with the treatment group, which consists of non-financial firms (NFFs) associated with enforced banks. The dependent variable in the analysis is the Probability of R&D, represented by the binary indicator R&D Selection (0/1), which reflects whether a firm engaged in R&D activities during a given year. The table is structured into four columns. Columns (1) and (3) report the estimated coefficients where the probability of R&D engagement (R&D Selection: 0/1) serves as the dependent variable, excluding control variables. Columns (2) and (4) present the estimates with the inclusion of control variables, again using the Probability of R&D as the dependent variable. The regression models incorporate several control variables to account for firm-specific characteristics. Sales Growth represents the percentage change in sales, expressed logarithmically. Sales denote the natural logarithm of the firm's total sales revenue in a given year. Liquidity is measured as the ratio of current assets to total assets, reflecting the firm's ability to meet short-term obligations. Tobin's Q is included as a measure of the firm's market value relative to its total assets. Leverage represents the ratio of total debt to total assets, indicating the extent of debt financing. Capex is the ratio of capital expenditures to total assets, capturing the firm's investment in new capital assets relative to its asset base. ROA (Return on Assets), defined as the ratio of operating income after depreciation to total assets, assesses the firm's ability to generate earnings from its assets. Finally, Solvency is measured as the ratio of earnings before interest and taxes (EBIT) to interest and related expenses, indicating the firm's capacity to meet its interest obligations

Table 3-7:Logit Model Results

	Total Sample		Bank-Linked NFFs Sample		Bank-Linked NFFs Sample	
	(1)	(2)	(3)	(4)	(5)	(6)
Variable Names	R&D Selection(0/1)	R&D Selection(0/1)	R&D Selection(0/1)	R&DSelection(0/1)	R&D Selection(0/1)	R&D Selection(0/1)
Log (Industry R&D Mean) t-1	0.01746	0.00327	-0.01201	0.02543	0.12937*	0.17109*
	(0.01453)	(0.02285)	(0.03745)	(0.05358)	(0.0699)	(0.09838)
Enforcement-Linked Years	1.27407***	0.72129***	0.78404***	0.55694**	0.96456***	0.63354**
	(0.14729)	(0.20069)	(0.19172)	(0.26277)	(0.22321)	(0.30796)
Sales Growth		-0.0133		-0.06088*		-0.13298**
		(0.01235)		(0.03472)		(0.06203)
Sales		0.2451***		0.47134***		0.47242***
		(0.0096)		(0.03829)		(0.07107)
Liquidity		0.24534***		-0.54201		-0.68622
		(0.03497)		(0.35012)		(0.62392)
Tobin's Q		0.03482***		0.38045***		0.87163***
		(0.00568)		(0.05868)		(0.12752)
Leverage		-0.43004***		1.30596		1.64486
		(0.11478)		(1.10433)		(2.04991)
Capex		-0.80075**		-0.10728		-0.28729
		(0.37287)		(1.29757)		(2.39418)
ROA		-0.28719***		-6.82541***		-8.26852***
		(0.04763)		(0.70979)		(1.22568)
Solvency		-0.53033***		-0.70707**		-1.76517***
		(0.09688)		(0.34494)		(0.67825)
Constant	0.22599	-0.86059**	0.88753	-0.55925	2.35294***	-2.72036**
	(0.23153)	(0.38815)	(0.76454)	(1.37751)	(0.63747)	(1.2376)
Observations	67000	30751	9439	5154	2967	1833
Pseudo R^2	0.28293	0.33418	0.30355	0.35393	0.27385	0.37455
Industry FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1*

Table 3.7 presents the results from both Logistic Regression and Ordinary Least Squares (OLS) regressions applied within a Difference-in-Difference (DID) framework. The primary aim is to assess the impact of enforcement actions on the R&D investments of manufacturing firms linked to banks. The key explanatory variable, Enforcement Action Years, is an interaction term that captures the post-enforcement period within the treatment group, consisting of non-financial firms (NFFs) associated with enforced banks. Two dependent variables are used to measure R&D outcomes. The first, R&D Selection (0/1), is a binary variable indicating whether a firm engaged in R&D activities during a specific year. The second, R&D Intensity, represents the ratio of R&D expenditure to sales, providing a measure of R&D spending relative to firm size. The table is organized into six columns. Columns (1), (3), and (5) display the estimates from Logistic Regression, with R&D Selection (0/1) as the dependent variable. Columns (2), (4), and (6) present the estimates from OLS regression, using R&D Intensity as the dependent variable. The regression models incorporate several control variables to account for firm-specific characteristics. Sales Growth represents the percentage change in sales, expressed logarithmically. Sales denote the natural logarithm of the firm's total sales revenue in a given year. Liquidity is measured as the ratio of current assets to total assets, reflecting the firm's ability to meet short-term obligations. Tobin's Q is included as a measure of the firm's market value relative to its total assets. Leverage represents the ratio of total debt to total assets, indicating the extent of debt financing. Capex is the ratio of capital expenditures to total assets, capturing the firm's investment in new capital assets relative to its asset base. ROA (Return on Assets), defined as the ratio of operating income after depreciation to total assets, assesses the firm's ability to generate earnings from its assets. Finally, Solvency is measured as the ratio of earnings before interest and taxes (EBIT) to interest and related expenses, indicating the firm's capacity to meet its interest obligations.

Table 3-8:Placebo Test Results

Variable Names	(1) R&D Selection (0/1)	(2) R&D Selection (0/1)	(3) R&D Selection (0/1)	(4) R&D Selection (0/1)
Log (Industry R&D Mean) t-1	0.00456**	-0.00355	-0.00187	-0.0059**
	(0.00187)	(0.00277)	(0.00191)	(0.00282)
Placebo Enforcement-Linked Years	0.00156	0.00336	0.00175	0.00357
	(0.00273)	(0.00393)	(0.00273)	(0.00393)
Sales Growth		-0.00203		-0.00167
		(0.00144)		(0.00145)
Sales		0.02969***		0.02783***
		(0.00103)		(0.00106)
Liquidity		0.02914***		0.0299***
		(0.00408)		(0.00408)
Tobin's Q		0.00299***		0.00289***
		(0.00051)		(0.00051)
Leverage		-0.05917***		-0.05437***
		(0.01457)		(0.01458)
Capex		-0.23997***		-0.13888***
		(0.04465)		(0.04634)
ROA		-0.0428***		-0.03854***
		(0.00484)		(0.00488)
Solvency		-0.0446***		-0.0444***
		(0.00843)		(0.00844)
Constant	0.77397***	0.58368***	0.7408***	0.63729***
	(0.00478)	(0.01018)	(0.01986)	(0.03109)
Observations	67137	31348	67137	31348
R-squared	0.00009	0.03594	0.0065	0.03896
Rho	0.34397	0.40958	0.34781	0.40989
Industry FE	YES	YES	YES	YES
Year FE	NO	NO	YES	YES

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1*

Note: Table 8 presents the placebo test regression estimates derived from a Difference-in-Difference (DID) framework, where a placebo treatment variable was randomly assigned to the treatment group to assess the robustness of our findings. The key explanatory variable, Placebo Treatment, replaces the actual enforcement action years with a randomly generated variable. The dependent variable in the analysis is the Probability of R&D, represented by the binary indicator R&D Selection (0/1), which reflects whether a firm engaged in R&D activities during a given year. The table is structured into four columns. Columns (1) and (3) report the estimated coefficients where the probability of R&D engagement (R&D Selection: 0/1) serves as the dependent variable, excluding control variables. Columns (2) and (4) present the estimates with the inclusion of control variables, again using the Probability of R&D as the dependent variable. The regression models incorporate several control variables to account for firm-specific characteristics. Sales Growth represents the percentage change in sales, expressed logarithmically. Sales denote the natural logarithm of the firm's total sales revenue in a given year. Liquidity is measured as the ratio of current assets to total assets, reflecting the firm's ability to meet short-term obligations. Tobin's Q is included as a measure of the firm's market value relative to its total assets. Leverage represents the ratio of total debt to total assets, indicating the extent of debt financing. Capex is the ratio of capital expenditures to total assets, capturing the firm's investment in new capital assets relative to its asset base. ROA (Return on Assets), defined as the ratio of operating income after depreciation to total assets, assesses the firm's ability to generate earnings from its assets. Finally, Solvency is measured as the ratio of earnings before interest and taxes (EBIT) to interest and related expenses, indicating the firm's capacity to meet its interest obligations.

Table 3-9:Alternative Model Test Results

.		Total Sample	Bank-Linked NFFs Sample		Bank-Linked NFFs Sample	
	(1)	(2)	(3)	(4)	(5)	(6)
Variable Names	**R&D/Sales**	**R&D/Sales**	**R&D/Sales**	**R&D/Sales**	**R&D/Sales**	**R&D/Sales**
Enforcement-Linked Years	-0.11031***	0.01072	-0.02265***	0.00247	-0.02494***	-0.00048
	(0.01509)	(0.01073)	(0.00642)	(0.00419)	(0.0062)	(0.00443)
Sales Growth		0.00505***		0.0013*		-0.00072
		(0.00085)		(0.00072)		(0.0011)
Sales		-0.01389***		-0.00293***		-0.00356***
		(0.00063)		(0.00065)		(0.00106)
Liquidity		0.01277***		0.01153**		0.01377
		(0.00244)		(0.00507)		(0.01058)
Tobin's Q		0.00193***		0.00238***		0.00974***
		(0.00029)		(0.00045)		(0.00093)
Leverage		0.01774**		0.03508		0.05765*
		(0.00878)		(0.02272)		(0.03473)
Capex		0.02628		0.11987***		0.18027***
		(0.02823)		(0.02754)		(0.04774)
ROA		-0.10323***		-0.19123***		-0.14991***
		(0.00287)		(0.00627)		(0.00978)
Solvency		-0.03817***		-0.0106**		-0.04086***
		(0.00452)		(0.0047)		(0.00782)
Constant	0.16315***	0.14493***	0.05288**	0.06195***	0.05064	0.03892
	(0.01961)	(0.01701)	(0.02595)	(0.01612)	(0.05832)	(0.0375)
Observations	58175	24180	11816	6684	4643	2764
R-squared	0.00908	0.2268	0.00693	0.22478	0.0127	0.20379
R/ho	0.04935	0.07404	0.12143	0.34782	0.12996	0.2037
Industry FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1*

Note: Table 3.9 presents the regression estimates derived from a Difference-in-Difference (DID) framework, analysing the impact of enforcement actions on the R&D investment behaviour of manufacturing firms connected to banks. The key explanatory variable, Enforcement Action Years, is an interaction term that combines the post-enforcement period with the treatment group, which comprises non-financial firms (NFFs) linked to enforced banks. The dependent variable in this analysis is R&D Intensity, defined as the ratio of R&D expenditure to sales. The table is organized into six columns. Columns (1), (3), and (5) report the estimates of R&D Intensity for the specified group without control variables. In contrast, Columns (2), (4), and (6) present the estimates of R&D Intensity for the same group with the inclusion of control variables. The regression models incorporate several control variables to account for firm-specific characteristics. Sales Growth represents the percentage change in sales, expressed logarithmically. Sales denote the natural logarithm of the firm's total sales revenue in a given year. Liquidity is measured as the ratio of current assets to total assets, reflecting the firm's ability to meet short-term obligations. Tobin's Q is included as a measure of the firm's market value relative to its total assets. Leverage represents the ratio of total debt to total assets, indicating the extent of debt financing. Capex is the ratio of capital expenditures to total assets, capturing the firm's investment in new capital assets relative to its asset base. ROA (Return on Assets), defined as the ratio of operating income after depreciation to total assets, assesses the firm's ability to generate earnings from its assets. Finally, Solvency is measured as the ratio of earnings before interest and taxes (EBIT) to interest and related expenses, indicating the firm's capacity to meet its interest obligations.

3.5.2.1 Difference-in-Differences Parallel Trend Assumption

Figure 3.1 provides an intriguing insight into the behaviour of two distinct categories of firms: bank-linked and non-bank-linked firms within the manufacturing sector. The visualisation reveals a notable trend in the Probability of R&D Investment for these firms.

The key observation here is the presence of a striking parallel trend between these two categories over the observed period, spanning from 1990 to 2021. In simpler terms, bank-linked NFFs and their non-bank-linked counterparts exhibit a highly similar pattern in their probability of engaging in R&D investment. This parallel trend suggests that, without major disruptions or significant external influences, these two groups of firms tend to follow a comparable trajectory in their propensity to invest in R&D activities.

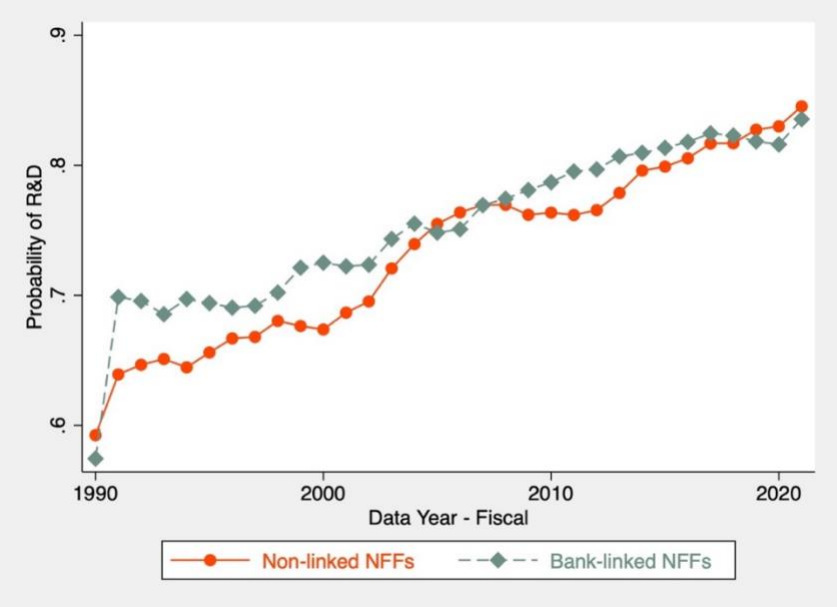

Figure 3.1:Probability of R&D Investment of Bank-linked and non-Bank-linked Firms

Note: This figure presents a graphical representation of the probability of Research and Development (R&D) investment in two distinct categories of firms: bank-linked and non-bank-linked firms. The data covers a time span from 1990 to 2021 and is reported in fiscal years. The x-axis of the figure represents the fiscal years, spanning from 1990 to 2021.The y-axis depicts the probability of R&D investment, which is expressed as a percentage.

Figure 3.2 delves into the Probability of R&D Investment for Enforcement-linked and non-enforcement-linked firms, offering a dynamic perspective on how R&D investment probabilities fluctuate over time. Unlike the consistent parallel trend depicted in Figure 3.1, Figure 3.2 reveals a more variable pattern year by year. However, within this variability, a distinct observation emerges: a notable shift in the probability of R&D investment among enforcement-linked firms during specific years, namely 2005, 2010, and 2020.

The rationale behind these shifts may be attributed to certain events occurring during these years. For instance, in 2010, which follows the 2008 financial crisis, banker-directors might have felt compelled to refocus their attention on NFFs after possibly neglecting them during the crisis years. Similarly, in 2020, the shift to online meetings due to the pandemic may have made it more feasible and convenient for banker-directors to participate in board meetings, potentially influencing R&D investment decisions. For instance, DeFilippis et al. (2020) observed a 12.9% rise in individual meeting participation and a 13.5% increase in meeting attendees compared to before the pandemic. Additionally, Theresa H.'s (2021) research revealed that virtual meetings for non-profit organizations are more cost-effective, convenient, and efficient, leading to increased attendance compared to face-to-face meetings.

Although these explanations are speculative, what is evident is that except during these specific years, enforcement-linked firms consistently experienced a notable and significant increase in their probability of R&D investment compared to their non-enforcement-linked counterparts. While further research may be needed to confirm these hypotheses, these observations underscore the intricate dynamics at play in shaping R&D investment decisions within the context of enforcement actions and banker-director involvement.

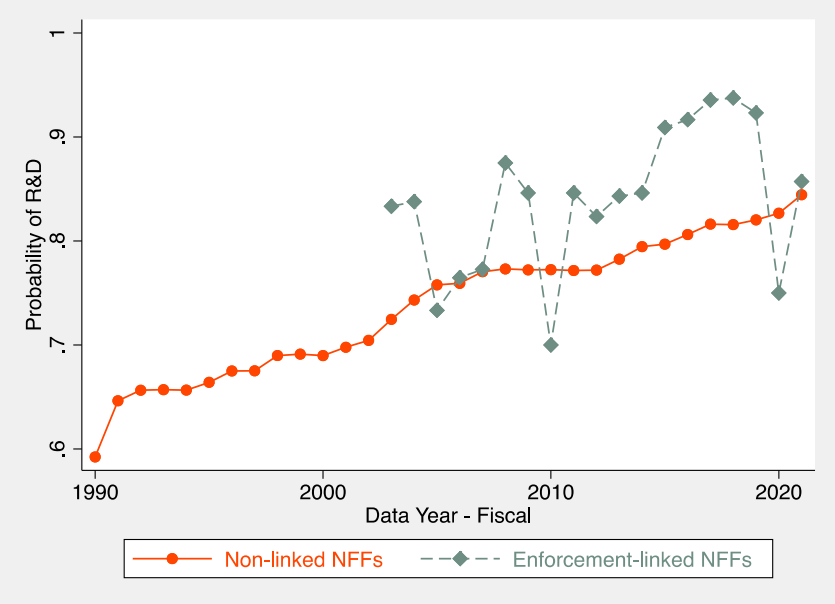

Figure 3.2:Probability of R&D Investment of Enforcement-linked and non-Enforcement-linked Firms

Note: This figure presents the probability of Research and Development (R&D) investment in firms categorized as enforcement-linked and non-enforcement-linked over the period spanning fiscal years from 1990 to 2021. The x-axis of the figure represents the fiscal years, spanning from 1990 to 2021. The y-axis depicts the probability of R&D investment, which is expressed as a percentage.

This observation suggests that during these specific years characterised by enforcement-linked activities, enforcement-linked firms in the manufacturing sector display a heightened inclination toward R&D investment. This phenomenon indicates that during these periods of enforcement activity, there is a noticeable shift in the focus of banker directors, who also serve as directors of non-financial firms (NFFs). This shift in focus appears to divert attention away from NFF's boards and towards the bank boards, resulting in an increased probability of R&D investment within this group of firms.

In summary, Figure 3.1 highlights a consistent and parallel trend in R&D investment probability between bank-linked and non-bank-linked NFFs. Meanwhile, Figure 3.2 provides a more dynamic perspective, showcasing fluctuations in R&D investment probability, especially during enforcement-linked years. These findings offer valuable insights into the complex interplay between various external factors, firm characteristics, and R&D investment decisions within the non-financial sector.

3.5.2.2 Dynamic R&D Probability and R&D/Sales around the Enforcement Actions

This section explores the dynamic impact of enforcement actions on the innovation activities of non-financial firms (NFFs) with banker-directors. When enforcement actions target the banks where these directors serve, their focus shifts to their banking responsibilities, leading to reduced involvement in their NFF board roles. This shift in governance provides a unique opportunity to assess how diminished director attention influences firm innovation, particularly in terms of R&D probability and R&D intensity.

Figure 3.3 captures the increase in R&D probability following enforcement actions, indicating that NFFs are more likely to engage in R&D when banker-directors are less involved. However, as shown in Figure 3.4, this change in R&D activity does not correspond to a significant shift in R&D intensity (R&D/Sales), which remains relatively stable before and after the enforcement event. Together, these figures highlight the nuanced relationship between director attention and firm innovation, where the likelihood of R&D increases without significantly altering the scale of investment.

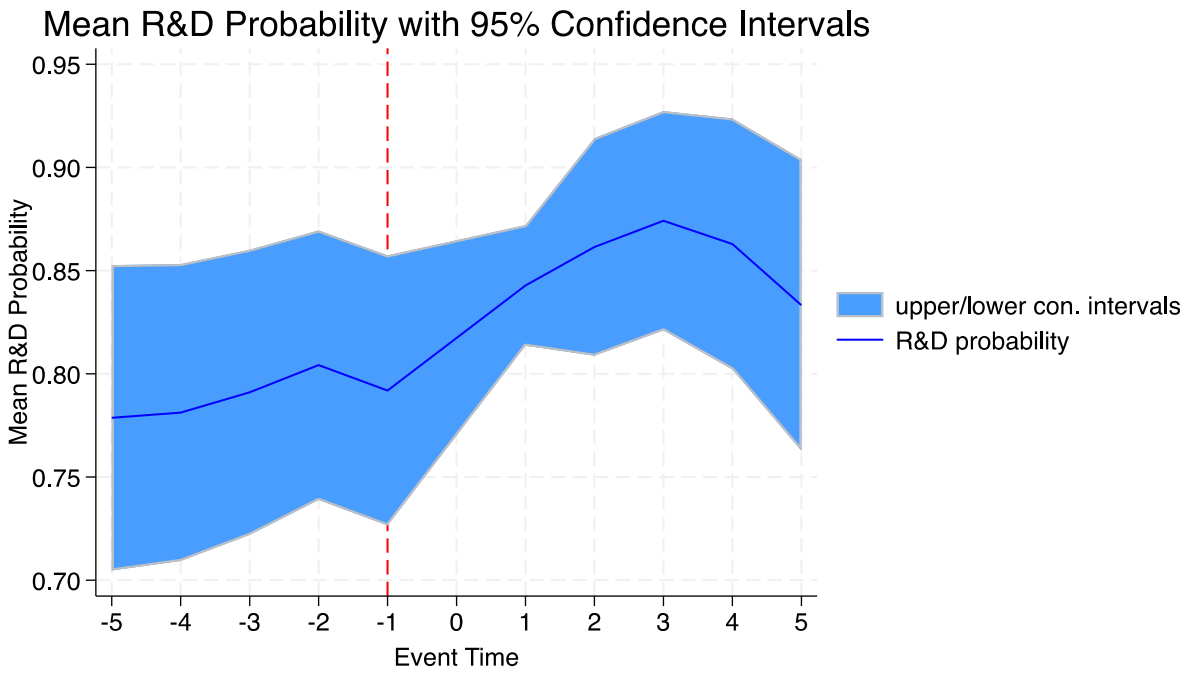

Figure 3.3:Mean R&D Probability Around Enforcement Actions with 95% Confidence Intervals

Note: This figure illustrates the mean R&D probability for non-financial firms (NFFs) with enforcement-linked banker-directors, across a timeline of five years before and after the enforcement action. The horizontal axis represents the event time, where 0 indicates the time of enforcement action faced by the bank where banker-directors are seated. The vertical axis shows the probability of the NFFs engaging in R&D activities. Blue Line: Represents the mean R&D probability across firms. Shaded Area: Represents the 95% confidence intervals around the mean estimate. The red dashed vertical line at Year -1 marks before the enforcement action event. Years 1 through 5 represent the post-treatment period.

The core mechanism behind these observed fluctuations in R&D probability stems from the shifting attention of banker-directors. When an enforcement action targets the banks at which these directors serve, their focus and engagement are redirected toward their banking responsibilities, especially during periods of heightened regulatory scrutiny. This shift in attention results in these directors attending less frequently or actively to their roles on the boards of NFFs. As a consequence, the governance and oversight dynamics within the NFFs change temporarily. Without the direct involvement of banker-directors, these firms experience a noticeable increase in their R&D probability post-treatment.

The figure 3.3 clearly shows that after the enforcement action, R&D probability rises steadily for two years, peaking at Year 2, before beginning to decline in the subsequent years. This pattern suggests that, in the absence of the direct oversight or influence of banker-directors, NFFs are able to make bolder decisions regarding their innovation strategies. One possible explanation for this surge in R&D activity could be the loosening of constraints or conservative approaches typically associated with banker-directors, who may prioritise financial prudence and risk management over aggressive

investment in innovation. When these directors shift their attention away from the NFF boards due to enforcement actions, it opens up opportunities for the remaining board members or management to allocate resources toward higher-risk, potentially higher-reward innovation projects, as evidenced by the increased probability of R&D investments.

However, as the figure indicates, this increase in R&D activity is not sustained indefinitely. Beginning in Year 3 post-treatment, the R&D probability begins to decline, reflecting a possible return of banker-director's attention to NFFs after the immediate crisis at their banks subsides. As their involvement in NFFs resumes, the firms may experience a reversion to more traditional governance structures, where innovation expenditures are moderated in favour of more conservative strategies. This decline aligns with the hypothesis that banker-directors, while effective at enforcing governance and risk management practices, may constrain the more entrepreneurial or innovation-focused aspects of firm strategy when they are actively involved.

The confidence intervals, while relatively stable around the peak of the post-treatment period, widen in the periods further from the treatment event. This indicates that while the post-treatment surge in R&D probability is statistically significant, the magnitude of the effect varies across firms, possibly depending on factors such as the firm's size, industry, or existing innovation capabilities.

In summary, the results highlight a clear temporal relationship between banker-director's enforced shift in attention and NFF's increased propensity to engage in R&D activities. The initial surge in R&D probability suggests that the absence of banker-directors, triggered by enforcement actions, allows NFFs to pursue more innovation-driven strategies, perhaps taking advantage of the temporary relaxation of conservative oversight. Nevertheless, the eventual decline in R&D probability underscores the transitory nature of this effect, raising important questions about the long-term balance between governance and innovation in firms influenced by banker-directors.

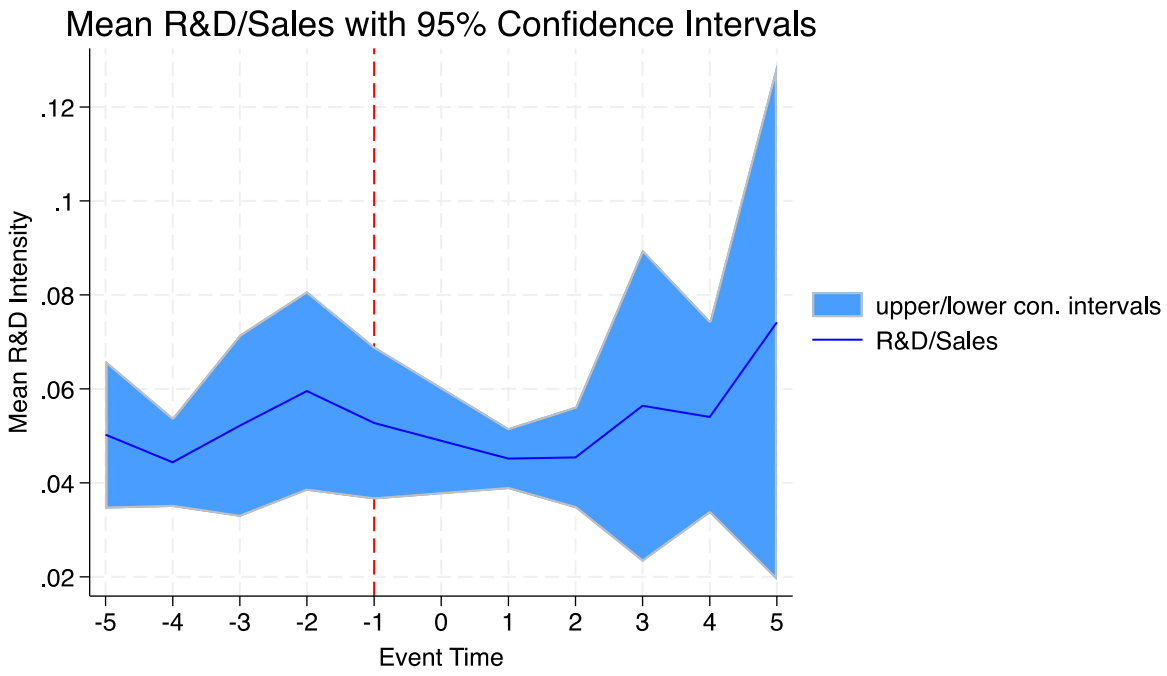

Figure 3.4:Mean R&D/Sales Around Enforcement Actions with 95% Confidence Intervals

Note: This figure shows the mean R&D intensity (measured as the ratio of R&D expenditures to sales) for non-financial firms (NFFs) with enforcement-linked banker-directors, spanning five years before and after the enforcement action. The horizontal axis reflects the timeline, with Year 0 denoting the enforcement action time. The vertical axis shows the mean R&D/Sales ratio. Blue Line: Represents the mean R&D/Sales ratio across firms. Shaded Area: Represents the 95% confidence intervals around the mean estimate. The red dashed vertical line at Year -1 marks before the enforcement action event. Years 1 through 5 represent the post-treatment period.

Figure 3.4 depicts the R&D Intensity (measured as the ratio of R&D expenditures to sales) for non-financial firms (NFFs) with enforcement-linked banker-directors, covering a timeline spanning five years prior to and after the enforcement action. The red dashed line marks the year of the enforcement action faced by the banks where these banker-directors are seated, with the years following representing the post-treatment period. The vertical axis illustrates the mean R&D/Sales ratio, with the shaded regions indicating the 95% confidence intervals.

Unlike the results seen in Figure 3.3, Figure 3.4 shows a relatively stable trend in R&D intensity, with no significant changes in the R&D/Sales ratio observed post-treatment. This stability suggests that while the enforcement action and subsequent diversion of banker-director's attention affected the R&D probability of NFFs, it did not lead to meaningful changes in the overall intensity of R&D expenditures relative to sales. The line representing the mean R&D/Sales ratio fluctuates mildly around a constant level both before and after the enforcement action, indicating that these firms continued to allocate a similar proportion of their sales to R&D activities, regardless of the banker-director's shifting focus.

The lack of significant change post-treatment may imply that while the absence of banker-directors influences NFF's propensity to engage in R&D projects, it does not necessarily lead to substantial changes in the scale or intensity of those investments relative to their sales. This could be due to various factors: firms may have long-term R&D budgets that are less flexible and less influenced by short-term governance changes, or the overall level of sales might dampen any potential effects of increased R&D activity in absolute terms.

The widening confidence intervals in the post-treatment period indicate that the estimates of R&D intensity become more uncertain as time progresses. However, the mean R&D/Sales ratio does not show a pronounced upward or downward trend, reinforcing the conclusion that enforcement actions, while affecting governance and decision-making at a high level, do not result in significant reallocations of resources toward or away from R&D when viewed as a proportion of sales.

Overall, the results presented in Figure 3.4 suggest that, despite a noticeable increase in R&D probability (Figure 3.3), there is no corresponding shift in the intensity of R&D investment relative to sales. This indicates that enforcement actions may alter the types or frequency of innovation activities that NFFs pursue, but they do not significantly alter the scale of these activities in relation to the firm's financial performance. The stability of R&D intensity could point to entrenched investment practices or longer-term R&D strategies that are less susceptible to short-term governance changes, further emphasizing the complex relationship between governance shocks and firm-level innovation outcomes.

3.6 Discussion

The results presented in this study shed new light on the intricate relationship between bank-linked directors and research and development (R&D) investment in manufacturing firms. We observed several noteworthy patterns and associations, which align with and expand upon existing literature in corporate governance and innovation.

3.6.1 Impact of Banker-Directors on R&D Investment

Our primary finding that banker-directors are associated with a reduction in the likelihood of R&D investment resonates with prior research suggesting that financial professionals on boards may prioritize financial stability over riskier, long-term investments like R&D. The conservative risk profile of banker-directors, who may prioritize short-term financial performance and mitigate risk exposures (Kroszner & Strahan, 2001), is a plausible explanation for these findings. Research by Ghosh (2016), which similarly found that banker-directors in Indian manufacturing firms deter R&D investments, highlights the broader relevance of these dynamics beyond the U.S. context. In both cases, banker-

directors seem to steer firms toward more conservative, less risky financial decisions, thereby limiting investments that drive long-term growth and innovation.

This tendency of banker-directors to be risk-averse, especially in firms with significant debt, aligns with findings by Dittman, Maug, and Schneider (2009), who also demonstrated that creditor-directors in Germany were more likely to avoid high-risk investments. In the U.S. context, the presence of enforcement actions exacerbates this dynamic, as banker-directors likely divert more attention to their banking obligations during these periods, leaving non-financial firms (NFFs) with more autonomy to pursue R&D investments. This suggests that distractions stemming from enforcement actions may, paradoxically, create opportunities for firms to increase innovation spending when bankers are less focused on firm governance.

3.6.2 Broader Implications for Corporate Governance and Innovation

Our findings contribute to the growing body of literature that emphasises the complexities of corporate governance structures, particularly the role of interlocking directors (Larcker et al., 2005; Mizruchi, 1996). While the presence of banker-directors provides valuable financial expertise and access to financing (Güner, Malmendier, & Tate, 2008), it also introduces potential conflicts of interest, particularly when it comes to strategic decisions like R&D that require balancing short-term financial performance with long-term growth potential. These conflicts of interest can undermine firm innovation, as documented by Kang and Kim (2017), who found that banker-directors on boards could negatively impact CEO's incentives to invest in R&D.

The trade-off between short-term financial gains and long-term innovation is particularly critical in high-tech and manufacturing sectors, where R&D is essential for sustaining competitive advantage (Thornhill, 2006). Despite the inherent risks, R&D investment offers significant long-term rewards. Studies like Sougiannis (1994) have shown that R&D investments can yield returns more than double their costs over time, underscoring the importance of sustained innovation. Our study supports these findings by showing that when banker-directors are distracted (due to enforcement actions), firms tend to increase their R&D spending, suggesting that corporate governance structures can either facilitate or inhibit long-term strategic investments depending on board composition.

3.6.3 Interaction Between Financial Crises, Regulatory Oversight, and Firm Behaviour

Our robustness checks, which excluded the 2007-2009 financial crisis years, further support the idea that external shocks to the financial system, such as enforcement actions, significantly influence banker-director's ability to engage with non-financial firms. This aligns with research on financial crises and corporate behaviours, which shows that periods of financial distress often lead to heightened regulatory scrutiny and a shift in focus for firms with significant financial ties (Pugachev & Schertler,

2021). The increased demands placed on banker-directors during such periods may reduce their capacity to influence non-financial firms, providing these firms with more freedom to pursue growth-oriented strategies, such as R&D investments.

The dynamic behaviours of enforcement-linked firms during these times also reflects the broader regulatory landscape post-Dodd-Frank. The Dodd-Frank Act introduced stricter regulations for financial institutions, which not only affected the governance of banks but also had spillover effects on non-financial firms through shared directors (Pugachev & Schertler, 2021). Our study contributes to this discussion by demonstrating how these regulatory pressures can indirectly benefit non-financial firms by reducing the oversight of conservative banker-directors, thus creating opportunities for increased R&D spending.

3.6.4 The Role of Financial Indicators in R&D Decisions

Our analysis also sheds light on the role of firm-specific financial characteristics in shaping R&D investment decisions. Consistent with prior studies (Hall, 2002; Czarnitzki & Kraft, 2004), we found that firms with higher liquidity and stronger growth prospects (as indicated by Tobin's Q) are more likely to engage in R&D investments. This suggests that financial flexibility is crucial for firms aiming to innovate, as it allows them to take on the inherent risks associated with R&D. Similarly, our findings on leverage and capital expenditures align with previous research that highlights the negative relationship between debt levels and R&D activity (O'Brien, 2003). Highly leveraged firms, constrained by their debt obligations, may shy away from risky investments like R&D, as they prioritize debt servicing over innovation.

3.6.5 Policy Implications and Future Research

The results of this study have important policy implications. As corporate governance reforms continue to evolve, understanding the role of banker-directors in shaping firm behaviour becomes increasingly important. Regulatory bodies and policymakers should be aware of the potential negative effects banker-directors can have on innovation, particularly in industries where R&D is a critical driver of long-term success. Encouraging board diversity or limiting the number of financial professionals on the boards of non-financial firms could be potential strategies to mitigate these adverse effects and promote more balanced decision-making.

In conclusion, this study enhances our understanding of the influence of banker-directors on R&D investment, particularly in the context of enforcement actions. Our findings confirm the significant role enforcement-linked banker-directors play in discouraging R&D investment, while also demonstrating how their distraction during enforcement periods can provide firms with opportunities to increase innovation spending. However, the relationship between corporate governance and innovation is

complex and warrants further research. Future studies could explore the long-term impact of reduced banker-director oversight on firm performance or investigate how different types of external shocks (beyond enforcement actions) influence board behaviours and innovation outcomes.

3.7 Conclusion

Banker-directors play a crucial role in corporate governance by overseeing the firm's financial performance, compliance with regulations, and risk management practices. Their influence on R&D investment decisions can be indirect but significant, as they may advocate for strategic alignment, accountability, and transparency in the firm's R&D initiatives. However, banker-directors often have a conservative risk appetite due to their background in banking and finance. This conservative approach may lead them to prioritise the projects that offer lower risk and more predictable returns over high-risk, high-reward opportunities. While this can mitigate financial risks, it may also limit the firm's innovation potential and long-term growth prospects. Hence, banker-directors can influence the firm's capital allocation decisions by discouraging investment in R&D projects that do not align with the company's long-term financial goals and growth strategy. Consequently, their involvement in budgeting and financial planning processes can shape the allocation of resources to R&D, either by increasing or decreasing the investment budget based on financial performance and priorities.

This paper studies the question of whether banker-directors are less favourable to R&D investment. While previous research by Ghosh (2016) shows that banker-directors may decrease the possibility of R&D investment in Indian manufacturing firms, there was an existing research gap regarding the validity of this relationship within US manufacturing. To address this gap, in this study, we employed a difference-in-differences approach using Enforcement Actions (EA) in a quasi-experimental setup to avoid endogeneity and sample selection bias.

Overall, this study provides robust evidence that the presence of banker-directors on the boards of manufacturing firms in the United States indeed discourages R&D investment. Our analysis shows that when banker-directors are distracted during enforcement action years, the likelihood of bank-linked manufacturing firms investing in R&D increases. This finding reinforces the notion that conflicts of interest associated with banker-director's dual roles as lenders and liabilities to the bank may dissuade firms from engaging in R&D activities (Kroszner and Strahan, 2001). Additionally, the high unpredictability and cost of R&D investments may negatively influence short-term performance, which may lead to a preference for short-term performance over long-term performance and return (Balkin et al., 2000; David et al., 2001; Han et al., 2015).

Our study also highlights the importance of controlling for time-specific factors in analysing the relationship between banker-directors and R&D investment probability. Our robustness tests with year-

fixed effects and different subsamples demonstrate that our main conclusion still holds, with a statistically significant positive effect of enforcement action years on R&D probability for the total sample.

We have also shed light on the broader landscape of factors influencing R&D investment decisions within manufacturing firms. Liquidity levels consistently emerged as a driving force, emphasising the pivotal role of financial stability in facilitating innovation. Market performance, as measured by Tobin's Q, demonstrated a strong and consistent positive influence on R&D investment, highlighting the synergy between market perception and innovation. The role of leverage in R&D decisions proved to be nuanced, with a negative impact on the likelihood of engagement in R&D activities. Capital expenditures (Capex) exhibited negative and significant relationships with R&D probability that were consistent across different sample groups. Finally, higher levels of Return on Assets (ROA) and solvency consistently correlated with decreased likelihoods of R&D engagement, raising questions about the intricate interplay between financial performance, solvency, and R&D strategy within firms.

In conclusion, our research not only confirms the substantial influence of enforcement-linked years on R&D investment but also unveils a complex web of factors that shape firm's R&D activities. These findings contribute to a deeper understanding of the intricate dynamics governing innovation in the corporate landscape. Discouraging research and development can have significant implications on various levels. R&D is crucial for innovation, which is essential for manufacturing firms to stay competitive in the market. If R&D efforts are discouraged, the company may fall behind competitors who invest more in innovation, leading to a loss of market share. Additionally, without ongoing R&D, a manufacturing firm may experience stagnation in its product offerings and processes. This can lead to outdated products, inefficient production methods, and, ultimately, declining profitability. Moreover, companies that do not invest in R&D may struggle to attract and retain top talent, especially innovative engineers, scientists, and researchers who are drawn to organisations where they can work on cutting-edge projects.

Nonetheless, the markets are dynamic, and consumer preferences can change rapidly. R&D helps companies adapt to these changes by developing new products and improving existing ones. Without a focus on R&D, a manufacturing firm may find it challenging to respond to market shifts effectively. Furthermore, failing to invest in research and development (R&D) can lead to a weakened competitive position. In such a scenario, competitors who continue to invest in R&D are likely to outpace and outperform a manufacturing firm that neglects these efforts. This can eventually result in the erosion of the company's competitive position and overall market standing.

On the other hand, stakeholders, including shareholders, employees, and customers, may become disillusioned if they observe that the company is not investing adequately in its future through R&D. Finally, while a banker-director may prioritise short-term financial metrics, neglecting R&D can affect the company's ability to secure financing in the future. Investors and lenders often consider a company's commitment to innovation a sign of its long-term viability and growth potential. In conclusion, discouraging R&D can have severe implications for a manufacturing firm's competitiveness, growth prospects, and overall sustainability. It is essential for boards to strike a balance between short-term financial considerations and long-term strategic investments in innovation and R&D. Policymakers and firms should be mindful of the potential adverse effects of banker-directors on corporate boards, particularly in industries where R&D investment is vital for long-term growth and innovation.

As we move forward, further research in this field is warranted to explore these relationships in more depth and within different economic contexts. Such knowledge can inform strategic decisions and policies aimed at promoting R&D investment and fostering innovation in the manufacturing industry and beyond. Ultimately, our study offers a valuable foundation for future research into the multifaceted nature of R&D investment decisions within the corporate world

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Chapter 4 The Role of Banker-Directors in ESG Performance: Insights from Enforcement Actions and Interlocking Directorships

4.1 Abstract

This study explores the relatively unexplored relationship between Corporate Social Responsibility (CSR) and the presence of banker-directors. Utilising a quasi-natural experimental design and a difference-in-differences methodology, we examine how banker-directors impact the Environmental, Social, and Governance (ESG) performance of non-financial firms (NFFs), especially during regulatory enforcement periods. Our analysis shows significant improvements in the overall ESG score and in each individual pillar, specifically Environmental, Social, and Governance, during these enforcement periods. These findings are robust across various cross-sectional analyses and robustness tests. However, the reduction in ESG controversies score during these times did not achieve statistical significance. Overall, these results suggest that while banker-directors are associated with notable changes in ESG scores, their presence does not advance CSR efforts and may even detract from ESG performance across certain dimensions.

Keywords: Director interlocks; Banker-directors; ESG; Environmental, Social, Governance Scores; Corporate Social Responsibility; Enforcement Actions; Spillover effect

4.2 Introduction

The role of banker-directors in influencing the Corporate Social Responsibility (CSR) investments of non-financial firms (NFFs) is both nuanced and impactful. Positioned at the intersection of finance and corporate governance, these directors leverage their expertise to shape CSR strategies, providing critical resources and strategic insights essential for effective CSR execution (Hasan et al., 2021). However, their involvement can also present challenges, particularly when firms face pressure to prioritize short-term financial outcomes over long-term CSR commitments (Balkin et al., 2000; David et al., 2001; Graham, Harvey, & Rajgopal, 2005; Han et al., 2015). This tension often stems from compensation structures that align banker-directors' interests with the firm's immediate financial health, potentially conflicting with the goals of sustainable CSR practices (Ayadi, Arbak, & Pieter De Groen, 2012).

The impact of banker-directors on CSR efforts is further complicated by their personal motivations and objectives. Research suggests that these directors may advocate for CSR initiatives primarily as a risk mitigation strategy, aligning CSR activities more closely with the interests of their affiliated banks rather than the broader stakeholder community (Hasan et al.,

2021). This approach, while potentially enhancing CSR investments, risks diverting focus towards short-term financial performance.

The broader discourse on the financial implications of CSR underscores the varying motivations driving firms' engagement in CSR activities (Davis, 1973; Aguilera et al., 2007; Lins, Servaes, & Tamayo, 2017). While some evidence points to a positive relationship between strong CSR practices and financial benefits, such as increased sustainability reporting among S&P 500 companies (Baron, 2001), other findings suggest that the impact of ESG policies on value creation may be minimal in the short term, with long-term benefits still subject to higher discount rates (Rojo-Suárez & Alonso-Conde, 2023).

Board diversity and expertise have also emerged as critical factors influencing CSR outcomes and the quality of Environmental, Social, and Governance (ESG) reporting (Harjoto, Laksmana, & Yang, 2019; Zhang, Zhu, & Ding, 2013). Research highlights the positive impact of diverse board compositions, particularly gender diversity, on ESG reporting quality and overall sustainability performance (Bravo & Reguera-Alvarado, 2018). Despite this, the specific relationship between CSR and banker-directors remains underexplored, a notable gap given that a significant proportion of S&P 500 firms have at least one banker-director on their boards (Hilscher & Şişli-Ciamarra, 2013).

Building on the existing literature, our research is motivated by the dual impact banker directors have on Corporate Social Responsibility (CSR) investments in NFFs. On one hand, these directors can significantly enhance CSR initiatives by leveraging their financial expertise and access to critical resources. Their expertise allows firms to navigate the complex landscape of CSR with greater precision, fostering long-term sustainability. However, there is also a downside; the tendency of banker directors to prioritize short-term financial performance, driven by compensation structures tied to immediate financial metrics, may undermine long-term CSR commitments. This dichotomy suggests that while banker directors can be instrumental in shaping CSR strategies, their influence may sometimes skew towards short-term gains at the expense of sustained ESG performance.

The literature on CSR has extensively explored various dimensions of corporate governance, yet the specific impact of banker directors remains under-examined. A notable exception is the study by Hasan et al. (2021), which highlighted the positive influence of affiliated bankers on CSR performance in U.S. companies. Their findings underscore the potential for banker directors to support CSR investments, especially when firms are financially robust and when the affiliated banks themselves are committed to CSR. However, this study is limited to banker directors who hold executive roles within banks, leaving a gap in understanding the broader influence of all banker directors, including independents.

The growing emphasis on Environmental, Social, and Governance (ESG) performance has prompted scholars and practitioners alike to scrutinise the role of board composition in driving sustainable corporate outcomes (Friede, Busch, and Bassen, 2015; Khan, Serafeim, and Yoon, 2016). While existing research demonstrates that financially sophisticated boards often mitigate downside risk and volatility (Masulis and Mobbs, 2011; Kang and Kim, 2017), relatively few studies examine how banker-directors, individuals serving on both financial and non-financial boards, shape ESG strategies when faced with external regulatory pressures. Building on this gap, the present chapter explores how enforcement actions function as a quasi-exogenous shock that temporarily diverts banker-directors' attention from ESG oversight. By incorporating these regulatory disruptions into the analysis, the study offers new insights into how dynamic shifts in governance focus can either hinder or foster ESG initiatives, extending previous work on static board composition (Dyck, Lins, Roth, and Wagner, 2019).

Unlike conventional analyses that treat ESG decision-making as a linear function of board expertise or firm-level characteristics (Lys, Naughton, and Wang, 2015), this chapter zeroes in on regulatory distractions in the form of enforcement actions to reveal how external governance shocks recalibrate banker-directors' influence on sustainability initiatives. Specifically, it posits that diminished banker director oversight during enforcement periods may allow for more proactive ESG investments, thereby enhancing the firm's social impact and stakeholder relations. This perspective enriches the broader literature on board interlocks and corporate responsibility by situating ESG performance within a framework of evolving regulatory demands (Krüger, 2015). Overall, the findings hold practical significance for both non-financial firms seeking to strengthen sustainability efforts and policymakers contemplating the implications of episodic regulatory scrutiny for corporate governance structures. Our study addresses this gap by broadening the scope to include all banker directors, regardless of their executive status, and by employing a Difference-in-Differences (DID) approach. This methodology, centered on enforcement actions as a quasi-natural experiment, allows for a more nuanced analysis of how banker directors impact ESG performance, particularly during periods when their attention is diverted to pressing responsibilities at their respective banks. By focusing on the years 2010 to 2021, our research provides a contemporary perspective, offering fresh insights that complement and extend the findings of earlier studies.

Moreover, our research challenges the assumption that banker directors uniformly enhance CSR efforts (Hasan et al., 2021). While their expertise can undoubtedly bolster CSR initiatives, there is also a legitimate concern that their short-termism tendencies, particularly in light of findings by Rojo-Suárez and Alonso-Conde (2023), could impede the long-term value creation associated with ESG policies. This potential conflict underscores the importance of

critically assessing the role of banker directors in shaping corporate strategies that balance immediate financial performance with sustainable, long-term growth.

This study explores the intricate relationships between banks, non-financial firms (NFFs), and corporate Environmental, Social, and Governance (ESG) practices by focusing on the influence of banker directors who hold concurrent positions on both financial and non-financial firm boards. Utilizing a comprehensive dataset that integrates board appointment records from BoardEx, enforcement action data from the Federal Reserve Bank and SNL Financial, and financial and ESG data from WRDS Compustat and Refinitiv ESG, we investigate how enforcement actions against banks influence the governance and ESG performance of the NFFs on whose boards these banker directors also serve.

The primary objective is to determine whether banker directors' increased focus on their banking responsibilities during enforcement years—when enforcement actions compel them to prioritize their roles in banks—affects the ESG outcomes of the NFFs they oversee. The study employs a difference-in-differences (DID) methodology to assess these impacts, with particular attention given to variations in ESG scores during enforcement-linked years.

Our final dataset, comprising 8,475 distinct NFFs across 51,250 firm-years, provided a robust foundation for analysis. We categorized 1,296 firms as bank-linked NFFs, with 273 of these further identified as enforcement-linked NFFs. These enforcement-linked firms spanned 1,139 firm-years. To complement this dataset, we incorporated ESG data from Refinitiv ESG Database, matching it with financial data from WRDS Compustat using a fuzzy name-matching algorithm and manual corrections.

Our findings reveal a significant and positive association between enforcement-linked years and the ESG scores of NFFs. Specifically, the analysis demonstrates that when banker directors are more preoccupied with their bank duties due to enforcement actions, the NFFs they govern tend to achieve higher ESG scores, ESG Combined Scores and in each individual pillar score, namely environmental, social and governance pillars. While our analysis shows a decrease in ESG scores during enforcement-linked years, the increase in ESG controversies (as reflected by a lower ESG Controversies score) did not achieve statistical significance.

The baseline results provide robust evidence that banker directors significantly influence the ESG performance of non-financial firms, particularly during enforcement-linked years. The Difference-in-Differences (DID) analysis reveals that non-financial firms experience a notable 4.5-point increase in ESG scores during periods when banker directors are more occupied with their responsibilities on bank boards due to enforcement actions. This improvement is statistically significant at the 1% level and is observed across all individual ESG pillars—

environmental, social, and governance. These findings suggest that reduced involvement of banker directors in the governance of non-financial firms, driven by their heightened focus on banking duties, coincides with enhanced ESG performance. This trend is also showing a decrease in the ESG Controversies score during these enforcement-linked years, reflecting fewer controversies. This suggests that non-financial firms might benefit from the risk-averse nature of banker-directors, who may mitigate risky activities, leading to a more conservative and stable governance approach during these periods.

Further analysis of the individual ESG pillars underscores the comprehensive nature of this positive impact. The environmental pillar shows significant improvement during enforcement-linked years, with firms demonstrating stronger environmental practices. Similarly, the social pillar benefits from the reduced presence of banker directors, as evidenced by enhanced social performance metrics. The governance pillar also sees a positive, albeit slightly less pronounced, effect, with significant improvements observed even after controlling for various firm-level factors. The consistency of these results across all three pillars suggests that the absence of active involvement by banker directors, when they are occupied with enforcement actions at their banks, allows for a more focused governance structure within non-financial firms that fosters better ESG outcomes.

Robustness tests further affirm the validity of these findings, highlighting the reliability of the observed relationships. A placebo test, which randomly assigns enforcement periods to check for spurious correlations, confirms that the results are not driven by random noise or other unobserved factors. Additionally, the analysis of heterogeneous treatment effects indicates that firm size does not drive the observed impact, as the positive effects of enforcement-linked years on ESG performance are consistent across both large-cap and small-cap firms. The exclusion of pandemic years from the analysis, along with visual inspections supporting the parallel trends assumption, reinforces the robustness of these findings. Together, these results strongly support the conclusion that enforcement-linked years are associated with significant and positive improvements in ESG performance for non-financial firms, driven by the reduced governance involvement of banker directors during these periods.

The study contributes to the existing literature by providing empirical evidence that the involvement of banker directors can have unintended negative effects on the ESG performance of NFFs. These findings suggest that the presence of banker directors may not always be beneficial for NFFs, particularly in terms of their sustainability performance, and that regulatory enforcement actions could indirectly foster improved ESG outcomes in these firms.

The literature on Corporate Social Responsibility (CSR) and Environmental, Social, and Governance (ESG) performance has long emphasised the importance of board composition in

shaping corporate outcomes. Studies such as those by Harjoto, Laksmana, and Yang (2019) and Bravo and Reguera-Alvarado (2018) highlight how diverse boards, particularly those with greater gender and educational diversity, tend to perform better in CSR and ESG initiatives. These findings align with the broader understanding that diversity within boards brings varied perspectives that enhance decision-making processes related to sustainability. However, the role of banker directors, as explored in this study, adds a new dimension to this discourse by revealing that these directors can sometimes exert a counterproductive influence on ESG performance, particularly when they are actively involved in the governance of non-financial firms (NFFs). This insight contributes to the ongoing debate on board composition by suggesting that the presence of banker directors may not universally benefit the sustainability performance of NFFs, challenging the assumption that all forms of board diversity are inherently advantageous for ESG outcomes.

The impact of banker directors on CSR and ESG performance has been relatively underexplored, with Hasan et al. (2021) being one of the first studies to delve into this area. This study portrays banker directors as advocates for CSR, leveraging their financial expertise to mitigate risks and promote sustainability. However, the findings presented here offer a different perspective, indicating that when banker directors are preoccupied with enforcement actions related to their banking duties, NFFs tend to achieve higher ESG scores. This suggests that the active involvement of banker directors may sometimes hinder, rather than help, the pursuit of long-term ESG goals. This contradiction with existing literature highlights the complexity of the banker-director role, suggesting that their focus on immediate financial performance could detract from their ability to contribute positively to ESG initiatives. This finding is crucial for understanding the dual impact of banker directors and suggests that their influence on CSR and ESG performance is contingent upon the specific contexts in which they operate.

Moreover, the study contributes to the literature by introducing the idea that regulatory enforcement actions can have an indirect but beneficial impact on the ESG performance of NFFs. This aligns with the broader discourse on the role of externalities in shaping corporate behaviour, as discussed in the works of Graham, Harvey, and Rajgopal (2005). Their study highlight how financial executives often prioritize short-term targets, sometimes to the detriment of long-term value creation. The findings here extend this argument by demonstrating that when banker directors are less involved due to regulatory enforcement, NFFs experience improvements in their ESG scores, particularly in the environmental, social, and governance pillars. This underscores the notion that external regulatory pressures can inadvertently create conditions that are more conducive to sustainable business practices, thereby contributing to the literature on the unintended positive consequences of regulatory interventions in corporate governance.

In light of this gap, our research presents a novel investigation into the role of banker-directors in shaping the ESG performance of non-financial firms. Utilizing a quasi-natural experimental design and a difference-in-differences methodology, we examine the impact of banker-directors during enforcement-linked years. Our findings reveal a significant positive effect on ESG scores, particularly within the environmental and governance pillars, during these periods. While the social pillar also shows positive impact, it achieves statistical significance only in the absence of control variables. Moreover, a reduction in ESG controversies score, though only statistically significant in the absence of control variables, suggests that banker-directors play a crucial role in influencing CSR decisions.

This study contributes to the growing body of literature by providing empirical evidence of the nuanced role banker-directors play in shaping CSR outcomes. It underscores the importance of considering the specific roles and affiliations of these directors within firms, as their impact on CSR and ESG performance may vary based on these factors.

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4.3 Literature Review: The Role of Corporate Social Responsibility (CSR) and Environmental, Social, and Governance (ESG) Performance

4.3.1 Definition and Evolution of CSR

Corporate Social Responsibility (CSR) encompasses a firm's proactive engagement with societal and environmental issues that extend beyond mere economic, technical, and legal obligations, aiming for broader societal benefits alongside traditional economic objectives (Davis, 1973, as cited in Aguilera et al., 2007). This evolving definition reflects ongoing debates regarding the financial benefits associated with CSR. The increasing corporate interest in CSR

and ESG is evidenced by a 2018 report from the Governance & Accountability Institute, which revealed that 86% of S&P 500 companies published sustainability or corporate responsibility reports, a significant increase from just under 20% in 2011 (www.ga-institute.com, n.d.). Recent empirical findings further confirm that investors actively reallocate funds based on sustainability metrics, with high-sustainability funds attracting greater capital inflows (Hartzmark & Sussman, 2019). This demonstrates the growing financial relevance of CSR beyond ethical considerations.

4.3.2 Theoretical Models and Empirical Evidence

4.3.2.1 Theoretical Models of CSR Involvement

Lins, Servaes, and Tamayo (2017) present a comprehensive theoretical model that explains the rising involvement of firms in CSR activities. Their model integrates organizational justice theories with corporate governance frameworks, elucidating the various stakeholder pressures driven by instrumental, relational, and moral factors. Understanding these motivations is crucial, given the substantial resources and attention corporations devote to CSR initiatives, underscoring the necessity for further empirical research and managerial insights. Additionally, Dyck et al. (2019) provide global evidence that institutional investors play a pivotal role in driving CSR engagement across firms, reinforcing the importance of investor-driven CSR strategies.

4.3.2.2 CSR and Financial Performance

Baron (2001) suggests that CSR expenditures can drive financial success through enhanced branding and reputation, positively influencing consumers, employees, investors, and other stakeholders. Empirical findings by Lins, Servaes, and Tamayo (2017) demonstrate that companies with high CSR intensity outperformed their peers during the 2008-2009 financial crisis by four to seven percentage points in stock returns. Additionally, these high-CSR firms exhibited superior profitability, growth, sales per employee, and higher debt levels.

Waddock and Graves (1997) identified a positive correlation between Corporate Social Performance (CSP) and both past and future financial performance. Their research indicates that companies with a history of strong financial performance are more likely to engage in socially responsible activities. Effective management of CSR initiatives is associated with improved financial performance over time.

Moreover, research shows that institutional investors avoid firms with poor ESG performance due to increased financial risk (Nofsinger, Sulaeman & Varma, 2019). Companies with weak CSR strategies are perceived as riskier investments, leading to lower market valuations. Further, Albuquerque, Koskinen, and Zhang (2019) provide theoretical and empirical evidence that CSR investments reduce a firm's systematic risk, contributing to long-term financial stability and resilience, particularly in industries like manufacturing that are exposed to environmental risks.

4.3.3 Board Composition and CSR/ESG Performance

4.3.3.1 The Impact of Board Diversity

The interplay between CSR and ESG performance has been a focus of extensive research, particularly regarding the role of board diversity. Hambrick and Mason's (1984) Upper Echelon Theory highlights how top management teams' cognitive and demographic attributes influence organizational performance. Milliken and Martins (1996) further emphasise that both observable and non-observable diversity factors shape organizational outcomes. Research by Bantel and Jackson (1989), Wiersema and Bantel (1992), and Carpenter (2002) supports a positive relationship between management diversity and innovation, strategic change, and financial performance.

Recent studies confirm these findings. Harjoto, Laksmana, and Yang (2019) highlight a positive association between board diversity (in terms of nationality and educational background) and Corporate Social Performance (CSP). Similarly, Yuan et al. (2020) demonstrate that companies adopting innovation-driven business strategies tend to integrate CSR more effectively, further supporting the case for diverse, strategically forward-thinking boards. Zhang, Zhu, and Ding (2013), Setó-Pamies (2013), and Jizi (2017) provide empirical evidence linking increased female board representation with enhanced CSR performance. These findings underscore the critical role of board composition in shaping corporate decisions related to environmental and social issues (Post, Rahman, & Rubow, 2011).

4.3.3.2 Gender Diversity and ESG Reporting

Research by Bravo and Reguera-Alvarado (2018) establishes a positive correlation between gender diversity in audit committees and the quality of voluntary ESG reporting. This diversity leads to more comprehensive and relevant reporting, prompting discussions on the impact of gender representation on boards. Crifo, Escrig-Olmedo, and Mottis (2018) identify a positive relationship between corporate sustainability and internal forces but a negative one with external forces, highlighting the importance of board training in sustainability issues. Kramer and Pfitzer (2022) argue that although many companies set ESG targets, few effectively integrate them into strategic decision-making, often leading to suboptimal sustainability outcomes.

4.3.3.3 Board Expertise and Sustainability Performance

Iliev and Roth (2023) argue that directors' sustainability knowledge significantly impacts their expertise, particularly in pivotal roles or during industry changes. Boards with sustainability knowledge improve a firm's Environmental and Social (E&S) performance by an average of 7.1%, accounting for 27.8% of variability in E&S performance. This improvement encompasses both environmental and social practices and involves evaluating trade-offs between sustainability and business aspects.

4.3.4 Banker-Directors and CSR/ESG Performance

4.3.4.1 Banker-Directors and CSR Initiatives

The impact of banker-directors on CSR initiatives has been less explored in the finance literature. Hasan et al. (2021) investigate this connection among U.S. firms, finding that banker-directors advocate for CSR initiatives as a strategic tool for risk reduction. This view is supported by Kang, Kim, and Liao (2020), who highlight the sensitivity of affiliated banker-directors to firms' risk-taking behaviour. However, our research reveals conflicting findings, with banker-directors sometimes decreasing ESG performance in non-financial firms. This discrepancy may arise from differences in definitions of banker-directors between studies.

Furthermore, empirical evidence from Nofsinger, Sulaeman, and Varma (2019) shows that institutional investors tend to avoid firms with weak ESG engagement, as these firms are perceived as financially riskier. This implies that banker-directors, often aligned with institutional investors' interests, may either promote CSR for financial resilience or deprioritize it when short-term financial performance is emphasized.

4.3.4.2 The Dual Impact of Banker-Directors

Banker-directors exert a dual impact on CSR investments in non-financial firms. Positively, their involvement often facilitates access to essential resources and provides valuable expertise for effective CSR initiatives. Conversely, their focus on short-term financial performance can undermine long-term CSR commitments, driven by compensation structures linked to immediate financial health (Ayadi, Arbak, & Pieter De Groen, 2012).

Graham, Harvey, and Rajgopal (2005) conducted a comprehensive survey of over 400 financial executives to gain insights into the factors influencing reported earnings and disclosure decisions. Their findings revealed a significant tendency among financial executives to prioritise short-term financial targets over long-term value creation. This aligns with the broader literature, where manufacturing firms, in particular, may struggle to balance ESG commitments with immediate performance metrics (Kramer & Pfitzer, 2022). Specifically, 79.9% of the surveyed executives indicated they would cut discretionary spending, including research and development (R&D), advertising, and maintenance, to meet earnings targets. Additionally, 55.3% stated they would delay the initiation of new projects for the same purpose, reflecting a strong preference for managing accounting metrics through economic actions that could have adverse long-term effects (Graham, Harvey, and Rajgopal, 2005). Their survey highlighted a preference among managers for taking economic actions with potential long-term drawbacks, such as cutting essential expenditures and delaying projects, rather than manipulating within-GAAP accounting choices to manage earnings. This behaviour underscores a broader trend of prioritising

immediate financial performance, often at the expense of strategic investments and sustainable growth.

4.3.4.3 Research Gaps and Future Directions

Despite extensive research on Corporate Social Responsibility (CSR), only Hasan et al. (2021) have examined the influence of banker-directors on CSR in U.S. firms, indicating a need for further study. Their research highlights that the presence of affiliated bankers has a positive impact on CSR performance, especially when banks demonstrate a strong CSR orientation. However, Rojo-Suárez and Alonso-Conde (2023) suggest that Environmental, Social, and Governance (ESG) policies have a limited short-term impact on value creation, which may influence banker-directors to be sceptical of ESG investments due to their short-term perspective. Therefore, our study aims to research these conflicting ideas further by using a Difference-in-Differences (DID) approach and focusing on the years 2010 to 2021 to provide a contemporary perspective on the impact of banker-directors on ESG performance.

4.3.5 Hypothesis

Based on the reviewed literature, we propose the following hypothesis:

H1: Non-financial firms with enforcement-linked banker-directors achieve higher ESG scores than other non-financial firms.

This structured review consolidates existing research and highlights the need for continued exploration into the impact of banker-directors on CSR and ESG performance.

4.4 Data and Methodology

The study started by sourcing data from the BoardEx universe, an extensive database containing information on company directors. We focused on analysing board appointment records between 2010 and 2021, specifically identifying directors who concurrently held positions within both financial institutions and non-financial firms.

To refine our sample further, we integrated enforcement action data obtained from the Federal Reserve Bank and SNL Financial into the existing BoardEx dataset. This integration facilitated the identification of "enforcement-linked" non-financial firms (companies with directors experiencing enforcement actions) whose directors also held positions within financial institutions. Subsequently, we identified "bank-linked NFF" firms—non-financial firms linked to banks through shared directors. This data was merged with financial data from Compustat to construct a comprehensive dataset encompassing director, company, and year-specific information for each firm.

This study assembles a comprehensive dataset integrating firm-level financial metrics, ESG performance indicators, and regulatory enforcement records, thereby allowing an in-depth exploration of how banker-directors influence sustainability outcomes under varying governance pressures. In line with prior research on corporate social responsibility (Friede, Busch, and Bassen, 2015; Dyck et al., 2019), we derive ESG data from a publicly available database of Refinitiv ESG. The firm selection focuses on publicly listed, non-financial entities with at least one board member possessing current or prior banking experience, as identified through a combination of BoardEx, SEC filings, and institutional disclosures. We further restrict the sample to firms for which we can reliably link banker-directors to enforcement actions within a 2010–2021 observation window. This approach captures both the post-financial crisis regulatory climate (Acharya and Ryan, 2016) and the increasing standardisation of ESG reporting, ensuring robust pre- and post-treatment data for a difference-in-differences design. Exclusions encompass companies lacking ESG reporting or undergoing major M&A events that might complicate genuine changes in sustainability strategies.

Banker-directors are operationally defined as individuals serving in executive or non-executive capacities at commercial or investment banks. The identification process references multiple data sources to confirm a director's banking affiliations. Key control variables include firm size (Log Assets), sector-level R&D intensity, and leverage ratios, all of which have been shown to influence corporate policies and ESG decisions (Lys, Naughton, and Wang, 2015). Finally, we employ industry and year-fixed effects to account for unobserved heterogeneity and macro-level shocks, reinforcing the internal validity of our causal inferences regarding banker-directors' role in shaping ESG performance.

The final dataset shown in Table 4.1 and Table 4.2 comprised 8,475 distinct non-financial firms, spanning 51,250 firm-years. Among these, 1,296 were identified as bank-linked NFF firms, with 273 of these further categorised as enforcement-linked NFF firms. The latter subset—enforcement-linked NFF firms—accounted for a total of 1,139 firm-years.

Table 4-1:Non-Financial Firms (NFFs) by Bank Association (2010–2021)

Category	**Not Linked to Banks (0)**	**Linked to Banks (1)**	**Total**
Number of Firms	7,179	1,296	8,475
Firm-Years	45,098	6,152	51,250

Note: This table shows the distribution of Non-Financial Firms (NFFs) by their association with banks. '0' represents firms not linked to banks, and '1' represents firms linked to banks. The table provides the number of firms and the aggregate firm-years from 2010 to 2021.

Table 4-2:Enforcement-Linked Years by Bank-Linked Years (2010–2021)

Category	Not Linked to Enforced Banks (0)	Linked to Enforced Banks (1)	Total
Number of Firms	1,023	273	1,296
Firm-Years	5,013	1,139	6,152

Note: This table describes the distribution of enforcement-linked years relative to bank-linked years for Non-Financial Firms. The '0' category indicates firm-years unlinked to enforced banks, while '1' represents firm-years linked to enforced banks. The data covers the period from 2010 to 2021.

To match the financial dataset, Environmental, Social, and Governance (ESG) data spanning the years 2010 to 2021 was sourced from the Refinitiv ESG Database. An algorithm leveraging fuzzy name matching was utilised to merge this ESG data with company financials retrieved from the WRDS Compustat database. Instances where name matching encountered difficulties due to minor naming differences, were manually corrected by assigning company identifier GVKEYs.

This comprehensive dataset, combining directorship information, enforcement actions, financials, and ESG data, offers a robust foundation for our subsequent analyses and insights into the relationships between financial institutions, non-financial firms, enforcement actions, and corporate practices related to ESG.

4.4.1 Model Selection

The research employs a difference-in-differences model to estimate the relationship between various ESG scores of non-financial companies and explanatory variables. The model examines the impact of enforcement-linked along with financial and performance-related factors from the previous year on the ESG scores.

$$\text{ESG Score}_{ij,t} = \beta_0 + \beta_1(\text{Enforcement} - \text{linked years})_{i,t} + \beta_2(\text{Sales})_{ij,t-1} + \beta_3(\text{Liquidity})_{ij,t-1} + \beta_4(\text{Tobin's Q})_{ij,t-1} + \beta_5(\text{Leverage})_{ij,t-1} + \beta_6(\text{Capex})_{ij,t-1} + \beta_7(\text{ROA})_{ij,t-1} + \beta_8(\text{Solvency})_{ij,t-1} + \text{q}_j + \varepsilon_{i,jt} \quad (1)$$

Where:

The dependent variable, denoted as the ESG Score, signifies an evaluative metric assessing a company's Environmental, Social, and Governance (ESG) performance. This metric relies on verifiable, publicly reported data pertaining to firm 'i' within industry 'j' during time 't'. Conversely, the Enforcement-linked years variable represents an interaction term discerning

whether firm 'i' in year 't' has a board member with ties to enforcement actions. The coefficients β_0 to β_8 in the model signify the influence of various factors on the ESG score. Specifically, Enforcement-linked years stand for the impact of years associated with enforcement actions on the ESG performance of the respective company at a given time 't'.

Several key financial indicators constitute the independent variables: Sales, indicating the prior-year (t-1) revenue generated by company i in industry j, serving as a fundamental gauge of its financial performance. Liquidity at time 't-1' gauges the company's ability to fulfil short-term financial obligations, typically assessed through metrics involving current assets and liabilities. Tobin's Q, measured at time 't-1', juxtaposes a company's market value against its replacement cost, offering insights into the efficiency of its investments and asset management practices. Leverage at time 't-1' delineates the extent of debt financing employed by the company, thereby reflecting its financial risk appetite and leverage strategy. Furthermore, Capex (Capital Expenditures) at time 't-1' captures the company's investments in long-term assets, critical for supporting growth and operational activities. ROA (Return on Assets) at the time 't-1' appraises the company's profitability by assessing its earnings generation concerning total assets, thereby indicating operational efficiency and asset utilisation. Solvency at time 't-1' evaluates the company's capacity to meet its long-term financial obligations. The variable q_j represents additional fixed effects or control variables not explicitly specified within the model. The variable $\mathcal{E}_{i,jt}$ encapsulates the error term in the model, encompassing unobserved factors that influence the ESG score but are not accounted for by the included variables. This comprehensive framework facilitates the assessment of ESG performance while considering a range of financial indicators and contextual variables.

4.4.2 Definition of ESG Scores

4.4.2.1 ESG Score

The ESG score is derived from a detailed assessment of a company's performance in environmental, social, and governance aspects, using 186 key metrics across 10 categories. These categories are rolled up into three pillar scores—Environmental, Social, and Governance—reflecting the company's overall ESG commitment and effectiveness based on industry-specific criteria.

4.4.2.2 Environmental Pillar Score

The Environmental pillar measures a company's impact on the environment through categories like Emissions, Innovation, and Resource Use. Themes include greenhouse gas emissions, waste management, biodiversity, product innovation, water and energy use, and sustainable practices in the supply chain.

4.4.2.3 Social Pillar Score

The Social pillar evaluates a company's responsibility towards its workforce, community, and consumers. Key categories include Community, Human Rights, Product Responsibility, and Workforce, covering themes like diversity, working conditions, health and safety, product quality, and data privacy.

4.4.2.4 Governance Pillar Score

The Governance pillar assesses a company's corporate governance practices, including CSR strategy, management structure, and shareholder rights. Categories focus on the structure and diversity of management, executive compensation, transparency in ESG reporting, and mechanisms to protect shareholder interests.

4.4.2.5 ESGC Score

The ESGC score combines the ESG score with an overlay of ESG controversies, adjusting the score based on the impact of significant negative media coverage. If a company faces controversies, the ESGC score reflects this by reducing the overall score based on the severity and relevance of these events.

4.4.2.6 ESG Controversies Score

The ESG Controversies score specifically indicates companies that have been penalised due to significant scandals or negative events. This score is based on 23 specific topics. It impacts the overall ESGC score and may continue to have an effect in future periods if the controversies persist or change. The score ranges from 0 to 100, where a score of 100 means no controversies, and a lower score means more controversies.

4.4.3 Summary Statistics and Pearson Correlation

The summary statistics can be found in Table 4.3. The ESG (Environmental, Social, Governance) scores demonstrate considerable variability across the assessed companies. The mean ESG score is 36.970, with a standard deviation of 19.195, indicating a noteworthy dispersion in the extent of environmental, social, and governance practices among the entities. These scores range widely, from a minimum of 0.440 to a maximum of 93.472. Additionally, the combined ESG score exhibits a mean of 35.727, reflecting a similar degree of dispersion, spanning from 0.440 to 92.542.

Within the individual pillars of ESG assessment, the Environmental Pillar Score displays a mean of 21.134 and a substantial standard deviation of 26.088. The Social Pillar Score registers a mean of 39.527, while the Governance Pillar Score presents a higher mean of 45.833, signifying relatively stronger governance performance among the evaluated entities. Notably, the ESG Controversies Score reveals a mean of 91.974, suggesting a low level of controversies or incidents within the entities studied.

Furthermore, financial metrics such as Capex, Leverage, Liquidity, ROA (Return on Assets), Sales, Solvency, and Tobin's Q demonstrate varying central tendencies and degrees of dispersion. For instance, Capex exhibits a low mean of 0.039 and Leverage shows a mean of 0.307 with relatively higher standard deviations of 0.042 and 0.252, respectively, implying wider fluctuations in these financial measures.

ROA, on the other hand, depicts a negative mean 0.026 and considerable variability with a standard deviation of 0.231, implying diverse performance levels among the companies in generating profits from their assets. Meanwhile, Tobin's Q displays a mean of 2.665, indicating a relatively high market value compared to the book value of assets, with a substantial standard deviation of 2.401, suggesting considerable dispersion in market valuation across the entities.

The Variance Inflation Factor (VIF) results, reported in Appendix Table 5.4, provide a robustness check for potential multicollinearity in the model. Key variables such as Sales, ROA, Liquidity, and Leverage exhibit VIF values ranging from 1.034 to 1.695, all comfortably below the commonly accepted threshold of 5. This suggests that multicollinearity is not a significant concern in this analysis, as the independent variables do not display high correlations with each other. The mean VIF of 1.304 further supports the stability and reliability of the regression estimates.

Table 4-3:Panel A Summary statistics

Variable Names	N	Mean	SD	Min	p25	Median	p75	Max
ESG score	5286	36.970	19.195	0.440	22.219	32.952	49.129	93.472
ESG Combined Score	5286	35.727	17.768	0.440	22.005	32.579	47.058	92.542
ESG Controversies Score	5286	91.974	21.574	1.613	100	100	100	100
Environmental Pillar Score	5286	21.134	26.088	0	0	7.825	37.167	98.546
Social Pillar Score	5286	39.527	20.960	0.611	23.029	36.173	52.921	97.702
Governance Pillar Score	5286	45.833	22.325	0.166	27.636	45.708	63.322	99.428
Capex	5286	0.039	0.042	0	0.013	0.026	0.050	0.461
Leverage	5286	0.307	0.252	0	0.127	0.270	0.431	2.261
Liquidity	5286	0.446	0.232	0.011	0.262	0.429	0.608	1
ROA	5286	0.026	0.231	-3.924	0.009	0.070	0.120	0.357
Sales	5286	7.033	2.117	-3.219	5.934	7.275	8.379	10.722
Solvency	5286	0.008	0.169	-1.196	0.001	0.005	0.014	0.623
Tobin’s Q	5286	2.665	2.401	0.461	1.331	1.885	3.079	29.247

Note: Summary statistics for key variables in a sample of 8,475 non-financial firms between 2010 and 2021. ESG Score: Evaluates a company's Environmental, Social, and Governance (ESG) performance using publicly reported verifiable data. ESG Combined Score: Integrates ESG score with ESG controversies, assessing a company's sustainability impact and conduct by considering 23 ESG controversy topics. Any involvement in scandals during the year results in penalties affecting the overall ESGC score. Environmental Pillar Score: Assesses a company's performance in Resource use, Emissions, and Innovation. Social Pillar Score: Evaluates a company's performance in Workforce, Human Rights, Community, and Product Responsibility. Governance Pillar Score: Analyses a company's Management, Shareholders, and Corporate Social Responsibility (CSR) strategy. Capex (Capital Expenditures): Represents a company's investment in long-term assets to support growth and operations. Leverage: Indicates the extent to which a company uses debt financing, reflecting its financial risk and leverage strategy. Liquidity: Measures a company's ability to meet short-term financial obligations, often assessed using metrics like current assets and liabilities. ROA (Return on Assets): Measures a company's profitability by evaluating its earnings generation from total assets, indicating operational efficiency and asset utilization. Sales: Represents the total revenue generated by a company from its primary business operations, serving as a key indicator of its financial performance. Solvency: Indicates a company's ability to meet long-term financial obligations. Tobin’s Q: Compares a company's market value to its replacement cost, providing insight into the efficiency of its investments and assets.

The pairwise correlation matrix in the Table 4.4 provides an overview of the relationships between key variables in the model, including ESG score, Sales, Liquidity, Tobin's Q, Leverage, Capex, ROA, and Solvency. Several notable patterns emerge from these correlations.

The ESG score exhibits a strong positive correlation with Sales (0.558, significant at the 1% level), suggesting that firms with higher sales tend to achieve better ESG performance. In contrast, ESG score is negatively correlated with Liquidity (-0.100, significant at the 1% level), indicating that firms with higher liquidity may prioritize financial flexibility over ESG-related initiatives. This result could reflect the trade-off between liquidity management and long-term investments in ESG-related projects.

Sales also displays important relationships with other variables. Notably, Sales is positively correlated with ROA (0.512, significant at the 1% level), indicating that more profitable firms tend to generate higher sales. Conversely, Sales shows a negative correlation with Tobin's Q (-0.378, significant at the 1% level), suggesting that firms with higher market valuations relative to their replacement costs tend to have lower sales. This inverse relationship may reflect the market's valuation of growth opportunities, which are not necessarily captured by current sales figures.

Liquidity is negatively correlated with Tobin's Q (-0.263, significant at the 1% level), reinforcing the notion that firms with greater liquidity may not be aggressively pursuing investment opportunities that enhance market valuation. Liquidity also has a significant negative correlation with Capex (-0.294, significant at the 1% level), suggesting that firms holding higher liquidity reserves may engage in fewer capital expenditures, potentially indicating a more conservative investment strategy.

Tobin’s Q exhibits a strong negative correlation with ROA (-0.739, significant at the 1% level), indicating that firms with higher market valuations relative to their assets tend to have lower current profitability. This could reflect the market's forward-looking expectations for growth, particularly for firms with high Tobin’s Q ratios. Moreover, Leverage shows a positive correlation with Tobin's Q (0.219, significant at the 1% level), implying that firms with higher market valuation relative to assets are more likely to rely on debt financing.

Leverage is negatively correlated with Liquidity (-0.150, significant at the 1% level), suggesting that highly leveraged firms tend to maintain lower levels of liquid assets. This inverse relationship is consistent with the notion that firms with high debt burdens may have reduced

financial flexibility. Additionally, Leverage exhibits a negative relationship with ROA (-0.258, significant at the 1% level), indicating that firms with higher debt tend to be less profitable.

ROA, in turn, is positively correlated with ESG score (0.223, significant at the 1% level), highlighting that more profitable firms tend to have better ESG performance. This could indicate that firms with stronger financial performance are better positioned to invest in ESG initiatives. Lastly, Solvency shows positive correlations with Sales (0.246, significant at the 1% level) and ROA (0.162, significant at the 1% level), suggesting that firms with stronger solvency metrics tend to have higher sales and profitability.

Table 4-4:Panel B Pairwise correlations

Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
(1) ESG score	1.000							
(2) Sales	0.558***	1.000						
(3) Liquidity	-0.100***	-0.263***	1.000					
(4) Tobin's Q	-0.017	-0.378***	0.185***	1.000				
(5) Leverage	0.025*	-0.060***	-0.150***	0.219***	1.000			
(6) Capex	-0.036***	0.005	-0.294***	-0.022***	0.006	1.000		
(7) ROA	0.223***	0.512***	-0.193***	-0.739***	-0.258***	0.006	1.000	
(8) Solvency	0.048***	0.246***	-0.082***	-0.058***	0.025***	0.019***	0.162***	1.000

*** *p<0.01, ** p<0.05, * p<0.1*

Note: The ESG Score is derived from a detailed assessment of a company's performance in environmental, social, and governance aspects, using 186 key metrics across 10 categories. These categories are aggregated into three pillar scores—Environmental, Social, and Governance—reflecting the company's overall ESG commitment and effectiveness based on industry-specific criteria. Sales represents the logarithm of total revenue generated by the company from its primary business operations. Liquidity is calculated as the ratio of current assets to total assets (act/at), indicating the company's ability to meet short-term financial obligations. Tobin's Q is a financial ratio comparing the market value of a company's assets to their replacement cost, calculated as ((prcc_f × csho) + at - ceq) / at. Leverage is the ratio of total debt to total assets (dt/at), reflecting the company's reliance on debt financing. Capex represents capital expenditures relative to total assets (capx/at), showing the company's investment in physical assets. ROA (Return on Assets) measures operating income after depreciation relative to total assets (oiadp/at). Solvency is calculated as earnings before interest and taxes relative to interest and related expenses (ebit/xint) divided by 1000, reflecting the company's ability to meet long-term financial obligations.

4.5 Baseline Results

4.5.1 The Impact of Banker Directors on ESG Scores

Our baseline Difference-in-Differences (DID) analysis, as detailed in Table 4.5, explores the influence of banker directors on the Environmental, Social, and Governance (ESG) scores of non-financial firms (NFFs). The results indicate a significant increase in ESG scores during years when banker directors' attention shifts towards their responsibilities on bank boards due to enforcement actions. Specifically, the analysis reveals that, on average, NFFs experience a 4.5-point higher ESG score during enforcement-linked years compared to non-enforcement years, with statistical significance at the 1% level.

Table 4.5 provides a comprehensive overview, with the dependent variable being the ESG score—a continuous measure ranging from 0 to 100, where higher scores indicate stronger ESG performance. The ESG score is derived from an in-depth evaluation of a company's environmental, social, and governance practices, based on 186 key metrics across 10 categories. These categories are aggregated into three pillar scores—Environmental, Social, and Governance—reflecting the firm's overall ESG commitment based on industry-specific benchmarks.

The key variable of interest is enforcement-linked years, defined as periods when banker directors are more engaged with their bank boards due to enforcement actions. During these periods, banker directors attend more bank board meetings, consequently reducing their involvement in the governance of non-financial firms.

In Column 1 of Table 4.5, the coefficient on enforcement-linked years is positive and highly significant at the 1% level, suggesting that when banker directors focus more on their bank-related duties, the ESG performance of the non-financial firms they oversee improves. This finding remains robust across various model specifications.

Column 2 introduces additional firm-level controls such as Sales, Liquidity, Tobin's Q, Leverage, Capex, ROA, and Solvency. Even after controlling for these factors, the coefficient on enforcement-linked years remains positive and statistically significant at the 1% level. Among the control variables, Sales are positively associated with ESG scores at the 1% significance level, while Tobin's Q shows a positive but statistically insignificant association. Both models include year-fixed and industry-fixed effects, ensuring the robustness of the results

Table 4-5:Baseline Results – ESG Score

		(1)	(2)
Variable Names	**Expected Sign**	**ESG Score**	**ESG Score**
Enforcement-linked years	+	12.7366***	4.4751***
		(1.2261)	(0.9751)
Sales	-		7.3339***
			(0.1419)
Liquidity	+		1.912
			(1.2048)
Tobin's Q	+		0.1378
			(0.0886)
Leverage	-		-1.4288*
			(0.8676)
Capex	-		-14.4244***
			(5.5684)
ROA	+		-9.4776***
			(1.0368)
Solvency	-		-6.9467***
			(1.1374)
Constant		32.702***	-21.5695***
		(1.2842)	(1.6725)
Observations		5286	5286
R-squared		0.0404	0.409
Rho		0.4358	0.466
Industry FE		YES	YES
Year FE		YES	YES

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1

Note: This table presents the regression estimates within a Difference-in-Difference (DID) framework, examining the impact of enforcement actions on the ESG score of non-financial firms linked to banks through a director. The variable "enforcement action years" represents an interaction term combining the post-enforcement period with the treatment group, comprising enforced-bank-linked non-financial firms (NFFs). The dependent variable is the ESG score, and it is a continuous variable ranging from 0 to 100, where 0 indicates low ESG effort, and 100 indicates high ESG performance. The ESG score is derived from a detailed assessment of a company's performance in environmental, social, and governance aspects, using 186 key metrics across 10 categories. These categories are rolled up into three pillar scores—Environmental, Social, and Governance—reflecting the company's overall ESG commitment and effectiveness based on industry-specific criteria. The table is structured into two columns. Column 1 displays estimates using the ESG score as the dependent variables without control variables, while Column 2 incorporates control variables. The analysis accounts for several explanatory variables, including Sales Growth, which is the percentage change in sales income over a specific time period stated in logarithmic form; Sales, the natural logarithm of a company's total sales revenue in a particular year; Liquidity, which is the ratio of a company's current assets to total assets and reflects its capacity to satisfy short-term financial commitments; Tobin's Q, a measure of a company's market worth in relation to its total assets; Leverage, the ratio of a company's total debt to total assets, indicating how much it relies on debt financing; Capex, the ratio of a business's capital expenditures to total assets, representing the firm's investment in new capital assets compared to total assets; ROA, which evaluates a company's capacity to generate profits from its assets, and is the ratio of its operating income after depreciation to its total assets; and Solvency, defined as the ratio of a company's earnings before interest and taxes to its interest and related expenditures, assessing the company's ability to make interest payments.

4.5.2 Analysis of Combined ESG Score and individual ESG Pillars

In this section, we explore how banker-directors influence Combined ESG score and each pillar of Environmental, Social, and Governance (ESG) performance, with a particular focus on periods linked to regulatory enforcement. By examining the Environmental, Social, and Governance pillars separately, as well as the composite ESG scores and controversies, we gain a nuanced view of how these risk-averse directors shape sustainable practices in non-financial firms.

4.5.2.1 Combined ESG Performance

Our initial focus is the ESG Combined (ESGC) Score, which incorporates both raw ESG ratings and adjustments for controversies. As shown in Table 4.6, the coefficient on enforcement-linked years is positive and highly significant at the 1% level, and it remains robust after controlling for firm-level characteristics. This improvement in the ESGC score suggests that when banker-directors are preoccupied with their banking obligations, non-financial firms appear to prioritise or maintain broad ESG initiatives. Notably, the positive relationship persists even though the ESG Controversies component itself decreases, implying that in the absence of risk-averse banker-directors, some firms might engage in slightly riskier activities yet still sustain an overall strong ESG performance. These findings align with the premise that banker-directors typically serve as a conservative force but that their temporary distraction can open the door for more proactive ESG investments.

4.5.2.2 Environmental Pillar

Turning to the Environmental Pillar, Table 4.7 reports that enforcement-linked years correlate with a statistically significant enhancement in environmental performance. This outcome indicates that firms seize the opportunity to address environmental objectives more aggressively when banker-directors, who are typically conservative about ventures with uncertain returns, are focused on regulatory compliance elsewhere. Given that many environmental investments (e.g., emissions-reduction technologies) entail long payback periods and uncertain outcomes, the diminished oversight from risk-averse directors may ease capital allocation to these projects.

4.5.2.3 Social Pillar

For the Social Pillar, Table 4.8 similarly shows a positive and highly significant coefficient on enforcement-linked years, underscoring that firms experience notable improvements in

socially oriented programs during these periods. This pattern suggests that, although banker-directors may provide valuable financial discipline, their tendency toward risk aversion can curtail certain long-horizon or stakeholder-focused initiatives. When banker-directors are diverted by enforcement demands, corporate leaders potentially gain more latitude to invest in community development, employee well-being, and other socially beneficial projects. Overall, the evidence reinforces the notion that the conservative stance of banker-directors can moderate the firm's willingness to engage in broad, socially oriented endeavours.

4.5.2.4 Governance Pillar

Table 4.9 focuses on the Governance Pillar. The coefficient on enforcement-linked years is positive and significant at the 1% level in the baseline specification, and it remains significant (albeit at the 10% level) once additional controls are introduced. The sustained, although slightly weaker, significance indicates that regulatory distractions still correlate with improvements in governance structures, such as board independence, audit procedures, or shareholder rights, though the magnitude of this relationship may be more sensitive to firm-level characteristics. One interpretation is that banker directors often enforce tight governance to protect creditor interests, but when their attention is diverted, management may implement changes that strengthen governance from a broader stakeholder perspective.

4.5.2.5 ESG Controversies and Risk-Taking Behaviours

Lastly, Table 4.10 examines ESG Controversies, providing insight into whether improved ESG scores come at the cost of increased reputational or operational risk. In the absence of firm-level controls, enforcement-linked years are associated with a negative and highly significant coefficient, indicating a rise in controversies. However, when controls are introduced, the effect loses significance, suggesting that firm-specific traits partially mediate the relationship. One plausible explanation is that, once banker-directors are less engaged, some firms might pursue riskier projects that yield higher ESG ratings in certain dimensions but also increase the potential for missteps or controversies. In other words, while the short-term absence of strict financial scrutiny can foster innovation and social investment, it may also elevate the firm's exposure to ESG-related challenges if not managed carefully.

4.5.2.6 Synthesis and Implications

Overall, these findings align with the hypothesis that enforcement actions function as an exogenous shock reducing banker-directors' influence, thereby creating a window for firms to

pursue more aggressive ESG strategies. The environmental, social, and governance pillars each exhibit positive reactions during enforcement-linked years, pointing to a broad-based impact on sustainability efforts. However, the mixed evidence on controversies underscores a nuanced trade-off: although ESG scores improve, some aspects of risk-taking (e.g., controversies) may simultaneously escalate, particularly when directorial oversight wanes. Once firm-level controls are factored in, the significance of controversies diminishes, suggesting that firm-specific policies or corporate cultures may either amplify or mute the risks tied to a more aggressive ESG posture.

In sum, the ESG performance of non-financial firms improves in aggregate during enforcement-linked periods, especially across individual pillars of environmental responsibility, social engagement, and governance practices. At the same time, the heightened propensity for ESG controversies highlights the complexity of balancing innovation and risk management when banker-directors are temporarily sidelined. From a policy perspective, these results indicate that while conservative financial oversight can mitigate reputational and operational risks, an overly cautious board dynamic may also stifle sustainability initiatives. Therefore, understanding how and when regulatory enforcement diverts banker-directors can offer valuable insights for corporate leaders, regulators, and investors aiming to optimise governance structures for robust ESG performance.

Table 4-6:Baseline Results – ESG Combined Score

Variable Names	Expected Sign	(1) ESGC Score	(2) ESGC Score
Enforcement-linked years	+	10.521***	3.3979***
		(1.1518)	(0.9584)
Sales	+		6.2576***
			(0.1395)
Liquidity	+		0.2675
			(1.1842)
Tobin's Q	+		0.1481*
			(0.0871)
Leverage	-		-1.4153*
			(0.8528)
Capex	-		-13.8069**
			(5.4731)
ROA	+		-7.0756***
			(1.0191)
Solvency	-		-5.8978***
			(1.118)
Constant		30.6317***	-15.0821***
		(1.2064)	(1.6439)
Observations		5286	5286
R-squared		0.04	0.3528
Rho		0.4352	0.4499
Industry FE		YES	YES
Year FE		YES	YES

Standard errors are in parentheses

*** p<.01, ** p<.05, * p<.1

Note: This table presents the regression estimates within a Difference-in-Difference (DID) framework, examining the impact of enforcement actions on the ESG Combined score of non-financial firms linked to banks through a director. The variable "enforcement action years" represents an interaction term combining the post-enforcement period with the treatment group, comprising enforced-bank-linked non-financial firms (NFFs). The dependent variable is the ESGC score, and it is a continuous variable ranging from 0 to 100, where 0 indicates low ESG effort, and 100 indicates high ESG performance. The ESGC score combines the ESG score with an overlay of ESG controversies, adjusting the score based on the impact of significant negative media coverage. If a company faces controversies, the ESGC score reflects this by reducing the overall score based on the severity and relevance of these events.
The table is structured into two columns. Column 1 displays estimates using the ESGC score as the dependent variables without control variables, while Column 2 incorporates control variables. The analysis accounts for several explanatory variables, including Sales Growth, which is the percentage change in sales income over a specific time period stated in logarithmic form; Sales, the natural logarithm of a company's total sales revenue in a particular year; Liquidity, which is the ratio of a company's current assets to total assets and reflects its capacity to satisfy short-term financial commitments; Tobin's Q, a measure of a company's market worth in relation to its total assets; Leverage, the ratio of a company's total debt to total assets, indicating how much it relies on debt financing; Capex, the ratio of a business's capital expenditures to total assets, representing the firm's investment in new capital assets compared to total assets; ROA, which evaluates a company's capacity to generate profits from its assets, and is the ratio of its operating income after depreciation to its total assets; and Solvency, defined as the ratio of a company's earnings before interest and taxes to its interest and related expenditures, assessing the company's ability to make interest payments.

Table 4-7:Baseline Results – Environmental Pillar Score

Variable Names	Expected Sign	(1) Environmental Pillar Score	(2) Environmental Pillar Score
Enforcement-linked years	+	19.8575***	9.3732***
		(1.6087)	(1.2996)
Sales	+		9.5138***
			(0.1892)
Liquidity	+		0.9568
			(1.6058)
Tobin's Q	+		0.2729**
			(0.1181)
Leverage	-		-3.7373***
			(1.1564)
Capex	-		-11.0611
			(7.4215)
ROA	+		-16.1461***
			(1.3819)
Solvency	-		-6.0788***
			(1.516)
Constant		17.131***	-52.4787***
		(1.685)	(2.2291)
Observations		5286	5286
R-squared		0.0471	0.3945
Rho		0.4256	0.4599
Industry FE		YES	YES
Year FE		YES	YES

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1

Note: This table presents the regression estimates within a Difference-in-Difference (DID) framework, examining the impact of enforcement actions on the Environmental Pillar score of non-financial firms linked to banks through a director. The variable "enforcement action years" represents an interaction term combining the post-enforcement period with the treatment group, comprising enforced-bank-linked non-financial firms (NFFs). The dependent variable is the Environmental Pillar score, and it is a continuous variable ranging from 0 to 100, where 0 indicates low Environmental effort, and 100 indicates high Environmental performance. The Environmental pillar measures a company's impact on the environment through categories like Emissions, Innovation, and Resource Use. Themes include greenhouse gas emissions, waste management, biodiversity, product innovation, water and energy use, and sustainable practices in the supply chain. The table is structured into two columns. Column 1 displays estimates using the Environmental Pillar score as the dependent variables without control variables, while Column 2 incorporates control variables. The analysis accounts for several explanatory variables, including Sales Growth, which is the percentage change in sales income over a specific time period stated in logarithmic form; Sales, the natural logarithm of a company's total sales revenue in a particular year; Liquidity, which is the ratio of a company's current assets to total assets and reflects its capacity to satisfy short-term financial commitments; Tobin's Q, a measure of a company's market worth in relation to its total assets; Leverage, the ratio of a company's total debt to total assets, indicating how much it relies on debt financing; Capex, the ratio of a business's capital expenditures to total assets, representing the firm's investment in new capital assets compared to total assets; ROA, which evaluates a company's capacity to generate profits from its assets, and is the ratio of its operating income after depreciation to its total assets; and Solvency, defined as the ratio of a company's earnings before interest and taxes to its interest and related expenditures, assessing the company's ability to make interest payments.

Table 4-8:Baseline Results – Social Pillar Score

Variable Names	Expected Sign	(1) Social Pillar Score	(2) Social Pillar Score
Enforcement-linked years	+	11.2977***	2.7953**
		(1.3689)	(1.1382)
Sales	+		7.6269***
			(0.1657)
Liquidity	+		2.1995
			(1.4064)
Tobin's Q	+		0.2627**
			(0.1034)
Leverage	-		-0.0215
			(1.0128)
Capex	-		-1.3887
			(6.5002)
ROA	+		-11.2338***
			(1.2103)
Solvency	-		-9.463***
			(1.3278)
Constant		36.7851***	-20.7461***
		(1.4338)	(1.9524)
Observations		5286	5286
R-squared		0.0346	0.3501
Rho		0.4092	0.4389
Industry FE		YES	YES
Year FE		YES	YES

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1

Note: This table presents the regression estimates within a Difference-in-Difference (DID) framework, examining the impact of enforcement actions on the Social Pillar score of non-financial firms linked to banks through a director. The variable "enforcement action years" represents an interaction term combining the post-enforcement period with the treatment group, comprising enforced-bank-linked non-financial firms (NFFs). The dependent variable is the Social Pillar score, and it is a continuous variable ranging from 0 to 100, where 0 indicates low social effort, and 100 indicates high social performance. The Social pillar evaluates a company's responsibility towards its workforce, community, and consumers. Key categories include Community, Human Rights, Product Responsibility, and Workforce, covering themes like diversity, working conditions, health and safety, product quality, and data privacy.
The table is structured into two columns. Column 1 displays estimates using the Social Pillar score as the dependent variables without control variables, while Column 2 incorporates control variables. The analysis accounts for several explanatory variables, including Sales Growth, which is the percentage change in sales income over a specific time period stated in logarithmic form; Sales, the natural logarithm of a company's total sales revenue in a particular year; Liquidity, which is the ratio of a company's current assets to total assets and reflects its capacity to satisfy short-term financial commitments; Tobin's Q, a measure of a company's market worth in relation to its total assets; Leverage, the ratio of a company's total debt to total assets, indicating how much it relies on debt financing; Capex, the ratio of a business's capital expenditures to total assets, representing the firm's investment in new capital assets compared to total assets; ROA, which evaluates a company's capacity to generate profits from its assets, and is the ratio of its operating income after depreciation to its total assets; and Solvency, defined as the ratio of a company's earnings before interest and taxes to its interest and related expenditures, assessing the company's ability to make interest payments

.Table 4-9:Baseline Results – Governance Pillar Score

Variable Names	Expected sign	(1) Governance Pillar Score	(2) Governance Pillar Score
Enforcement-linked years	+	8.8783***	2.6467*
		(1.4946)	(1.4)
Sales	+		5.2997***
			(.2038)
Liquidity	+		4.8348***
			(1.7299)
Tobin's Q	+		-0.1828
			(0.1272)
Leverage	-		-0.5824
			(1.2457)
Capex	-		-25.3324***
			(7.995)
ROA	+		-2.8604*
			(1.4887)
Solvency	-		-3.6116**
			(1.6331)
Constant		40.331***	0.3543
		(1.5655)	(2.4014)
Observations		5286	5286
R-squared		0.0156	0.159
Rho		0.4076	0.4059
Industry FE		YES	YES
Year FE		YES	YES

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1

Note: This table presents the regression estimates within a Difference-in-Difference (DID) framework, examining the impact of enforcement actions on the Governance Pillar score of non-financial firms linked to banks through a director. The variable "enforcement action years" represents an interaction term combining the post-enforcement period with the treatment group, comprising enforced-bank-linked non-financial firms (NFFs). The dependent variable is the Governance Pillar score, and it is a continuous variable ranging from 0 to 100, where 0 indicates low Governance effort, and 100 indicates high Governance performance. The Governance pillar assesses a company's corporate governance practices, including CSR strategy, management structure, and shareholder rights. Categories focus on the structure and diversity of management, executive compensation, transparency in ESG reporting, and mechanisms to protect shareholder interests.
The table is structured into two columns. Column 1 displays estimates using the Governance Pillar score as the dependent variables without control variables, while Column 2 incorporates control variables. The analysis accounts for several explanatory variables, including Sales Growth, which is the percentage change in sales income over a specific time period stated in logarithmic form; Sales, the natural logarithm of a company's total sales revenue in a particular year; Liquidity, which is the ratio of a company's current assets to total assets and reflects its capacity to satisfy short-term financial commitments; Tobin's Q, a measure of a company's market worth in relation to its total assets; Leverage, the ratio of a company's total debt to total assets, indicating how much it relies on debt financing; Capex, the ratio of a business's capital expenditures to total assets, representing the firm's investment in new capital assets compared to total assets; ROA, which evaluates a company's capacity to generate profits from its assets, and is the ratio of its operating income after depreciation to its total assets; and Solvency, defined as the ratio of a company's earnings before interest and taxes to its interest and related expenditures, assessing the company's ability to make interest payments

Table 4-10:Baseline Results – ESG Controversies Score

Variable Names	Expected Sign	(1) ESG Controversies	(2) ESG Controversies
Enforcement-linked years	+	-5.6212***	-1.1723
		(1.4725)	(1.4311)
Sales	+		-4.2599***
			(0.2083)
Liquidity	+		-4.982***
			(1.7683)
Tobin's Q	+		0.1648
			(0.13)
Leverage	-		1.1535
			(1.2734)
Capex	-		2.9255
			(8.1728)
ROA	+		11.1176***
			(1.5218)
Solvency	-		1.9021
			(1.6694)
Constant		80.2234***	112.7773***
		(1.5423)	(2.4548)
Observations		5286	5286
R-squared		0.0691	0.1438
Rho		0.233	0.2324
Industry FE		YES	YES
Year FE		YES	YES

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Note: This table presents the regression estimates within a Difference-in-Difference (DID) framework, examining the impact of enforcement actions on the ESG Controversies score of manufacturing non-financial firms linked to banks through a director. The variable 'enforcement action years' represents an interaction term combining the post-enforcement period with the treatment group, comprising enforced-bank-linked non-financial firms (NFFs). The dependent variable is the ESG Controversies score, a continuous variable ranging from 0 to 100, where 0 indicates high ESG controversies, and 100 indicates no ESG controversies. The ESG Controversies score specifically penalises companies involved in significant scandals or negative events, which are tracked across 23 topics. The table is structured into two columns. Column 1 displays estimates using the ESG Controversies score as the dependent variables without control variables, while Column 2 incorporates control variables. The analysis accounts for several explanatory variables, including Sales Growth, which is the percentage change in sales income over a specific time period stated in logarithmic form; Sales, the natural logarithm of a company's total sales revenue in a particular year; Liquidity, which is the ratio of a company's current assets to total assets and reflects its capacity to satisfy short-term financial commitments; Tobin's Q, a measure of a company's market worth in relation to its total assets; Leverage, the ratio of a company's total debt to total assets, indicating how much it relies on debt financing; Capex, the ratio of a business's capital expenditures to total assets, representing the firm's investment in new capital assets compared to total assets; ROA, which evaluates a company's capacity to generate profits from its assets, and is the ratio of its operating income after depreciation to its total assets; and Solvency, defined as the ratio of a company's earnings before interest and taxes to its interest and related expenditures, assessing the company's ability to make interest payments.

4.6 Robustness Tests

4.6.1 Placebo Test

To verify the robustness of our results and ensure they are not driven by random chance, we conducted a placebo test. This involved randomly assigning "fake" enforcement periods, where banker directors were assumed to be absent when they were actually present. The placebo interaction in Table 4.11 term did not yield significant results, confirming that our findings are not merely capturing noise or other unobserved factors.

4.6.2 Heterogeneous Treatment Effects

We also examined whether the impact of banker directors varies across different types of firms by exploring heterogeneous treatment effects in Table 4.12. One might assume that banker-directors are sitting on the boards of large-cap firms, and therefore, results are driven by this difference in firm size. Specifically, we tested whether firm size influences the observed effects by creating a variable for large firms to analyse whether the impact of enforcement-linked years differs between large-cap and small-cap firms. The coefficient on the interaction term between enforcement action, post-period, and large firm was insignificant, suggesting that our results are not driven by firm size.

4.6.3 Exclusion of Pandemic Years

Given the unique economic conditions and board attendance patterns during the pandemic years (2020-2021), in Table 4.13 we re-ran our baseline DID regression excluding these years to ensure they did not distort our results. The baseline results remained robust, with significant increases in ESG scores during enforcement-linked years, reinforcing the validity of our findings.

4.6.4 Propensity Score Matching

Table 4.14 presents the results of a robustness test using a Difference-in-Difference (DID) analysis combined with propensity score matching. This method ensures that the treatment and control groups are balanced, making the results more robust by reducing selection bias. The treatment group includes non-financial firms linked to enforced banks through a director, while the control group consists of firms without such a link.

The results show a positive coefficient of 2.193 for the difference between treated and control firms, with a p-value of 0.095. This suggests that, on average, enforcement-linked firms experience an ESG score increase of 2.193 points compared to control firms after the enforcement actions, though this effect is statistically significant only at the 10% level.

While the results indicate a marginally significant positive impact of enforcement actions on ESG scores for bank-linked firms, the relatively large standard error (1.314) suggests some variability in the treatment effect across firms. The positive coefficient supports the notion that the presence of banker-directors can influence ESG outcomes, but the significance level ($p<0.1$) and confidence interval suggest that further investigation is warranted to solidify the robustness of this finding.

This analysis strengthens the overall conclusion that regulatory enforcement actions impact the ESG performance of firms linked to banker-directors, albeit with moderate statistical certainty.

4.6.5 Entropy Balancing

To strengthen the credibility of the baseline findings, we employ entropy balancing (Hainmueller, 2012) as an alternative method for addressing potential endogeneity in the assignment of enforcement-linked banker-directors. Unlike traditional propensity score approaches, which rely on estimating a propensity score and then iteratively checking covariate balance, entropy balancing recalibrates the weights of control observations so that they mirror the distributional properties (e.g., means or variances) of the treated units across all specified covariates. This targeted reweighting aims to mitigate observable confounding factors in a more direct and transparent manner.

We impose balance constraints on the first moments (means) of the covariates. Post-balancing diagnostics confirm that standardised differences in means across Sales, Liquidity, Tobin's Q, Leverage, Capex, ROA, and Solvency are reduced to near zero, reflecting a high degree of overlap between treatment and control samples. This indicates that conditional on the included variables, the reweighted control sample serves as a close statistical analogue to the enforcement-linked treatment group, thereby diminishing the risks of specification bias.

4.6.5.1 Empirical Findings

As shown in Table 4.15 (based on the entropy balancing procedure), the ATT for ESG performance is 4.528, with a standard error of 1.221. Interpreted substantively, firms subject to enforcement-linked banker-directors exhibit ESG scores that are, on average, approximately 4.53 points higher than those of the matched control group. This result dovetails with our baseline regressions in suggesting that enforcement-driven shifts in banker-directors' oversight can create windows for stronger ESG initiatives. By assigning precise weights to control

observations, entropy balancing verifies that our main conclusions hold even under a more stringent matching framework that mandates exact distributional alignment.

The entropy balancing estimates corroborate our central thesis that banker-directors may inadvertently enable firms to pursue more pronounced ESG strategies. These findings remain robust after rigorous balancing on key firm characteristics, reinforcing the argument that the distractive effect of enforcement actions can help non-financial firms reallocate corporate priorities toward sustainability goals. Future research might extend this entropy balancing approach by incorporating higher-order moments or covariances for additional covariates, further refining our understanding of how regulatory pressures intersect with board composition to drive ESG performance.

Table 4-11:Robustness Test – Placebo Test

Variable Names	Expected Sign	(1) ESG Score	(2) ESG Score
Placebo enforcement-linked years	+	0.7479	0.2138
		(0.5678)	(0.4426)
Sales	+		7.4254***
			(0.1408)
Liquidity	+		2.1152*
			(1.2065)
Tobin's Q	+		0.133
			(0.0888)
Leverage	-		-1.3721
			(0.8694)
Capex	-		-13.9266**
			(5.5794)
ROA	+		-9.5111***
			(1.0396)
Solvency	-		-6.9913***
			(1.1398)
Constant		33.6011***	-22.0476***
		(1.2992)	(1.6745)
Observations		5286	5286
R-squared		0.0201	0.4066
Rho		0.44	0.4683
Industry FE		YES	YES
Year FE		YES	YES

Standard errors are in parentheses

*** p<.01, ** p<.05, * p<.1

Note: This table presents the regression estimates within a Difference-in-Difference (DID) framework, examining the impact of enforcement actions on the ESG score of non-financial firms linked to banks through a director. The variable "placebo enforcement action years" represents an interaction term combining the post-enforcement period with the placebo treatment group. The dependent variable is the ESG score, and it is a continuous variable ranging from 0 to 100, where 0 indicates low ESG effort, and 100 indicates high ESG performance. The ESG score is derived from a detailed assessment of a company's performance in environmental, social, and governance aspects, using 186 key metrics across 10 categories. These categories are rolled up into three pillar scores—Environmental, Social, and Governance—reflecting the company's overall ESG commitment and effectiveness based on industry-specific criteria. The table is structured into two columns. Column 1 displays estimates using the ESG score as the dependent variables without control variables, while Column 2 incorporates control variables. The analysis accounts for several explanatory variables, including Sales Growth, which is the percentage change in sales income over a specific time period stated in logarithmic form; Sales, the natural logarithm of a company's total sales revenue in a particular year; Liquidity, which is the ratio of a company's current assets to total assets and reflects its capacity to satisfy short-term financial commitments; Tobin's Q, a measure of a company's market worth in relation to its total assets; Leverage, the ratio of a company's total debt to total assets, indicating how much it relies on debt financing; Capex, the ratio of a business's capital expenditures to total assets, representing the firm's investment in new capital assets compared to total assets; ROA, which evaluates a company's capacity to generate profits from its assets, and is the ratio of its operating income after depreciation to its total assets; and Solvency, defined as the ratio of a company's earnings before interest and taxes to its interest and related expenditures, assessing the company's ability to make interest payments.

Table 4-12:Robustness Test – Large Firms

Variable Names	Expected Sign	(1) ESG Score	(2) ESG Score
Enforcementlinked#Large Firm	+	26.3301***	0.6776
		(1.3549)	(1.2372)
Sales	+		7.6784***
			(0.1578)
Liquidity	+		1.1107
			(1.2139)
Tobin's Q	+		0.1069
			(.0886)
Leverage	-		-1.3039
			(0.8661)
Capex	-		-14.424***
			(5.556)
ROA	+		-9.0125***
			(1.0394)
Solvency	-		-7.1398***
			(1.1355)
Constant		19.3995***	-20.6063***
		(1.3931)	(1.6844)
Observations		5286	5286
R-squared		0.1157	0.4119
Rho		0.4233	0.468
Industry FE		YES	YES
Year FE		YES	YES

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*
.

Note: This table presents the regression estimates using a Difference-in-Difference (DID) framework with cross-sectional analysis for large firms that represent firms with total assets above the median in the datasets. It examines the impact of enforcement actions on the ESG score of non-financial firms linked to banks through a director. The variable "enforcement action years" represents an interaction term combining the post-enforcement period with the treatment group, comprising enforced-bank-linked non-financial firms (NFFs). The dependent variable is the ESG score, and it is a continuous variable ranging from 0 to 100, where 0 indicates low ESG effort, and 100 indicates high ESG performance. The ESG score is derived from a detailed assessment of a company's performance in environmental, social, and governance aspects, using 186 key metrics across 10 categories. These categories are rolled up into three pillar scores—Environmental, Social, and Governance—reflecting the company's overall ESG commitment and effectiveness based on industry-specific criteria. The table is structured into two columns. Column 1 displays estimates using the ESG score as the dependent variables without control variables, while Column 2 incorporates control variables. The analysis accounts for several explanatory variables, including Sales Growth, which is the percentage change in sales income over a specific time period stated in logarithmic form; Sales, the natural logarithm of a company's total sales revenue in a particular year; Liquidity, which is the ratio of a company's current assets to total assets and reflects its capacity to satisfy short-term financial commitments; Tobin's Q, a measure of a company's market worth in relation to its total assets; Leverage, the ratio of a company's total debt to total assets, indicating how much it relies on debt financing; Capex, the ratio of a business's capital expenditures to total assets, representing the firm's investment in new capital assets compared to total assets; ROA, which evaluates a company's capacity to generate profits from its assets, and is the ratio of its operating income after depreciation to its total assets; and Solvency, defined as the ratio of a company's earnings before interest and taxes to its interest and related expenditures, assessing the company's ability to make interest payments

Table 4-13:Robustness Test – Without pandemic years (2020-2021)

Variable Names	Expected Sign	(1) ESG Score	(2) ESG Score
Enforcement-linked years	+	12.7111***	3.5635***
		(1.3323)	(1.0493)
Sales	+		7.8567***
			(0.1755)
Liquidity	+		2.0084
			(1.4636)
Tobin's Q	+		.4533***
			(.1301)
Leverage	-		-1.0536
			(1.0394)
Capex	-		-22.4141***
			(6.6003)
ROA	+		-11.0049***
			(1.2191)
Solvency	-		-5.9284***
			(1.4554)
Constant		33.8237***	-25.9166***
		(1.251)	(1.9219)
Observations		3701	3701
R-squared		0.0324	0.4221
Rho		0.4603	0.506
Industry FE		YES	YES
Year FE		YES	YES

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1

Note: This table presents the regression estimates within a Difference-in-Difference (DID) framework, excluding pandemic years 2020 and 2021. It examines the impact of enforcement actions on the ESG score of non-financial firms linked to banks through a director. The variable "enforcement action years" represents an interaction term combining the post-enforcement period with the treatment group, comprising enforced-bank-linked non-financial firms (NFFs). The dependent variable is the ESG score, and it is a continuous variable ranging from 0 to 100, where 0 indicates low ESG effort, and 100 indicates high ESG performance. The ESG score is derived from a detailed assessment of a company's performance in environmental, social, and governance aspects, using 186 key metrics across 10 categories. These categories are rolled up into three pillar scores—Environmental, Social, and Governance—reflecting the company's overall ESG commitment and effectiveness based on industry-specific criteria. The table is structured into two columns. Column 1 displays estimates using the ESG score as the dependent variables without control variables, while Column 2 incorporates control variables. The analysis accounts for several explanatory variables, including Sales Growth, which is the percentage change in sales income over a specific time period stated in logarithmic form; Sales, the natural logarithm of a company's total sales revenue in a particular year; Liquidity, which is the ratio of a company's current assets to total assets and reflects its capacity to satisfy short-term financial commitments; Tobin's Q, a measure of a company's market worth in relation to its total assets; Leverage, the ratio of a company's total debt to total assets, indicating how much it relies on debt financing; Capex, the ratio of a business's capital expenditures to total assets, representing the firm's investment in new capital assets compared to total assets; ROA, which evaluates a company's capacity to generate profits from its assets, and is the ratio of its operating income after depreciation to its total assets; and Solvency, defined as the ratio of a company's earnings before interest and taxes to its interest and related expenditures, assessing the company's ability to make interest payments.

Table 4-14:Robustness Test – Propensity score match

ESG score	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
Treated vs Control	2.193	1.314	1.67	.095	-.382	4.767	*
Mean dependent var		37.022	SD dependent var			19.185	

*** p<.01, ** p<.05, * p<.1

Note: This table presents the Difference-in-Difference (DID) analysis with the propensity score matched treatment group, a method used to compare the ESG scores of non-financial firms linked to banks through a director before and after enforcement actions. The coefficient shows the difference between the control and propensity score matched treatment group. The dependent variable is the ESG score, and it is a continuous variable ranging from 0 to 100, where 0 indicates low ESG effort, and 100 indicates high ESG performance. The ESG score is derived from a detailed assessment of a company's performance in environmental, social, and governance aspects, using 186 key metrics across 10 categories. These categories are rolled up into three pillar scores—Environmental, Social, and Governance—reflecting the company's overall ESG commitment and effectiveness based on industry-specific criteria.

Table 4-15 Robustness Test – Entropy balancing match

Entropy balancing Number of observation = 3,453
Balance tolerance = 0.00001
Treatment : Enforcement-linked years = 1
Targets : 1
Covariates : Sales, Liquidity, Tobin's Q, Leverage, Capex, ROA, Solvency
Treatment-effects estimation

ESG_score	Coefficient	Std.err	t	P>t	[95% conf. interval]	
ATT	4.528	1.221	3.710	0.000	2.134	6.923

Note: This table reports the average treatment effect on the treated(ATT) effect by using entropy balancing approach(Hainmueller, 2012) to compare the ESG scores of non-financial firms linked to banks through a director before and after enforcement actions. Under entropy balancing, each control observation is reweighted so that its distribution on key covariates matches that of the treatment group, thereby mitigating biases in observable characteristics. The coefficient reflects the difference between the entropy-balanced control and treatment groups. The dependent variable is the ESG score, a continuous metric on a 0–100 scale in which 0 indicates low ESG effort and 100 indicates high ESG performance. It is derived from a comprehensive assessment of a firm's Environmental, Social, and Governance pillars, encompassing 186 key metrics across 10 categories that capture the breadth of a company's ESG commitment.

4.6.6 Parallel Trends, Visual Analysis, and Control vs. Treatment Groups

The DID method relies on the parallel trend assumption, which posits that control and treatment firms would have followed similar trends in the absence of the treatment. Although there is no direct test for this assumption, we conducted a visual inspection of the trends. Figure 4.5 demonstrates that both bank-linked and non-bank-linked firms display parallel trends across the sample years, supporting the validity of our DID approach.

We further substantiate our findings through a visual analysis of ESG scores, comparing enforcement-linked years with non-enforcement-linked years. Figures 4.1 through 4.4 provide a comprehensive comparison of ESG scores between these periods for NFFs. The data show that during enforcement-linked years, NFFs achieve consistently higher ESG scores. The ESG Combined Scores also follow this pattern, with enforcement-linked years associated with higher scores.

The environmental scores show a significant difference between enforcement-linked and non-enforcement-linked firms, with the former achieving higher scores. The social pillar scores exhibit a similar trend, with enforcement-linked firms consistently outperforming their counterparts. In the governance pillar, treatment firms demonstrate higher scores throughout most of the period, with some exceptions in 2010 and 2012. The ESG Controversies analysis shows that during enforcement-linked years, these firms experience more controversies, as reflected by the lower ESG Controversies score. This suggests that while enforcement-linked years are associated with better overall ESG outcomes, they may also lead to an increase in riskier activities and controversies when banker-directors are less involved. These visual analyses consistently support the hypothesis that NFFs experience improved ESG performance but more controversies when banker directors are more focused on their banking responsibilities, as reflected by the decrease in the ESG Controversies score during enforcement-linked years.

The evidence presented in this section underscores the significant influence of banker directors on the ESG performance of non-financial firms. When these directors are more engaged with their banking duties, NFFs benefit from enhanced ESG scores but face increased controversies, as reflected by the lower ESG Controversies score during these periods. This suggests that banker directors may mitigate riskier activities, leading to fewer controversies when their attention is not diverted by enforcement actions. The robustness tests confirm the reliability of these findings, reinforcing the notion that the observed effects are genuine and not artifacts of random variation or specific subgroups within the sample.

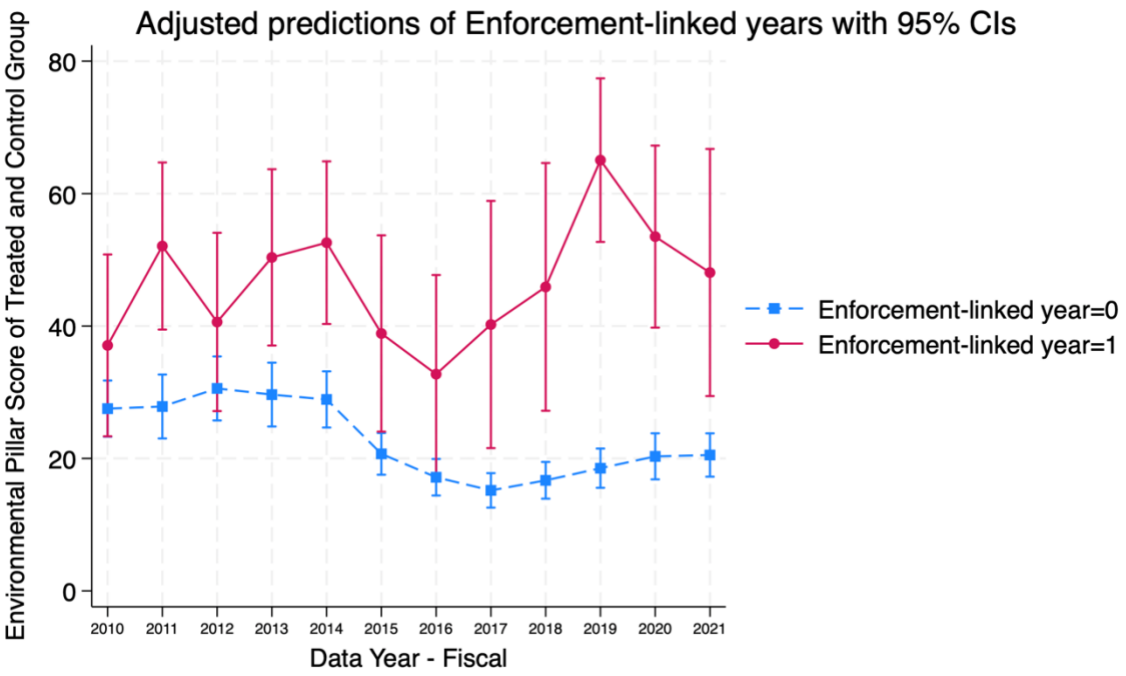

Figure 4.1:Mean Environmental Score of Enforcement-linked NFFs and non-enforcement-linked NFFs

Note: Figure 4.1 illustrates the Mean Environmental Pillar Score of Enforcement-linked NFFs and non-enforcement-linked NFFs.

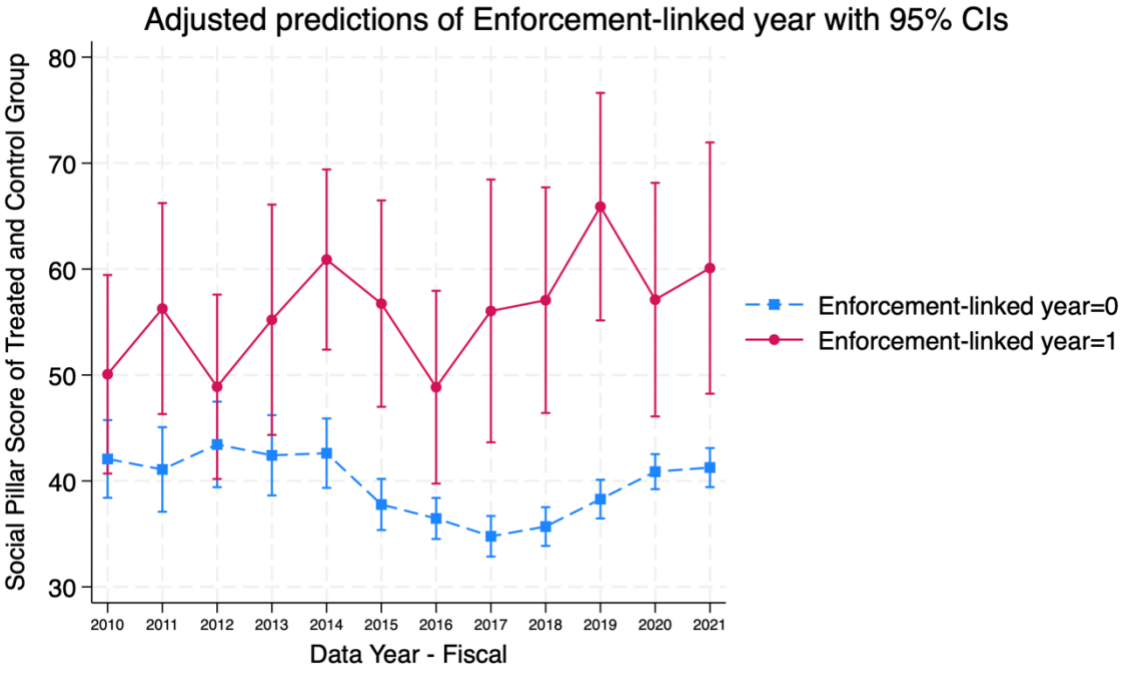

Figure 4.2:Mean Social Score of Enforcement-linked NFFs and non-enforcement-linked NFFs

Note: Figure 4.2 illustrates the Mean Social Pillar Score of Enforcement-linked NFFs and non-enforcement-linked NFFs.

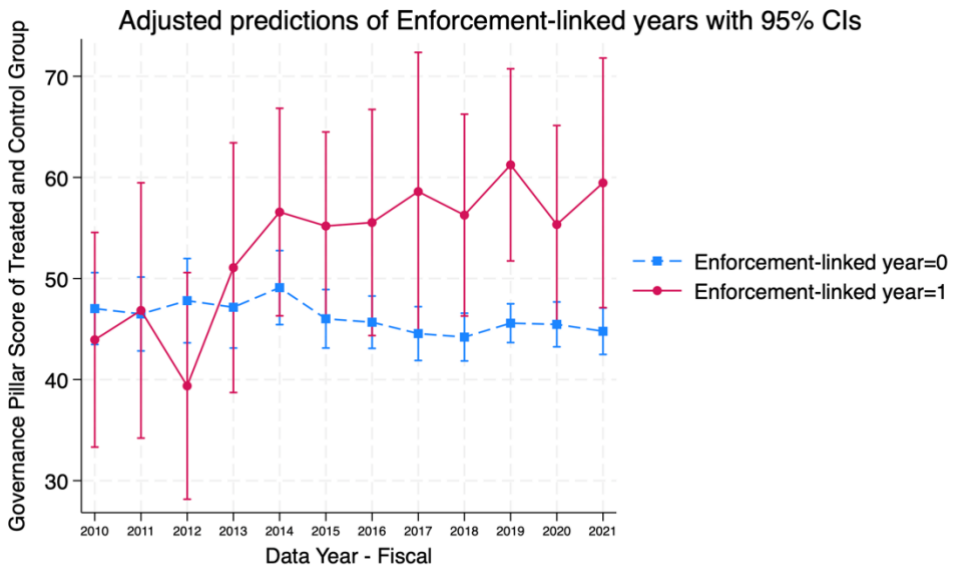

Figure 4.3:Mean Governance Score of Enforcement-linked NFFs and non-enforcement-linked NFFs

Note: Figure 4.3 illustrates the Mean Governance Pillar Score of Enforcement-linked NFFs and non-enforcement-linked NFFs.

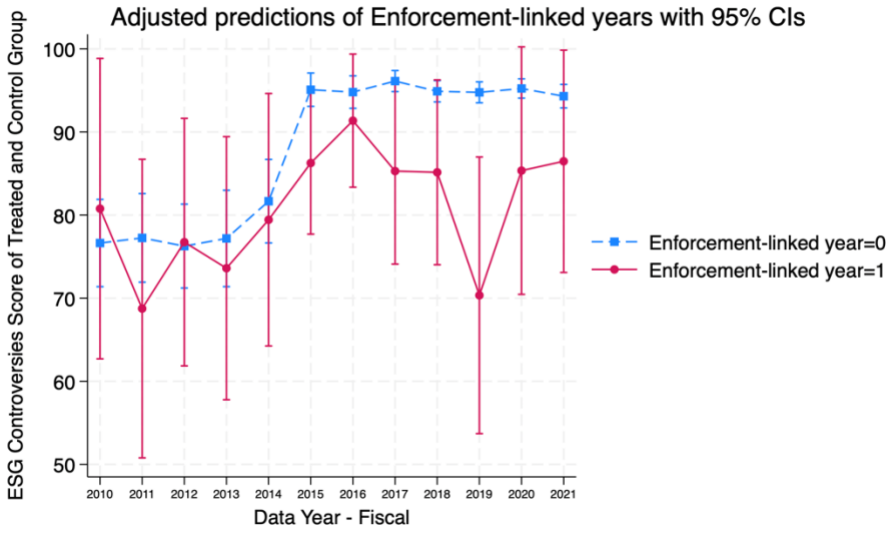

Figure 4.4:Mean ESG Controversies Score of Enforcement-linked NFFs and non-enforcement-linked NFFs

Note: Figure 4.4 illustrates the Mean ESG Controversies Score of Enforcement-linked NFFs and non-enforcement-linked NFFs.

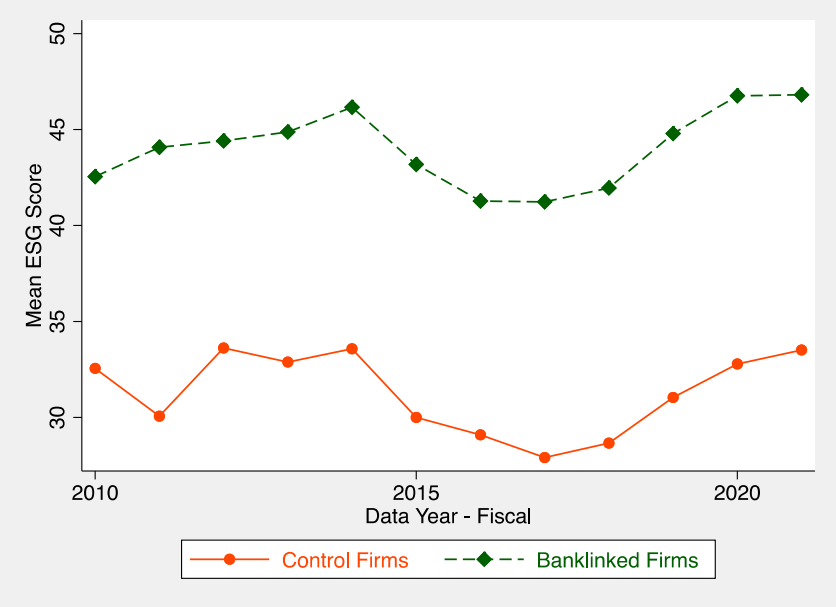

Figure 4.5:Mean ESG Score of Control and Bank-linked Firms

Note: The Figure 4.5 shows the mean ESG scores of control firms and bank-linked firms from 2010 to 2020. The two groups display parallel trends in their ESG scores during the pre-enforcement period, indicating similar ESG trajectories prior to regulatory interventions.

4.6.7 Dynamic ESG scores and Individual Pillar scores around the Enforcement Actions

To further validate the impact of banker-directors on ESG performance, we employ an event study framework as a robustness test. This analysis provides a temporal examination of how ESG scores and their individual pillars (Environmental, Social, and Governance) respond to the regulatory enforcement actions faced by the banks where banker-directors are seated. The event study framework allows us to observe the dynamic effects of these enforcement events over time, focusing on the years immediately before and after the intervention. Our findings show a consistent pattern across all ESG pillars: when banker-directors are preoccupied with banking-related enforcement actions, the ESG scores of non-financial firms (NFFs) tend to improve, particularly in the year following the enforcement. However, as banker-directors return to their NFF governance roles post-enforcement, we observe a decline in ESG performance, suggesting that their involvement negatively impacts long-term sustainability practices. These results support our hypothesis that the reduced attention of banker-directors during enforcement years fosters stronger ESG outcomes, but their return leads to a regression in corporate governance, environmental, and social practices, aligning with the broader narrative of short-term financial prioritization at the expense of ESG goals. This event study provides robust evidence that the temporal dynamics of banker-directors' involvement play a crucial role in shaping NFFs' ESG performance.

The figure 4.6 shows a steady increase in ESG performance leading up to the enforcement action, with a clear upward trend in ESG scores starting around three years before the enforcement event. This suggests that NFFs improve their ESG performance as banker-directors shift their focus toward dealing with bank-related regulatory pressures.

Interestingly, there is a significant improvement in the ESG score at Year 1 post-enforcement, when banker-directors are primarily occupied with their bank duties and thus less involved in the governance of NFFs. This absence appears to coincide with stronger ESG performance in these firms, as they are free to pursue more ambitious ESG goals without the conservative or risk-averse influence often associated with banker-directors.

However, from Year 2 onward, when banker-directors return to their roles on NFF boards, the ESG scores begin to decline. This downward trend suggests that the presence of banker-directors may diminish a firm's focus on ESG initiatives, as they shift attention away from long-term sustainability practices in favour of more short-term financial considerations. The reduction in ESG scores after Year 1 reinforces the idea that banker-directors may not prioritize ESG performance when they are actively involved in corporate governance, potentially constraining efforts to improve environmental, social, and governance outcomes.

Overall, this figure demonstrates that the absence of banker-directors during enforcement-linked years is associated with improvements in ESG scores, while their return is correlated with a decrease in these scores, highlighting their potentially negative influence on a firm’s sustainability performance.

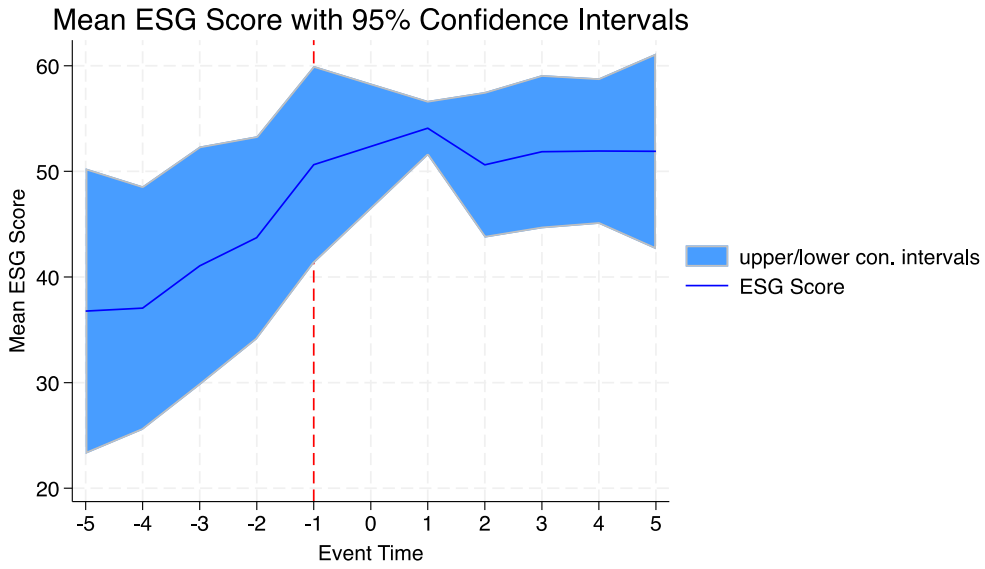

Figure 4.6:Mean ESG Score with 95% Confidence Intervals

Note: This figure illustrates the average Environmental, Social, and Governance (ESG) score of non-financial firms (NFFs) linked to banker-directors, before and after the enforcement action. The horizontal axis represents the timeline, spanning from five years before to five years after the enforcement action, with Year -1 marking before the enforcement action itself (represented by the red dashed vertical line). The vertical axis indicates the mean ESG score, with higher values reflecting stronger performance across environmental, social, and governance dimensions. The blue line represents the mean ESG score, while the shaded region illustrates the 95% confidence intervals, providing an indication of the precision of the estimates.

The figure 4.7 follows a similar trend to the overall ESG score in the earlier figure. The Environmental Pillar score rises in the years leading up to the enforcement event, suggesting that environmental performance improves as banker-directors shift their attention to their responsibilities on bank boards due to regulatory scrutiny. The steepest rise occurs between two years before and the enforcement year, reflecting a potential increase in environmental practices when banker-directors become less involved in NFF governance.

At Year 1 post-enforcement, when banker-directors remain occupied with their banking duties, the Environmental Pillar score stays elevated, indicating that NFFs continue to prioritize environmental initiatives. However, a decline in the Environmental Pillar score begins at Year 2 when banker-directors return to their NFF board responsibilities. This trend suggests that the presence of banker-directors may diminish environmental performance, as their return coincides with a downturn in the environmental pillar score.

The observed decline after Year 1 post-enforcement underscores the possibility that banker-directors may deprioritize environmental issues in favour of other, more immediate financial concerns when they re-engage in the governance of NFFs. This pattern is consistent

with the broader finding that banker-directors may hinder sustained progress in ESG and environmental efforts when their attention is focused back on NFFs, reducing the positive momentum in environmental practices.

As with the overall ESG score, the confidence intervals widen slightly in the post-enforcement period, indicating some variability in the impact across different firms. Nevertheless, the general trend points to a negative influence of banker-directors on environmental performance when they return to active governance roles.

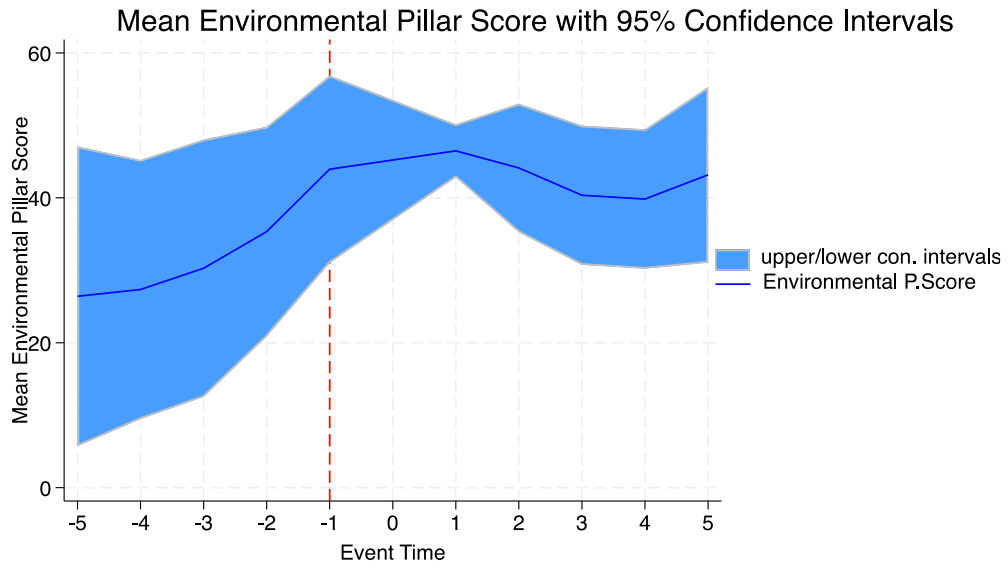

Figure 4.7:Mean Environmental Pillar Score with 95% Confidence Intervals

This figure shows the average Environmental Pillar score of non-financial firms (NFFs) with banker-directors before and after enforcement actions. The horizontal axis represents the timeline, from five years before to five years after the enforcement action, with Year -1 marking before the enforcement event (marked by the red dashed vertical line). The vertical axis indicates the mean Environmental Pillar score, with higher values reflecting better environmental performance. The blue line represents the mean Environmental Pillar score, while the shaded area indicates the 95% confidence intervals, which offer insight into the precision of the estimates.

The Social Pillar score in Figure 4.8 follows a similar pattern to the other ESG pillars, with steady improvement in the years leading up to the enforcement event. From Year -3 to Year -1, the Social Pillar score experiences a noticeable upward trend, suggesting that firms are strengthening their social practices as banker-directors shift their focus toward regulatory issues at their respective banks. This improvement is particularly sharp in the year just before the enforcement event, likely reflecting the reduced influence of banker-directors on NFFs' governance during this critical period.

At Year 1 post-enforcement, when banker-directors are still preoccupied with their responsibilities on bank boards, the Social Pillar score remains elevated, indicating that NFFs continue to maintain higher levels of social performance. However, by Year 2, the Social Pillar score begins to decline, marking the return of banker-directors to their governance roles in NFFs. This decline suggests that their renewed presence may negatively impact the firm's social initiatives, possibly shifting priorities away from social responsibility and toward more financial or risk-averse strategies.

The sustained lower Social Pillar scores in Years 3 through 5 post-enforcement further reinforce the interpretation that banker-directors may deprioritize social issues when they are more involved in NFF governance. The downward trend is consistent with findings across the other ESG pillars, highlighting the potential detrimental impact banker-directors can have on CSR-focused efforts, particularly those related to social engagement and responsibility.

The widening of confidence intervals post-Year 2 reflects increased variability in social performance outcomes, suggesting that the return of banker-directors may have uneven effects across firms. While some firms maintain higher social scores, others experience more significant declines, further underscoring the complex relationship between banker-directors and social pillar outcomes in NFFs.

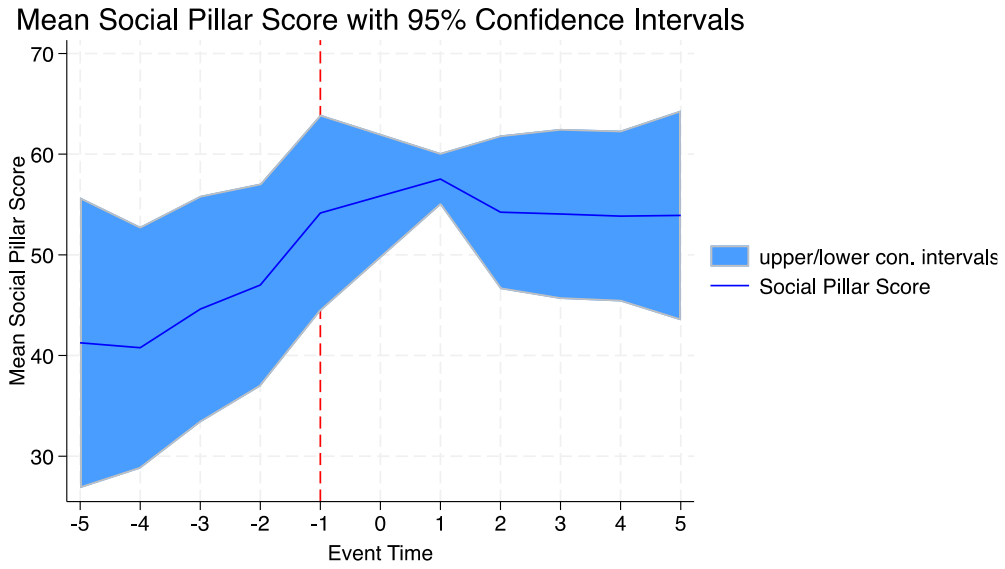

Figure 4.8:Mean Social Pillar Score with 95% Confidence Intervals

Note: This figure presents the average Social Pillar score for non-financial firms (NFFs) with banker-directors, both before and after the enforcement actions. The horizontal axis represents the timeline, spanning from five years before to five years after the enforcement action, with Year -1 marking before the enforcement event (marked by the red dashed vertical line). The vertical axis reflects the mean Social Pillar score, with higher values indicating stronger social performance in areas such as labour practices, community engagement, and social responsibility. The blue line represents the mean Social Pillar score, while the shaded area indicates the 95% confidence intervals, illustrating the reliability of the estimates.

The Governance Pillar score in Figure 4.9 shows a different trajectory compared to the Environmental and Social Pillars, with a more consistent upward trend both before and after the enforcement event. In the lead-up to the enforcement action, there is a steady improvement in governance scores as banker-directors become increasingly focused on their bank-related duties, allowing NFFs to implement stronger governance practices.

At Year 1 post-enforcement, when banker-directors are still focused on regulatory issues within their banks, the Governance Pillar score reaches one of its highest levels. This suggests that the absence of banker-directors may have allowed NFFs to strengthen their governance frameworks, perhaps with more focus on enhancing transparency, shareholder rights.

However, unlike the environmental and social scores, the Governance Pillar score does not experience a sharp decline when banker-directors return to the NFF boards in Year 2. Instead, the score remains relatively stable, with minor fluctuations, indicating that the governance improvements achieved during the banker-directors' absence may have been more durable than changes in the environmental or social pillars. This stability could be attributed to structural

changes that are less likely to be reversed quickly, such as reforms in board composition or governance policies that were implemented during the enforcement period.

Nevertheless, the slight dip in scores after Year 2 suggests that the return of banker-directors still has some moderating effects on governance performance, though less pronounced than in the other ESG pillars. This finding highlights the potential for more enduring governance improvements, even as banker-directors reintegrate into their roles, but also underscores the potential risk that their involvement could slow or limit further progress.

As with the other pillars, the confidence intervals widen slightly post-enforcement, suggesting some variability across firms in maintaining strong governance practices. Overall, this figure indicates that while banker-directors may not have as strong a negative effect on governance as they do on environmental or social performance, their return can still pose challenges to sustaining high levels of governance quality in NFFs over time.

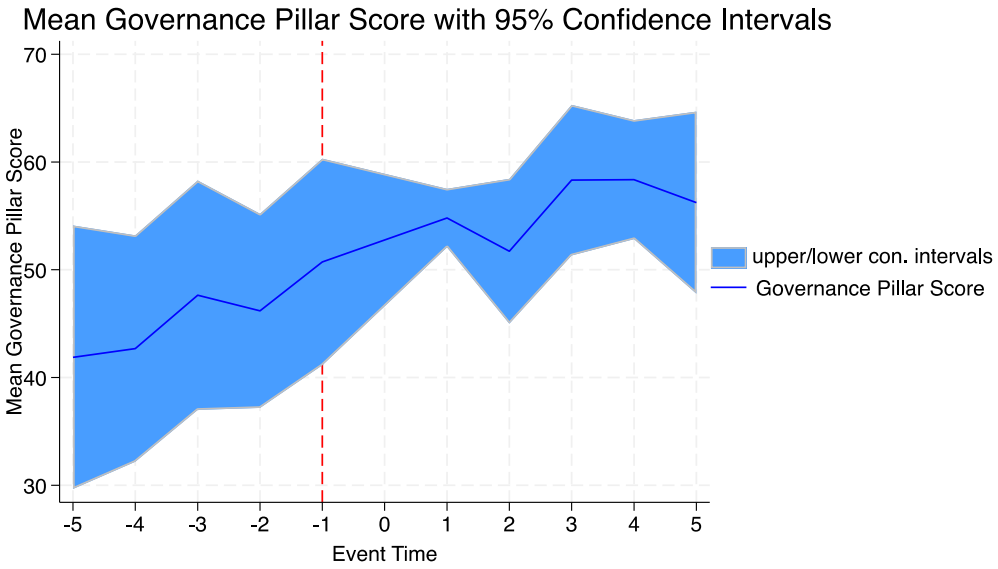

Figure 4.9:Mean Governance Pillar Score with 95% Confidence Intervals

This figure presents the average Governance Pillar score for non-financial firms (NFFs) with banker-directors, showing the evolution of scores before and after enforcement actions. The horizontal axis covers five years before and after the enforcement event, with Year -1 marking before the enforcement action itself (indicated by the red dashed vertical line). The vertical axis represents the mean Governance Pillar score, where higher scores indicate stronger corporate governance practices, including board structure, shareholder rights, and transparency. The blue line represents the mean Governance Pillar score, while the shaded region displays the 95% confidence intervals, showing the reliability of the estimates.

4.7 Conclusion

This study contributes to the growing but still underexplored literature on the relationship between Corporate Social Responsibility (CSR) and the role of banker-directors within non-financial firms (NFFs). While previous research, such as Hasan et al. (2021), has suggested that banker-directors promote CSR initiatives primarily as a risk mitigation strategy, our findings present a contrasting narrative. Through a detailed Difference-in-Differences (DID) analysis, we discovered that the Environmental, Social, and Governance (ESG) performance of NFFs significantly improves during periods when banker-directors are preoccupied with their responsibilities on bank boards due to enforcement actions. This improvement in ESG scores during enforcement-linked years challenges the notion that banker-directors are inherently advocates of CSR for risk reduction.

Our baseline results, supported by robustness tests, demonstrate that NFFs experienced an average 4.5-point increase in ESG scores during enforcement-linked years. This positive impact was consistent across different models, firm-level controls, and all individual ESG pillars—Environmental, Social, and Governance. The economic implications of these findings suggest that the less direct involvement of banker-directors in NFF governance during enforcement-linked years creates conditions under which firms can enhance their sustainability efforts. These results align with the broader literature on the short-term focus of banker-directors, as highlighted by Graham, Harvey, and Rajgopal (2005), who argue that ESG investments often do not yield immediate financial returns, and thus may be deprioritized by directors focused on short-term gains.

The visual analysis further substantiates our econometric findings, showing consistently higher ESG, ESG Combined, and pillar scores during enforcement-linked years. However, these improvements were accompanied by an increase in ESG-related controversies, as indicated by the decrease in the ESG Controversies score. This suggests that while ESG outcomes improve when banker-directors are less involved in the day-to-day governance of NFFs, their reduced involvement leads to a rise in controversies, likely due to riskier activities undertaken by the firms.

The discrepancy between our results and those of Hasan et al. (2021) may stem from differences in the definition and roles of banker-directors considered in each study. While Hasan et al. (2021) focused exclusively on affiliated executive banker-directors, our research encompasses all banker-directors, regardless of their executive or independent status. This broader perspective could explain the divergent findings, indicating that the impact of banker-

directors on ESG performance might vary significantly based on their specific roles and affiliations within the firm.

Our findings carry significant economic implications, suggesting that the involvement of banker-directors may not always be conducive to a firm's long-term sustainability goals, particularly when their focus is diverted by substantial external responsibilities, such as during enforcement-linked years. While banker-directors undoubtedly bring valuable financial expertise to the table, their presence can sometimes hinder the firm's ESG performance. This potential misalignment between financial oversight and sustainability objectives is a critical consideration for both firms and regulators when structuring corporate governance frameworks.

From a literature perspective, our study underscores the need for a deeper understanding of the complex roles banker-directors play in shaping firm strategies, particularly in areas such as CSR and ESG. The divergent evidence between our results and those of prior research highlights the necessity for further investigation into the specific conditions under which banker-directors either enhance or impede CSR and ESG initiatives. Future research should differentiate between various types of banker-directors—such as executive versus independent—and examine how these roles influence firm behaviour across different industries. This nuanced insight is essential for developing governance practices that effectively balance financial oversight with sustainable business strategies, ultimately fostering more resilient and socially responsible firms.

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Chapter 5 Conclusion

This thesis has provided a comprehensive analysis of the multifaceted impacts of the Dodd-Frank Act (DFA) and the role of banker-directors in corporate governance. Through an examination of director quality, R&D investments, and ESG performance, the study has shed light on the complex and often counterintuitive effects of regulatory mandates and the involvement of banker-directors in strategic decision-making processes.

5.1 Director Quality Post-DFA

Chapter 1 focused on the impact of the DFA's risk committee mandate on director quality within bank holding companies (BHCs). Despite the legislative intent to enhance the expertise and effectiveness of directors by requiring the establishment of a separate risk committee, the findings revealed no significant improvement in director quality post-DFA. This suggests that structural changes alone, such as the creation of risk committees, may be insufficient to drive meaningful improvements in governance practices without corresponding enhancements in director capabilities and incentives. The lack of significant change in director quality also provides a potential explanation for the minimal impact of the DFA on bank risk-taking behaviour, as effective governance requires not only well-designed structures but also competent and motivated individuals to implement them (Balasubramanyan et al., 2019).

These findings underscore the limitations of regulatory interventions that focus primarily on structural reforms without addressing the underlying factors that contribute to effective governance. While the DFA's risk committee mandate was well-intentioned, it may not have fully considered the complexities of board dynamics and the importance of director expertise and motivation in driving effective decision-making. This chapter highlights the need for a more nuanced approach to regulatory reform—one that recognizes the importance of both structure and substance in achieving meaningful improvements in corporate governance.

5.2 Banker-Directors and R&D Investments

Chapter 2 explored the influence of banker-directors on R&D investments in manufacturing firms. The analysis revealed that banker-directors often exert a conservative influence on R&D spending, likely due to their risk-averse nature (Krishnan and Visvanathan, 2007) and potential conflicts of interest (Kroszner and Strahan, 2001; Guner, Malmendier, and Tate, 2008) between their roles as lenders and board members. However, during periods of regulatory enforcement actions against their financial institutions, when these directors are preoccupied with their banking responsibilities, firms tend to increase their R&D investments. This finding suggests that the reduced involvement of banker-directors in firm governance during these periods may allow for greater focus on long-term innovation and strategic investments.

The implications of this finding are significant for both corporate governance and corporate strategy. By highlighting the potential trade-offs between financial oversight and innovation, this chapter underscores the importance of carefully considering the composition of corporate boards, particularly in industries where R&D is a critical driver of growth. Firms that rely heavily on innovation may need to reassess the role of banker-directors on their boards, balancing the benefits of financial expertise with the need for a more entrepreneurial and risk-tolerant approach to decision-making. Additionally, this chapter raises important questions about the broader impact of regulatory enforcement on corporate behaviour, suggesting that external pressures can have unintended but potentially beneficial effects on firm strategy.

5.3 Banker-Directors and ESG Performance

Chapter 3 extended the investigation to ESG performance, assessing how banker-directors influence non-financial firms' ESG outcomes during periods of regulatory enforcement. The results showed significant improvements in ESG scores, particularly across all individual pillars—environmental, social, and governance—during these periods. This suggests that when banker-directors are less involved in the day-to-day governance of firms due to their preoccupation with regulatory issues, firms may be better positioned to advance their ESG initiatives.

These findings challenge the assumption that banker-directors uniformly enhance CSR efforts and highlight the need for a more nuanced understanding of their role in corporate governance (Hasan et al., 2021). While banker-directors bring valuable financial expertise, their focus on short-term financial performance and risk management can sometimes conflict with the longer-term goals of ESG initiatives. This tension is particularly evident in the ESG Controversies Score, where the study found that the positive effects of reduced banker-director involvement were less consistent. This variability suggests that the impact of banker-directors on different aspects of ESG performance may depend on several factors, including the specific industry in which the firm operates, the firm’s existing governance structures, and the nature of the regulatory environment (Hasan et al., 2021; Rojo-Suárez & Alonso-Conde, 2023).

The broader implications of these findings are significant for both corporate governance and regulatory policy. They suggest that while banker-directors can play a valuable role in enhancing the financial discipline and risk management practices of non-financial firms, their involvement may need to be carefully balanced with the firm’s broader strategic objectives, particularly in areas such as innovation and sustainability. Policymakers and regulators may also need to consider the potential unintended consequences of regulatory interventions that inadvertently shift the focus of banker-directors away from their governance responsibilities within non-financial firms.

5.4 Implications for Corporate Governance and Financial Regulation

The insights gained from this thesis have significant implications for both corporate governance and financial regulation, emphasising the complexity of improving governance structures in non-financial firms (NFFs) and financial institutions alike. The findings illustrate that while structural reforms such as the Dodd-Frank Act (DFA) mandate important governance mechanisms, such as the creation of risk committees, they may be insufficient if not accompanied by deeper changes in board composition, director expertise, and incentives.

The thesis suggests that board composition, particularly the inclusion of banker-directors, requires a more thoughtful approach. Banker-directors, often celebrated for their financial expertise and discipline, bring invaluable insights into risk management and capital allocation. However, as seen in their influence on R&D investments and ESG performance, these directors also introduce a tendency toward financial conservatism that can sometimes hinder long-term value creation. For instance, their risk-averse nature and potential conflicts of interest can lead to reductions in R&D investment, curtailing innovation in industries where it is critical for sustained competitiveness, such as manufacturing, technology or pharmaceuticals.

Additionally, during periods of regulatory enforcement actions (EAs), the attention of banker-directors shifts toward their financial institutions, unintentionally creating room for firms to reallocate resources toward innovation and long-term initiatives. This dynamic raises questions about the appropriate balance of financial oversight and entrepreneurial risk-taking within boards. As firms face increasing pressure to innovate and integrate sustainability into their core strategies, the presence of banker-directors, while beneficial for financial stability, might need to be balanced with other voices on the board who prioritise long-term growth and sustainability goals.

The thesis also underscores the need for regulatory bodies to go beyond structural reforms like the DFA's risk committee mandate. Policymakers must recognise that simply mandating board-level structures will not yield significant improvements in corporate governance unless these reforms are designed to also enhance the capabilities and incentives of the individuals tasked with governance responsibilities. For example, the DFA's risk committee mandate sought to enhance governance by adding risk management expertise to bank holding companies (BHCs), but the research reveals that director quality did not significantly improve as a result. This suggests that more robust criteria for selecting and motivating directors may be necessary to fully achieve the DFA's objectives.

Further, the thesis highlights an urgent need for diversity in board composition. Diversifying boards with members who possess expertise in ESG and innovation may help balance the conservative tendencies of banker-directors. ESG, once seen as a peripheral concern, has now become central to stakeholder expectations and regulatory frameworks. Banker-directors' financial conservatism, while

beneficial for short-term financial health, may clash with the need to prioritise sustainability initiatives that, though costly in the short term, provide long-term societal and financial benefits. The thesis findings, which show that ESG scores improve when banker-directors are less involved, suggest that firms might need to incorporate directors who are more aligned with sustainability and stakeholder-focused governance to drive better ESG performance.

Finally, this thesis presents broader implications for financial regulation. Policymakers should consider the unintended consequences of governance mandates, such as diverting banker-directors' attention from non-financial firms to their banks during periods of regulatory scrutiny. This finding suggests that while regulatory interventions like enforcement actions, in this case, serve important purposes, they can also shift governance dynamics within firms, leading to both positive and negative outcomes. Regulatory bodies might need to take a holistic approach to governance reform, focusing not only on compliance and risk management but also on fostering long-term value creation through innovation and sustainability.

By recognising that structural changes and regulatory mandates are only part of the solution, firms and policymakers can develop more comprehensive governance models, one that integrates financial discipline with strategic innovation and sustainability goals. This will ensure that firms are not only compliant but also capable of thriving in a rapidly changing business environment.

5.5 Future Research Directions

This thesis has illuminated the complex role of banker-directors within corporate governance, particularly how their influence interacts with regulatory changes like the Dodd-Frank Act (DFA) and Enforcement Actions. However, several areas remain ripe for further exploration that could significantly deepen our understanding of the interplay between corporate governance, regulation, and firm performance.

5.5.1 Industry-Specific Analysis

Future studies could examine how the influence of banker-directors differs across industries. This thesis has focused on a general perspective, but different sectors, such as technology, healthcare, and energy, might experience varying impacts due to industry-specific risk profiles and innovation requirements. Industries with higher R&D intensity or those with substantial ESG concerns, for instance, may demonstrate different board dynamics under banker-directors. This would also address the limitation of generalizing findings across diverse sectors with unique governance challenges.

5.5.2 Longitudinal Studies on Post-DFA Impacts

Although this thesis explores the impact of the DFA on director quality and governance structures, further longitudinal studies are needed to track the evolving effectiveness of these regulations. Research could assess whether the DFA's effects, particularly in enhancing governance, have become more

pronounced or diminished over time. By investigating how governance reforms are implemented and adjusted, scholars can offer insights into the long-term sustainability of such reforms.

5.5.3 Impact of Evolving ESG Standards on Governance and Potential Bias in ESG data

As global ESG standards continue to evolve, further research is required to assess how these changing frameworks influence the role of banker-directors on corporate boards. In particular, scholars should explore how increased regulatory pressure for ESG disclosures and sustainability practices might either align or conflict with the conservative financial outlook often associated with banker-directors. This line of inquiry could inform how boards balance ESG goals with financial prudence in an increasingly stakeholder-focused corporate landscape.

Although this study offers robust evidence on how banker-directors influence ESG performance under regulatory enforcement, several limitations merit acknowledgement. First, potential biases in ESG data pose a measurement challenge. Publicly available datasets often vary in terms of reporting standards and disclosure practices, which can dilute the accuracy of comparative analyses. Moreover, some firms may engage in superficial "greenwashing," potentially inflating their reported ESG metrics without enacting substantial reforms. Second, ESG decision-making is inherently multifaceted, shaped not only by banker-directors' risk aversion but also by board diversity, investor activism, and broader regulatory pressures, factors that this study does not fully capture. Although enforcement actions provide a compelling quasi-experimental context, they predominantly centre on banking-related infractions, which may limit the generalizability of the findings to other regulatory domains. Finally, the enforcement period observed here may not reflect longer-term governance adjustments that emerge once scrutiny subsides, raising questions about the persistence of short-run ESG improvements.

Building on these insights, future research could productively examine a range of open questions. First, scholars might investigate how other director types, such as sustainability officers or industry-specific experts, shape ESG policies relative to banker-directors, an approach that would clarify whether financial expertise exerts a uniquely conservative influence on sustainability outcomes. Second, extending the analysis to capture the long-term effects of temporary banker-director disengagement could reveal whether higher ESG performance persists once enforcement periods end or if firms revert to prior practices. A cross-country comparison might further illuminate how differences in legal frameworks and cultural norms interact with banker-director dynamics, particularly in regions with stronger or weaker ESG mandates. Finally, incorporating qualitative measures, such as board-meeting transcripts, consumer sentiment surveys, or case studies of specific ESG initiatives, could add depth to quantitative data, allowing for a richer understanding of how ESG practices evolve and how financial experts on corporate boards balance short-term risk mitigation against long-term sustainability objectives.

5.5.4 Governance During Periods of Financial Crises

Another potential avenue for future research could involve studying the role of banker-directors during periods of financial or economic crisis. Since banker-directors are often associated with financial conservatism, it would be beneficial to analyse how their presence influences firm resilience during downturns. This could help in understanding whether firms with banker-directors are better equipped to navigate financial turmoil compared to those without such board members.

5.5.5 Risk-Aversion and Firm Performance: A Double-Edged Sword

While this thesis has demonstrated that banker-directors tend to diminish R&D probability and decrease ESG performance, it is essential to consider that these conservative behaviours may, under certain conditions, benefit non-financial firms (NFFs). R&D investments are inherently high-risk activities with uncertain outcomes, and ESG initiatives, while gaining prominence, may not always have a direct or immediate impact on profitability. As a result, the risk-aversion exhibited by banker-directors could actually enhance financial stability and protect shareholder value, especially in firms with lower risk tolerance or those operating in highly competitive or capital-intensive industries.

R&D projects often require substantial upfront costs and long development cycles, with no guarantee of success. By curbing excessive R&D expenditures, banker-directors may help firms avoid over-investing in speculative ventures that could jeopardise short-term financial health. For firms in industries where innovation is not the primary driver of competitiveness, a conservative approach to R&D might align more closely with their strategic goals. In such cases, risk-averse governance can preserve liquidity and ensure that firms are not exposed to undue financial strain, particularly during periods of market volatility or economic downturns.

Similarly, while ESG performance is increasingly seen as a marker of good governance and long-term sustainability, its immediate impact on profitability remains a subject of debate. Banker-directors' conservative stance on ESG initiatives may reflect their focus on maintaining short-term financial performance, ensuring that firms do not over-allocate resources to initiatives that could yield uncertain returns. In industries where ESG considerations are not yet fully integrated into the competitive landscape, this cautious approach could help NFFs maintain a focus on core business operations, particularly if their primary stakeholders prioritise financial outcomes over social or environmental performance.

Future research could further investigate the conditions under which the risk-averse behaviour of banker-directors enhances firm performance. For example, studies could explore whether certain types of NFFs—such as those in mature industries or with stable cash flows—benefit more from conservative governance practices than those in sectors driven by innovation and ESG imperatives. Understanding the nuanced impacts of banker-directors' risk aversion across different firm contexts will be crucial for assessing whether this governance model promotes or hinders long-term value creation.

5.6 Final Thoughts

In conclusion, this thesis provides valuable insights into the intricate interplay between regulatory policies, board composition, and corporate strategic outcomes. By examining director quality after the DFA and the role of banker-directors in shaping R&D investments and ESG performance, the study offers a nuanced perspective on the challenges and opportunities of governance reforms in the post-crisis financial landscape. The findings underscore the importance of a holistic approach to corporate governance that considers both structural and individual factors in enhancing the efficacy of governance practices and ensuring the long-term stability and sustainability of financial institutions.

Appendix A VIF Values for Independent Variables

Table 5-1:Variance inflation factor

Variable Names	VIF	1/VIF
Sales	1.695	0.590
ROA	1.657	0.604
Liquidity	1.503	0.665
Leverage	1.191	0.839
Tobin's Q	1.157	0.865
Solvency	1.117	0.895
Capex	1.080	0.926
Enforcement-linked years	1.034	0.967
Mean VIF	1.304	.

Note: This table presents the Variance Inflation Factor (VIF) values for the independent variables used in the regression model alongside their corresponding inverse (1/VIF). All variables exhibit VIF values well below the threshold of 5, indicating the absence of multicollinearity concerns in the model.

Appendix B Definitions of Variables and VIF

Table 5-2: Definitions of Variables

Variables	Definition	Mean (SD)	Source
Dependent variables			
R&D Selection (0/1)	Dummy variable whether firm undertake R&D in a year or not	0.7530 (0.4313)	Generated
R&D/Sales	R&D intensity =R&D to Sales ratio	0.1130 (0.2213)	Compustat
Explanatory variables			
Sales Growth	Log of sales growth	-1.8213 (1.5222)	Compustat
Sales	Log of sales	5.1115 (2.5169)	Compustat
Liquidity	Current asset to Total Asset=act/at	0.2216 (0.9446)	
Tobin's Q	Tobin's q =((Price close*Common shares Outstanding)+Total asset-Common equity))/Total asset= ((prcc_f*csho)+at–ceq)/at	2.9163 (5.5830)	Compustat
Leverage	Total Debt to Total Asset ratio= dt/at	0.0455 (0.2262)	Compustat
Capex	Capital expenditures to Total Asset = capx/at	0.0485 (0.0459)	Compustat
ROA	Operating income after depreciation to total asset= oiadp/at	-0.0566 (0.6964)	Compustat
Solvency	Earnings before interest and taxes to Interest and related expense/1000 = (ebit/xint)/1000	0.0069 (0.2450)	Compustat

Note: This table presents a comprehensive summary of the critical variables utilised in our study, including both dependent and independent variables. The definitions of each variable are provided, offering clarity on their specific meanings and interpretations within the context of our research. In addition, descriptive statistics, including the mean and standard deviations (in parentheses), are presented for each variable. The "Source" column in Table 1 elucidates the origins of these variables.

Table 5-3:Variance Inflation Factor (VIF)

Variable Names	VIF	1/VIF
Liquidity	3.772	0.265
ROA	2.917	0.343
Leverage	2.787	0.359
Tobin's Q	2.067	0.484
Sales	1.517	0.659
Sales Growth	1.196	0.836
Industry Mean R&D	1.162	0.861
Solvency	1.082	0.924
Enforcement-linked years	1.028	0.973
Capex	1.021	0.979
Mean VIF	1.855	.

Note: Table 11 presents the Variance Inflation Factor (VIF) results, which are used to assess the presence of multicollinearity among the independent variables in the regression model. A VIF score above the commonly accepted threshold of 5 indicates a potential issue with multicollinearity, which could impact the reliability of the regression estimates.

Appendix C Variance Inflation Factor

Table 5-4: Variance Inflation Factor (VIF)

Variable Names	VIF	1/VIF
Roa	3.953	0.253
Tier1 Capital	3.705	0.270
Year after	2.090	0.478
Dodd-Frank (0/1)	1.928	0.519
Treated	1.603	0.624
Loans ratio	1.520	0.658
Bad loans ratio	1.508	0.663
Size	1.442	0.693
Age	1.115	0.897
Female	1.071	0.934
Mean VIF	1.993	.

Table 12 presents the Variance Inflation Factor (VIF) values for the variables included in the regression model. The VIF measures the degree of multicollinearity among the independent variables, with a higher value indicating greater collinearity. A VIF below the threshold of 5 indicates no significant multicollinearity concerns. The table also includes the inverse of the VIF (1/VIF) for each variable.

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