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Contents

GENERAL INTRODUCTION

The global financial crisis of 2007-2008 has prompted a reevaluation of corporate governance practices within banks. Some policymakers and researchers have attributed the failure of various internal corporate governance mechanisms to this crisis (Kirkpatrick, 2009; BCBS, 2010; BGFRS, 2010). Recognizing the crucial role of board oversight in addressing agency problems, several international reform initiatives are underway to improve the corporate governance of banks. However, from a theoretical perspective, it remains unclear whether implementing good governance practices, such as having an independent board, necessarily reduces risk-taking. Corporate governance practices that align managerial incentives with shareholder interests could potentially lead to increased risk-taking, as shareholders' payoffs are restricted on the downside by limited liability.

Furthermore, banks, especially systemically important ones, often enjoy support from the financial safety net during times of distress. Specifically, banks can benefit from explicit state guarantees, such as risk-insensitive deposit insurance, and potential implicit guarantees, in the form of liquidity and capital support that prevent bank failures. This financial safety net effectively provides bank shareholders with a "put option", whose value increases as the riskiness of the bank's assets rises. Moreover, incentives for banks to take on correlated risks increase when state guarantees are more likely to be triggered in the case of multiple bank failures. Consequently, as shareholders seek to shift risk to taxpayers, they can benefit from taking on more systemic and stand alone risks, with additional risk-taking gains increasing with the strength of financial safety nets.

Shareholder incentives to take on greater risks can be opposed by debtholders who tend to be more risk-averse compared to shareholders. Unlike debtholders, shareholders effectively hold a 'call option' on the bank's value with an exercise price equivalent to the total amount of outstanding debt. When a manager invests in a risky project and it succeeds, all benefits accrue to shareholders, while debtholders receive a fixed payment. Conversely, if the project fails, the value of collateral to debtholders decreases, leading to a decline in the value of outstanding debt. In the worst case of the bank going bankrupt, shareholders can simply walk away due to limited liability, thereby transferring all the risk to debtholders (John & Senbet, 1998). This risk-shifting incentive by managers who act in the interest of shareholders has significant governance implications in terms of agency costs of debt, effective monitoring, and the efficiency of managerial incentives. A bank's corporate governance is a key determinant of how this potential conflict between bank shareholders and debtholders to take on risk is resolved.

Acharya et al. (2009) and Mülbert (2009) suggest a hypothetical solution to align the interests of shareholders and debtholders/regulators. Their suggestion aims to encourage board of directors of banks to include directors nominated by/related to banking regulators. Such directors could steer the management away from projects that might seem profitable but are too risky from an overall welfare perspective. The presence of directors nominated by or related to regulators could be particularly relevant for banks in countries where regulatory authorities do not carry out intensive supervision, such as on-site examinations. Among bank stakeholders, bondholders' preferences most closely align with those of supervisors when it comes to exerting direct discipline to prevent banks from taking excessive risks (Flannery & Bliss, 2019). Board positions can be instrumental in improving bondholders' monitoring capabilities, surpassing the effectiveness of loan covenants. This is because the board can exercise oversight by influencing compensation structures and approving corporate strategies, which in turn can help in disciplining management (Byrd & Mizruchi, 2005; Tirole, 2010). Bondholders' interests are closely aligned with supervisors in terms of directly disciplining banks to prevent excessive risk-taking. The board can also evaluate project risk, which is part of its advisory role, and help establish a balance between a bank's risk exposure and its corresponding actions. Kronenberger & Weiskirchner-Merten (2022) have demonstrated that appointing bank representatives to the boards of non-financial firms can serve as a mechanism to curb excessive risk-taking. These bank representatives are directors affiliated with loan-providing commercial banks. Distinguin et al. (2023) have provided empirical evidence that the influence of directors affiliated with bondholders on European banks' boards significantly reduces bank risk without adversely affecting profitability.

This thesis focuses on the impact that the imposition by banking regulators of a quota for having a minimum number of bondholder representatives on the boards of banks can have on the behavior of banks. We focuses on banks, rather than non-financial firms, as improving the corporate governance of banks has emerged as a crucial objective for financial regulatory authorities seeking to promote financial stability by reducing excessive risk-taking.

The first objective of the thesis is to theoretically analyze whether the discipline exercised by bondholder through their representatives can be a tool that complements or substitutes for prudential capital regulation. Our goal is to establish a regulatory framework that enables banking regulators to harness bondholders' market discipline, aligning with the third pillar of the Basel II capital regulations framework. Relying on market discipline can be a cost-effective approach compared to continually adjusting and enforcing complex capital requirements. It leverages the self-interest of bondholders to align their actions with the goal of maintaining a stable and healthy banking system.

The second objective of our work is to empirically examine whether the presence of bondholder representatives on bank boards complements or substitutes banking supervision and regulation. Furthermore, we aim to discern whether the discipline exerted by bondholders, through their representatives, is contingent on the regulatory, legal, and cultural environment of a country. Analyzing how the operational environment influences how debtholder representatives monitor and influence banking risk is pivotal in understanding the effectiveness of a bondholder representatives quota in mitigating excessive risks.

The third objective of this thesis is to theoretically investigate whether the presence of bondholder representatives on bank boards influences their behavior regarding risk reporting, as mandated by supervisors under the Basel II framework. Bondholder monitoring through representatives adds an extra layer of scrutiny, potentially reducing the costs associated with both on-site and in-site controls. Our exploration also aims to ensure that this monitoring activity does not compromise the credit supply from banks, a vital component for a country's economic financing, growth, and employment.

In Chapter 1, we examine whether banking regulators can use the discipline exerted by bondholders through their representation on bank boards (referred to as bondholder representatives from here on) as a complement or substitute for banking regulation. To achieve this objective, we investigate a one-period discrete model in which the regulator chooses between two regulatory frameworks: one that involves solely a minimum capital requirement and another that additionally incorporates a quota mandating a minimum number of bondholder representatives on the bank's board. There is a banking regulator with a dual objective of promoting financial stability by mitigating the risk of bank failure, while simultaneously ensuring the bank's profitability. The bank is undertaking a large-scale lump-sum investment project and is funded by capital from its shareholders and debt from bondholders (uninsured debtholders). Shareholders select the members of the board, except for bondholder representatives if a quota is imposed by the regulator. The board decides on the project risk and chooses a manager's compensation scheme. Shareholders and their board representatives aim to capitalize on the potential benefits associated with project risk (as highlighted in prior works such as Dewatripont & Tirole (1994); Jensen & Meckling (1976)). In contrast, bondholders and their board representatives seek to reduce the likelihood of project defaults. We begin by establishing a framework in which the regulator determines the optimal level of capital requirements in the absence of a quota on bondholder representatives. We then construct a framework where the regulator has the option to impose both capital requirements and a quota for appointing a minimum number of bondholder representatives to the board.

Our analysis demonstrates the optimal levels of capital and risk in these frameworks. We show that when bankruptcy costs are relatively high, the regulator uses the bondholder representative quota as a complement to capital regulation to reinforce financial stability. Although this results in increased expected utility for bondholders, shareholders experience reduced expected utility compared to a framework without a quota on bondholder representatives. Conversely, in scenarios with lower bankruptcy costs, the regulator utilizes the bondholder representative quota to reduce the capital constraint, thereby enhancing bank profits, albeit at the expense of financial stability. Our findings indicate that the regulator does not use the bondholder representatives' quota as a substitute for capital requirements in situations of low bankruptcy costs. In this context, we show that the implementation of a quota on bondholder representatives is associated with higher expected utility for shareholders and, conversely, lower expected utility for bondholders.

Our research complements the existing literature on the effectiveness of bondholders' market discipline, standing out as the first to theoretically establish a framework that considers the bondholder representatives' quota as a regulatory mechanism in complement to capital constraints to mitigate financial instability. Additionally, our paper contributes to the corporate governance literature for banks by emphasizing the potentially crucial role of a bondholder representative quota in addressing the agency problems faced by the various stakeholders relevant to banks. The implications of our study are important for regulators and advocates of corporate governance reform by assessing the effectiveness of market discipline in enhancing regulation to control bank risk-taking.

In Chapter 2, we analyze whether the discipline exerted by bondholders through their representatives on bank boards is contingent on the regulatory, legal environment, and cultural environments of a country. Following prior studies, we identify three factors that could influence the risk-reducing effect of bondholder representatives. These factors include regulatory factors (supervisory power and capital regulation), legal factors (creditor rights and shareholder rights), and national cultural values (individualism/collectivism and long-term orientation/short-term orientation). We capitalize on a unique dataset of board ties between European-listed financial institutions and their bondholders after the implementation of the Banking Recovery and Resolution Directive (BRRD) in 2016. Our data includes information on 105 out of 155 European banks listed on the stock market, as well as 1,381 directors and 82,503 bondholders from 2016 to 2018. We only focus on European banks for two reasons: firstly, bondholders of several European financial institutions, including three Italian banks and Banco Popular in Spain, suffered financial losses after the introduction of the BRRD in 2016. Secondly, a substantial number of European banks have appointed at least one bondholder representative to their board of directors. Our findings on the interaction of the proportion of bondholder representatives and country-specific factors have important implications for corporate governance reforms in the financial sector. Our results indicate that bondholders, through their representatives on bank boards, significantly reduce bank risk, irrespective of the factor (i.e., regulatory, legal environments, and national cultural values). However, the magnitude of this impact varies. It is stronger in the presence of higher capital stringency, creditor rights, shareholder rights, and individualism, while it is weaker in the presence of higher supervisory power and long-term orientation. Our results further show that supervisory power can act as a substitute for the risk-reducing effect of bondholder representatives. Our results are robust to alternative estimation proxies of bank risk and definitions of bondholder representatives.

These results contribute to the growing literature on bondholder monitoring, market discipline, and corporate governance of banks. The study adds to the existing literature on the efficacy of bondholder representatives as a mechanism for strengthening market discipline. It also provides valuable insights for ongoing policy discussions regarding the optimal corporate governance models for banks, particularly in achieving financial stability that benefits all stakeholders. The study emphasizes the potentially vital role that bondholder representatives can play in addressing the complex web of agency issues that affect the various parties involved with banks.

In Chapter 3, we investigate the impact of bondholders, through their representatives on bank boards, on the incentives for banks to accurately report project risk and credit supply. Basel II is built on the idea that banks possess more accurate information about their assets. Therefore, by employing the IRB model, regulators can obtain a more precise estimate of a bank's risk compared to the crude measures in Basel I. However, because banks know that reporting a high level of risk leads to a higher capital requirement, they have an incentive to understate their true risk. Risk-sensitive capital requirements can promote accurate risk reporting if the regulator is capable of gathering precise information on banks' project risk and imposes sanctions on any bank found to have underestimated its true risk.

We address our research question by building a framework based on Spinassou (2013) model. In an adverse selection model, a representative bank is characterized by a board composition that incorporates a quota of directors affiliated with bondholders. The board is tasked with project selection, risk analysis, and reporting the risk to the regulator. The bank faces two categories of projects: (1) keeping assets safe by investing in risk-less projects such government bonds and (2) financing a risky project (granting loan to a firm). The bank uses the IRB model to estimate its project risk and reports. The regulator imposes a minimum capital requirement based on the bank's risk report. The board chooses a level of risk to report that maximizes its expected utility, which is a weighted average of the proportion of shareholders and bondholders' representatives.

Our results indicate that the threshold that incentivizes the bank to truthfully report its project risk decreases as the proportion of bondholder representatives on the bank board increases. The result suggests that the bank's incentives to misreport increase with a greater presence of bondholder representatives on the bank board. Our results also indicate that bondholder representatives on bank boards are associated with lower credit supply. Additionally, we find that the expected utility of the regulator decreases when bankruptcy cost is not excessively high, as the proportion of bondholder representatives increases.

Our paper contributes to the corporate governance literature for banks by emphasizing the potential impact of bondholder representatives on risk reporting and credit supply. The implications of our study are important for regulators in striking the right balance between financial stability and credit supply. Our study fits in an emerging literature that has examined the impact of bondholder representatives on bank boards on credit supply.

Chapter 1

Bondholder Representatives on Bank Boards: Complementing or Substituting Capital Requirements to Mitigate Bank Risk

This paper draws from the working paper "Directors related to debt-holders: a solution to banking sector stability?" co-authored with Carole Haritchabalet and Laetitia Lepetit.

1.1 Introduction

The primary objectives of banking regulation are to ensure prudential practices and promote a safe banking system due to the crucial role banks play as liquidity providers for the economy (Diamond & Dybvig, 1983; Berger & Bouwman, 2009; Chen & Hasan, 2011). Unlike non-financial companies, banks are unique, having leverage exceeding 90 percent (Adams & Mehran, 2003; Berger & Bouwman, 2013; Laeven, 2013; Hopt, 2013; Gornall & Strebulaev, 2018). Since the passage of the Basel Accord in 1988, capital requirements have become the primary tool used by regulators to limit banks' risk exposure. Nevertheless, the ever-increasing complexity and opacity of banks' assets (Flannery et al., 2004; Morgan, 2002), coupled with evolving financial conditions, have rendered reliance solely on capital requirements inadequate in addressing moral hazard issues within banks and ensuring the stability of the financial system (Hellmann et al., 2000).

Over the last two decades, policymakers and researchers embrace the principle of adopting a mix of regulatory discipline and market discipline (Billett et al., 1998; BIS, 2006). The objective is to leverage private investors as monitoring agents to influence and mitigate excessive risk-taking behavior driven by financial safety nets without excessively constraining profit (Flannery & Bliss, 2019). While market discipline was originally introduced as the third pillar in the Basel II capital regulations framework, its primary objective lies in ensuring that banks provide comprehensive information about their operations, empowering market participants to make well-informed assessments of their financial soundness. Consequently, a more accurate descriptor for Pillar 3 might have been "information disclosure" rather than "market discipline" (Flannery & Bliss, 2019). This distinction arises from the fact that the relationship between market and regulatory discipline has not been thoroughly elaborated upon, especially within official documentation. This study aims to address this gap by theoretically determining the optimal regulatory framework capable of effectively integrating capital requirements and market discipline to reduce bank risk while preserving bank profitability.

Among bank stakeholders, bondholders' preferences most closely align with those of supervisors when it comes to exerting direct discipline to prevent banks from taking excessive risks (Flannery & Bliss, 2019).[1] However, Flannery (2001) posits that while bondholders are good at assessing banks' risk, their ability to influence banks' behavior is limited. One of the primary challenges lies in identifying the instruments that are most likely to empower bondholders to effectively influence bank risk-taking behavior, all while ensuring that they do not excessively constrain their profitability. The literature that analyzes the role of debtholders as a market discipline mechanism is not very developed and does not specifically pertain to banks. In his study on incentive conflicts among shareholders, bondholders, and managers, Douglas (2009) posits that bondholders have a direct impact on corporate decisions, albeit without specifying the precise mechanism for this influence. His model demonstrates that bondholders use this influence to dissuade asset substitution and compensation schemes that could potentially encourage managers to underinvest when debtholders stand to benefit the most. Another aspect of theoretical literature highlights two instruments that bondholders can use to actively enforce discipline and mitigate risk. Firstly, debt covenants can mitigate pre-default risks by aligning the interests of shareholders and managers with those of bondholders (Smith Jr & Warner, 1979; Holmström & Myerson, 1983; Colonnello et al., 2021). Ashcraft (2008) provides empirical evidence that bondholders can use covenants to control managers in banks. However, these mechanisms can also lead to suboptimal outcomes and increased default risks, contributing to their infrequent use in debt contracts due to associated costs (Helwege et al., 2017). Moreover, the use of debt covenants in banks, particularly in Tier 2 capital's subordinated bonds, is further restricted as they are not allowed under the initial Basel Accord.[2]

[1]Market discipline comprises two distinct components: market monitoring and market influence (Bliss & Flannery, 2002). Market monitoring, often referred as indirect market discipline, pertains the hypothesis that investors are able to detect changes in a bank's risk condition and incorporate them into security prices. On the other hand, market influence, also known as direct market discipline, refers to investors' ability to induce changes in the risk-taking behavior of banks.

[2]Banks are required to meet regulatory capital standards, which encompass two components: Tier 1 and Tier 2 capital. Tier 1 serves as going-concern capital, absorbing losses as they happen, and consists of common stock, retained earnings, disclosed reserves, and non-redeemable non-cumulative preferred stock. Tier 2 capital functions as gone-concern capital, absorbing losses in the event of bank failure before depositors and general creditors, and includes undisclosed reserves, asset revaluation reserves, and subordinated debt under specific conditions (Basel Committee on Banking Supervision, 2020).

An alternative instrument for bondholders to exert influence over managerial decisions is through board representation. Board positions have the potential to facilitate bondholders monitoring that exceeds the efficacy of loan covenants. This enhanced oversight stems from the board's capacity to discipline management through its influence on compensation structure and the approval of corporate strategy (Byrd & Mizruchi, 2005; Tirole, 2010). Evaluating project risk falls within the purview of the board's advisory role, enabling the establishment of an equilibrium between the bank's risk exposure and the corresponding expected profit (Larcker & Tayan, 2020; OECD, 2015). In line with this argument, Kronenberger & Weiskirchner-Merten (2022)'s theoretical framework demonstrates that when non-financial firms appoint bank representatives to their boards, i.e. directors affiliated to loan-providing commercial banks, it acts as a mechanism to curb excessive risk-taking. As a result, this leads to a decrease in expected managerial compensation and borrowing costs, ultimately enhancing shareholder value. However, Güner et al. (2008) and Dittmann et al. (2010) provide empirical evidence that having bank representatives on the board of non-financial firms is associated with lower profitability. This is because these affiliated directors tend to prioritize the interest of their bank when there are divergence between shareholders' and debtholders objectives. Within the banking industry, Distinguin et al. (2023) provide empirically evidence showing that the influence of directors affiliated to bondholders on European bank boards significantly reduces bank risk without adversely affecting profitability.

Our paper contributes to this literature by theoretically examining whether banking regulators can use the discipline exerted by bondholders through their representation on bank boards (referred to as bondholder representatives from here on) as a complement or substitute for banking regulation. To the best of our knowledge, we are the first to investigate whether a banking regulator can, in addition to or as an alternative to capital requirements, require shareholders to appoint a minimum number of bondholders representatives to mitigate the risk of bank failure while maintaining profitability.

Our aim is to establish a regulatory framework that would enable banking regulators to use the market discipline of bondholders to mitigate excessive risk-taking behavior, as it was originally introduced as the third pillar in the Basel II capital regulations framework. To achieve this objective, we investigate a one-period discrete model in which the regulator chooses between two regulatory frameworks: one that involves solely a minimum capital requirement and another that additionally incorporates a quota mandating a minimum number of bondholder representatives on the bank's board. The social objectives of the regulator encompass preserving financial stability by mitigating the risk of bank failure, while simultaneously ensuring the bank's profitability. The bank is undertaking a large-scale lump-sum investment project and is funded by capital from its shareholders and debt from bondholders (uninsured debtholders). Shareholders select the members of the board, except for bondholder representatives if a quota is imposed by the regulator. The board makes a decision on the project risk and chooses a manager's compensation scheme. The manager implements the project under moral hazard by selecting an unobservable productive effort. The shareholders and their board representatives aim to capitalize on the potential benefits associated with project risk (as highlighted in prior works such as Dewatripont & Tirole (1994); Jensen & Meckling (1976)). In contrast, the bondholders and their board representatives seek to reduce the likelihood of project defaults.

We begin by establishing a framework in which the regulator determines the optimal level of capital requirements in the absence of bondholder representatives quota. Our analysis demonstrates that the board's choice of project risk decreases as the regulator imposes higher capital requirements. This outcome aligns with prior theoretical research, which has shown that capital requirements effectively curtail bank risk-taking (Holmstrom & Tirole, 1997; Santos, 1999; Hellmann et al., 2000; Chiesa, 2008; V. V. Acharya, 2003). Considering the regulator's expected utility, which is negatively affected by the risk of default and positively influenced by the bank's expected profit, we determine that there exists an optimal level of capital requirements that ensures a balance between bank profit and financial stability.

We then construct a framework where the regulator has the option to impose both capital requirements and a quota for appointing a minimum number of bondholder representatives to the board. Our model demonstrates that the optimal framework for the regulator is to implement both a capital constraint and a quota enforcing a minimum number of bondholder representatives on the bank's board.

Our model therefore demonstrates that the optimal decision for the regulator is to implement a comprehensive framework integrating both a capital constraint and a debtholder representatives quota. Through the comparison of the optimal levels of capital and risk in these frameworks, we show that when bankruptcy costs are relatively high, the regulator uses the debtholder representative quota as a complement to capital regulation to reinforce financial stability. Although this results in increased expected utility for bondholders, shareholders experience reduced expected utility compared to a framework without a quota on debtholder representatives. Conversely, in scenarios with lower bankruptcy costs, the regulator utilizes the debtholder representatives quota to reduce the capital constraint, thereby enhancing bank profits, albeit at the expense of financial stability. Our findings indicate that the regulator does not therefore use the debtholder representatives quota as a substitute for capital requirements in situations of low bankruptcy costs. In this context, we show that the implementation of a quota on debtholder representatives is associated with higher expected utility for shareholders and, conversely, lower expected utility for bondholders.

Our research complements the existing literature on the effectiveness of bondholders' market discipline, standing out as the first to theoretically establish a framework that considers the bondholder representatives quota as a regulatory mechanism in complement to capital constraints to mitigate financial instability. Additionally, our paper contributes to the corporate governance literature for banks by emphasizing the potentially crucial role of a bondholder representatives quota in addressing the agency problems faced by the various stakeholders relevant to banks. The implications of our study are important for regulators and advocates of corporate governance reform by assessing the effectiveness of market discipline in enhancing regulation to control bank risk-taking. Firstly, recognizing the challenges posed by increasingly complex and large banking organizations, financial regulators seek additional tools beyond the standard supervisory toolkit. Our model demonstrates that a regulatory framework combining a capital constraint and a debtholder representatives quota can contribute to enhancing financial stability. Secondly, our study responds to the highlighted failure of internal governance mechanisms as a significant factor in the global financial crisis of 2008. Recommendations from entities like the BCBS (2010), OECD (2010), and the European Union (2010) emphasize that the corporate governance of banks should aim to enhance the welfare not only of shareholders but also of debtholders and regulators. Similarly, the International Monetary Fund (2014, p.7) suggests studying the potential merits and consequences of including representation for debtholders on bank boards. Our research demonstrates that imposing a debtholder representatives quota alongside capital requirements allows for the consideration of both shareholder and bondholder interests, contributing to improved financial stability, particularly in contexts where bankruptcy costs are relatively high.

The rest of the paper proceeds as follows. Section 2 describes the model. Section 3 introduces the framework when the regulator only implements a capital constraint. Section 4 presents the framework combining a capital constraint and a debtholder representatives quota. Section 5 compares the two frameworks. Section 6 concludes.

1.2 Model description

1.2.1 Setup

We consider a representative bank that faces an investment project that generates an observable risky outcome $x \geq 0$. The board of directors of the bank appoints a manager to execute a large-scale project, which, for the sake of simplicity, we standardize to a lump-sum of 1. To finance the project, the bank is required to invest a capital amount K in addition to an uninsured debt amount $(1 - K)$ borrowed from the market, specifically from bondholders. To simplify the model, the insured amount of debt is normalized to zero.[3] The capital K is determined by the minimum capital adequacy standard imposed by the regulator. This requirement is costly for the bank as there is an opportunity cost of capital $\tau > 1$. The regulator determines the regulatory framework with the dual social responsibility of both minimizing the likelihood of bank defaults and their subsequent negative externalities, while also taking into account the welfare of bank shareholders by maximizing bank profits, akin to the approach outlined in Dell'Ariccia & Marquez (2006). The failure of a bank leads to a social cost λ. This cost encompasses the overall impact on society including negative externalities that can adversely affect the economy, affecting not only debtholders

[3] As our objective is to investigate how the regulator can employ market discipline from debtholders as a supplementary or complement tool to capital regulation, we have focused our analysis on the role of bondholders not benefiting from deposit insurance coverage. The presence of depositors insured by a deposit insurance system in the model would not change the qualitative results of the paper.

but potentially spreading to other banks (contagion effects) and causing disruptions within the payment system. We assume that the weight α the regulator puts on bank profit and $(1-\alpha)$ on financial stability are exogenous and determines by the government, reflecting its preferences for fostering the stability of the banking system over shareholder interests.

To initiate the project, the bank must secure a borrowing of $(1-K)$ from bondholders at a gross interest rate ρ. We capture the idea that bank capital is a costly form of funding by assuming that $\tau > \rho$ as in Hellmann et al. (2000) and Dell'Ariccia & Marquez (2006). Without loss of generality, we assume that there is a competitive debt market. In this context, several prospective lenders compete to issue a debt to the bank. If the most attractive debt offer made a positive profit, the bank could turn to an alternative lender and offer to switch for a slightly lower interest rate. Therefore, the expected rate of return ρ is normalized to 0 as in Tirole (2010) (equivalent to the risk-free interest rate).

The project undertaken by the bank yields an observable outcome x with three possible outcome realizations: high (x_H), medium (x_M), and low (x_L). The three possible outcome realizations enable us to disentangle the board's influence on the project's risk within our discrete model. The definition, probabilities of these outcomes, and assumptions follow Kronenberger & Weiskirchner-Merten (2022). We assume that $x_H = x_M + \mu$, $x_L = x_M - \mu$ with $x_M \geq \mu > 0$. The parameter μ describes a symmetric outcome structure, which simplifies the analysis. The probabilities for potential outcomes are given as:

$P[x = x_H] = (1-\theta p)/2 - \theta^2 r + e$

$P[x = x_M] = (\theta p + \theta^2 r)$

$P[x = x_L] = (1-\theta p)/2 - e$

For the probability functions to remain non-negative, we assume that $p \in (0,1)$, $r \in (0, (1-p)/2)$, and $e \in (0, (1-p)/2)$. Four elements determine the probabilities of possible outcomes. The first element, represented by the parameter $\theta \in [0,1]$, reflects the project risk level determined by the board of directors in consideration of the regulatory capital requirement. A value of θ close to 0 indicates a high level of risk, whereas θ close to 1 implies a low level of risk. As θ increases, the likelihood of both high and low project outcomes rises, while concurrently reducing the probability of achieving a medium project outcome. The second element is the manager effort e. The manager is entrusted with the responsibility of overseeing the day-to-day operations of the bank. This includes tasks like monitoring and auditing clients' financial records, upholding exceptional customer service standards, and addressing any client complaints or concerns. The manager exerts a non-observable effort e to carry out these tasks that influences the outcome probabilities. The manager's effort e decreases the probability of low outcomes while increasing the probability of high outcomes. The third element, the parameter p, captures the influence of market conditions, such as economic growth and loan market demand and supply. Lastly, the parameter r represents industry-specific characteristics (e.g., volatility, profitability, firm growth, R&D expenditures, etc.). The board can not choose the parameters p and r which impact the outcome probabilities as in Kronenberger & Weiskirchner-Merten (2022), by setting project risk θ, the board does influence their impact on the project.

Throughout the model, we assume that there are sufficient funds to cover full debt payment when the project is successful, i.e., when the outcome is either x_M or x_H. Conversely, when the low outcome x_L is realized, the bank cannot repay all of its debt as $x_L = x_M - \mu < 1 - K$.

In the following sections, we describe the roles assumed by the three risk-neutral players in the model: the board of directors, the manager and the regulator.

1.2.2 The board of directors

The role of the board of directors is to oversee the efficient functioning of the bank's management and decision-making processes. One of its core duties is to define the manager's compensation payments w. Additionally, the board is responsible for determining the level of project risk θ, while considering the regulatory capital requirement constraint K. We assume without loss of generality that the maximum payoff a director can receive is 0.

The board's structure defines its utility. In cases where the regulator imposes no constraints on the appointment of board members, shareholders choose directors to protect their interests, specifically to determine the optimal level of risk that will maximize the bank's profits. In this scenario, the expected utility function of the board of directors $E\left[U_{BoD}|\theta\right]$ aligns with that of the shareholders $E\left[U_S|\theta\right]$ (bank profit) with

$$E\left[U_S|\theta\right] = E\left[\max\left\{x - w - \left(1 - K\right), 0\right\}\right] \tag{1}$$

We assume that the regulator holds the authority to mandate the inclusion of bondholder representatives in board nominations. The regulator's objective in implementing a quota for a minimum representation of bondholders is to reduce the risk of default. Shareholders have strong incentives to favor risky investments, especially in highly leveraged firms like banks to exploit the upside benefit of risky projects. In contrast, bondholders prefer a risk level that ensures the complete repayment of their debt upon the project's conclusion. Following Hermalin & Weisbach (1998), we assume that the preferences of individual directors can be aggregated into a single (collective) utility function. Consequently, the utility of the board of directors in the presence of both shareholder and bondholder representatives is as follows

$$E\left[U_{BoD}|\theta\right] = \beta E[U_D|\theta] + (1-\beta)E[U_S|\theta] \tag{2}$$

where β is the proportion of bondholder representatives mandated by the regulator, and $E[U_D|\theta]$ denotes the expected utility function of bondholders defined as follows

$$E[U_D|\theta] = \left(\frac{1+\theta p}{2} + e\right)(1-K) + \left(\frac{1-\theta p}{2} - e\right)(x_M - \mu) \tag{3}$$

The higher the quota of bondholder representatives β, the stronger their weight on the board's utility. Since the shareholders' objective is to maximize profits, they would not, without regulatory constraints, choose to appoint bondholder representatives, as this could potentially reduce the bank's profitability. However, the imposition of a quota for bondholder representatives within a regulatory framework, either in addition to or as a substitute for capital requirements, may not necessarily decrease profits if accompanied by a reduction in the regulatory capital level.

1.2.3 Manager's compensation scheme

The manager is responsible for implementing the investment project. The board of directors fix the managerial compensation scheme that the manager receives for effort supply e. The manager receives w_H, w_M, or w_L for a high, medium, and low realized outcome, respectively. The manager implements the project by choosing either a high effort e_h or a low effort e_l, and the effort level is not observable by board members. We assume that $e_h > 0$, and without loss of generality, we normalize e_l to 0. Low effort causes no cost to the manager while producing a high effort implies a positive cost, defined as $C(e_h) = c$. We normalize the manager's reservation utility $\underline{U}$ to 0.

Assuming that the board wants to induce a high effort from the manager, the board designs a compensation scheme that satisfies the following constraints:

(IC) $E\left[U_M|e_h\right] \geq E\left[U_M|e_l\right]$

(PC) $E\left[U_M|e_i\right] \geq 0$ with $i \in \{l, h\}$

(LLC) $w_j \geq 0$ with $j \in \{H, M, L\}$

where $E\left[U_M|e_j\right]$, $j \in \{h, l\}$ is the expected utility of the manager given their effort. The incentive compatibility constraint (IC) ensures that it is optimal for the manager to choose $e = e_h$. The participation constraint (PC) requires that the manager's expected utility from accepting the contract is at least as high as the reservation utility. The limited liability constraints (LLC) say that the manager receives non-negative payments. The incentive compatibility constraint writes

$$\begin{aligned} & (\frac{1-\theta p}{2} - \theta^2 r + e_h)w_H + (\theta p + \theta^2 r)w_M + ((1-\theta p)/2 - e_h)w_L - c \\ \geq \; & (\frac{1-\theta p}{2} - \theta^2 r + e_l)w_H + (\theta p + \theta^2 r)w_M + (1-\theta p)/2)w_L \end{aligned} \tag{4}$$

Simplifying Eq (4), we obtain:

$$w_H - w_L \geq \frac{c}{e_h} \tag{5}$$

All compensation schemes that satisfy Eq (5) induce the manager to provide high effort. As the board wants to minimize the manager compensation, they choose $w_L = 0$ and $w_M = 0$ (that satisfy the PC and LLC constraints). We then have $w_H = \frac{c}{e_h}$. Therefore, the expected utility of the manager given high effort e_h is

$$E[U_M|e_h] = \left(\frac{1-\theta p}{2} - \theta^2 r + e_h\right)\frac{c}{e_h} - c \tag{6}$$

The derivative of Eq (6) with respect to θ shows that the manager's expected utility is increasing (lower θ) in project risk

$$\frac{\partial E[U_M|e_h]}{\partial \theta} = -\left(\frac{p}{2} + 2\theta r\right)c < 0 \tag{7}$$

Throughout the rest of the paper, we make the assumption that the board wants that the manager induces a high effort. High effort is associated with higher expected utility for the manager, an increased probability of high state outcome that benefits shareholders, and a decreased probability of low state outcome that benefits bondholders.

1.2.4 Regulator's objective function

The regulator operates under a predefined social objective, which represents the tasks mandated by the government or society. This social objective encompasses the preservation of both banking sector stability and bank profitability, as in Dell'Ariccia & Marquez (2006). Specifically, the regulator's role is to ensure the stability of the financial system to the extent that a bank's insolvency incurs a social cost λ, all while safeguarding the bank's profitability. The expected utility of the regulator is defined as follows

$$E\left[U_R|\theta\right] = \alpha E\left[U_S|\theta\right] - (1-\alpha)\lambda\left(\frac{1-\theta p}{2} - e_h\right) \tag{8}$$

where α and $(1-\alpha)$ represent the government's prioritization of bank profitability and financial stability, respectively; $E\left[U_S|\theta\right]$ represents expected utility of shareholders; and $\left(\frac{1-\theta p}{2} - e_h\right)\lambda$ represents the expected social cost borne by the regulator in the event of a bank failure.

The regulator's primary objective is to maximize profit while minimizing the probability of default. To achieve these objectives, two distinct regulatory frameworks are available. Firstly, the regulator implements solely a capital constraint. Under this framework, the regulator imposes on the bank to hold a specific amount of capital K. In other words, capital requirements compel banks to maintain a designated level of capital. It aims to reduce shareholders' preference for excessive risk-taking induced by leverage. Specifically, the required capital aims to optimize the bank's profit benefiting shareholders, while simultaneously mitigating the risk of default to protect bondholders' interests.

Secondly, the regulator has the option to implement a minimum capital requirements alongside a quota β to ensure a minimum number of bondholder representatives on the board. Through the establishment of a bondholder representatives quota, the regulator ensures that the interests of bondholders are directly represented in the bank's decision-making processes, alongside those of shareholders. This approach could effectively align the objective of promoting the well-being of all stakeholders while reducing the risk of bank default.

Our first objective is to assess the optimality of the regulator imposing a regulatory constraint solely on capital or, alternatively, combining it with a bondholder representatives quota. Subsequently, we can compare these two regulatory frameworks to discern whether the two tools are complementary or substitutes and identify which one provides greater benefits for all stakeholders involved.

1.3 Framework with capital requirements

In this section, we determine the level of risk selected by the board of directors and the regulator's optimal capital requirement level in the absence of a bondholder representatives quota.

1.3.1 Capital requirements and risk levels

The board opts for a risk level θ that maximizes shareholders' utility while complying with the capital constraint K imposed by the regulator

$$\max_{\theta} E[U_S|\theta] = \left(\frac{1-\theta p}{2} - \theta^2 r + e_h\right)\left(x_H - (1-K) - \frac{c}{e_h}\right) + \left(\theta p + \theta^2 r\right)\left[x_M - (1-K)\right] - \tau K \tag{9}$$

The first order condition with respect to θ determining the level of project risk that maximizes the expected utility of shareholders θ_1 is as follows

$$\underbrace{-\frac{p}{2}\left[(1-K) - x_L\right]}_{\text{leverage effect}} \underbrace{-2\theta_1 r \mu}_{\text{risk-return effect}} + \underbrace{\left(\frac{p}{2} + 2\theta_1 r\right)\frac{c}{e_h}}_{\text{effort effect}} = 0 \tag{10}$$

Eq (10) shows how the board's risk decision is shaped by three distinct effects. The "*leverage effect*" highlights that a higher debt level $(1-K)$ increases the incentives of shareholders to opt for a higher level of risk, particularly when the project's return is low, $x_L < (1-K)$. This, in turn, increases the probability of achieving higher returns while increasing the probability of default. The "*risk-return effect*" captures the influence of risk on expected project outcome while the "*effort effect*" reflects its impact on the expected managerial compensation. Higher risk increases the probability of both high outcomes and high managerial compensation. The optimal project risk chosen by the board that maximizes the shareholders' expected utility is

$$\theta_1 = \frac{p}{4r\left(\mu - \frac{c}{e_h}\right)}\left[x_L - (1-K) + \frac{c}{e_h}\right] \tag{11}$$

The optimal project risk θ_1 is an interior solution when the manager's cost to produce a high level of effort c is not excessively high. If c is excessively high, it implies a corresponding increase in the manager's compensation as $w_H = \frac{c}{e_h}$, with all benefits from high project outcome directed toward the manager. In this scenario, the "*effort effect*" dominates the "*risk-return effect*" and "*leverage effect*". Consequently, shareholders, aiming to minimize the manager's compensation, opt for the lowest risk by setting $\theta_1 = 1$, or by inducing low effort from the manager. For simplicity, we focus on the case where θ_1 is an interior solution. Subsequently, we make the assumption that the cost to the manager for producing high effort is not excessively high, with $c < \overline{c}$, with $\overline{c} = \frac{e_h[4r\mu+(1-K)-x_L]}{p+4r}$.

The board's choice of the optimal risk level is contingent upon the minimum regulatory capital requirement K mandated by the regulator.

Lemma 1 *The optimal risk decreases (higher θ_1) as the regulatory capital requirement increases.*

Proof: See the appendix.

The optimal risk level, θ_1, decreases with an increase in capital requirements. This finding aligns with the existing literature showing that higher capital requirements results in shareholders having more of their own funds at stake, thereby reducing their incentives for undertaking excessive risk (see, Admati et al. (2013)). More, specifically, higher capital requirements mitigate the impact of the "*leverage effect*" within the risk function, which in turn decreases overall risk. The imposition of higher capital requirements acts as a mechanism to enhance financial stability by mitigating incentives for excessive risk-taking.

1.3.2 Optimal capital requirements

The regulator maximizes its expected utility by imposing a level of required capital that balances between maximizing profit and minimizing the risk of default. The optimization of Eq (8) leads to the following result

Proposition 1 *There exists a level of capital requirement K^* that maximizes the expected utility of the regulator, with*

$$K^* = 1 - x_L - \frac{c}{e_h} - \left(\frac{1-\alpha}{\alpha}\right)\lambda + \frac{8r}{p^2}\left[\tau - \frac{1}{2} - e_h\right]\left(\mu - \frac{c}{e_h}\right) \tag{12}$$

Proof: See the appendix.

The optimal level of capital requirement K^* strikes a balance between bank profit and financial stability. By imposing K^*, the regulator aims to increase the bank's resilience and its capacity to withstand adverse events, thereby contributing to the overall stability of the financial system. The determination of K^* is influenced by social costs of bankruptcy λ, the manager's cost of supply high effort c, the cost of capital τ, and the three parameters influencing outcome probabilities (p, r and μ).

Corollary 1 *The optimal capital requirement level K^* decreases with an increase in the social cost of bankruptcy λ, the cost of supply high effort c, or the economic parameter p, and increases with an increase in the cost of capital τ, the industry-specific parameter r, or the project outcome difference μ.*

Proof: See the appendix.

Therefore, we highlight that the optimal level of regulatory capital is higher when the cost of capital is higher and, conversely, lower when bankruptcy costs are higher. This may seem counterintuitive, considering that a higher cost of capital reduces the bank's profit and, consequently, the regulator's expected utility. Conversely, higher bankruptcy costs decreases the regulator's expected utility (see Eq (1)). These results are explained by the impact of the cost of capital and bankruptcy costs on the level of risk chosen by the board when the regulator imposes a capital constraint. For a capital requirement K^*, given θ_1 (Eq (11)), the project risk the board sets gives

$$\theta_1\left(K^*\right) = \frac{p}{4r\left(\mu - \frac{c}{e_h}\right)}\left(\frac{\alpha-1}{\alpha}\right)\lambda + \frac{2}{p}\left[\tau - \frac{1}{2} - e_h\right] \tag{13}$$

The derivative of $\theta_1\left(K^*\right)$ with respect to λ shows that project risk increases (lower $\theta_1\left(K^*\right)$ as the social cost of bankruptcy increases. On the contrary, the derivatives with respect to τ shows that project risk decreases (higher $\theta_1\left(K^*\right)$) when the cost of capital increases.

Furthermore, the board's choice of the optimal risk level when the regulator imposes a capital requirement of K^* relies not only the cost of bankruptcy λ and cost of capital τ, but also on the three parameters influencing outcome probabilities (p, r and μ), as outlined below:

Lemma 2 *The optimal risk decreases (higher $\theta_1(K^*)$) with an increase in the cost of capital τ or industry-specific parameter r or project outcome difference μ, while it increases with an increase in the social cost of bankruptcy λ or the manager's cost of supplying effort c or the economic parameter p.*

Proof: See the appendix.

1.4 Framework with capital requirements and a bondholder representatives quota

We now determine both the risk level sets by the board of directors and the optimal capital requirement imposed by the regulator within a framework that introduces a bondholder representatives quota alongside the capital regulatory constraint.

1.4.1 Level of risk

The board, with a proportion of bondholder representatives β, selects a risk level θ_β that maximizes its expected utility, as described in Eq (2). The first-order condition with respect to θ_β determines the optimal risk level that maximizes the board's utility , given a required capital K, as follows

$$\underbrace{\beta\frac{p}{2}\left[(1-K)-x_L\right]}_{\text{bondholder effect}}+(1-\beta)\left[\underbrace{-\frac{p}{2}\left[(1-K)-x_L\right]}_{\text{leverage effect}}\underbrace{-2\theta_\beta r\mu}_{\text{risk-return effect}}+\underbrace{\left(\frac{p}{2}+2\theta_\beta r\right)\frac{c}{e_h}}_{\text{effort effect}}\right]=0 \quad (14)$$

When setting the project risk, the board of directors faces the task of balancing the interests of both bondholders and shareholders. The board's decision is still influenced by the three effects highlighted earlier, namely the "*leverage effect*", "*risk-return effect*", and "*effort effect*". Additionally, a new factor comes into play, the "*bondholder effect*", representing the incentives of bondholders to advocate for low-projects risk as they are associated with a lower probability of default. By advocating for low projects risk, they seek to ensure a higher probability of full repayment of the bank's outstanding debt. The optimal risk that maximizes the board utility is

$$\theta_\beta = \frac{p}{4r\left(\mu - \frac{c}{e_h}\right)}\left[x_L - (1-K) + \frac{c}{e_h}\right] + \frac{p}{4r\left(\mu - \frac{c}{e_h}\right)}\left[\frac{\beta}{1-\beta}\left[(1-K) - x_L\right]\right] \tag{15}$$

The optimal risk function θ_β can be divided into two parts. The left-hand side is equal to θ_1, the optimal project risk under the capital requirement framework (see Eq(11)), wherein the "*leverage effect*", "*risk-return effect*", and "*effort effect*" come into play. The right-hand side of Eq (15) represents the "*bondholder effect.*" Specifically, a stronger influence of bondholder representatives, i.e., a higher quota β, results in a decrease in project risk. This underscores the significant role played by the composition of the board, particularly the imposition of a quota on bondholder representatives, in determining the optimal risk level

Lemma 3 *The optimal risk decreases (higher θ_β) as the quota of bondholder representatives on the board β increases.*

Proof: See the appendix.

Bondholder, represented by their representatives on the board of directors, are strongly incentivized to take actions that reduce the probability of default, as low-return projects result in no debt repayment ($x_L < (1-K)$). An effective strategy to achieve this objective is to work towards reducing project risk, thereby increasing the probability of full debt repayment.

In the regulatory framework with a sole capital constraint, we have shown that the level of risk decreases with increased capital requirements (refer to Lemma 1). In the regulatory framework that integrates both available tools, the impact of capital on risk is contingent upon the level of the bondholder representatives quota

Lemma 4 *The impact of regulatory capital on risk depends on the proportion of bondholder representatives on the board:*

- *If $\beta < \frac{1}{2}$, the optimal risk decreases (higher θ_β) as the regulatory capital requirement increases*

- *If $\beta > \frac{1}{2}$, the optimal risk increases (lower θ_β) as the regulatory capital requirement increases*

- *If $\beta = \frac{1}{2}$, the regulatory capital requirement has no impact on the optimal risk.*

Proof: See the appendix.

The model shows that the risk-reducing effect of higher capital requirements is effective only when the quota imposes a proportion of bondholder representatives that is not high ($\beta < \frac{1}{2}$). As explained above, a higher capital level increases shareholders investment in the project and reduces the "*leverage effect*". As shareholders take on a larger share of the downside risks in the event of bankruptcy, a higher value of K diminishes their incentives to take on additional risk. When $\beta < \frac{1}{2}$, shareholder representatives dominate the board and tend to opt for lower risk for higher capital levels. Conversely, when the quota imposes a proportion of bondholder representatives that dominates the board ($\beta > \frac{1}{2}$), higher capital leads to increased risk. Bondholders inherently prefer lower risk to minimize the probability of default. However, if higher capital requirements increases the probability of a full debt payment across all scenarios, bondholders have fewer incentives to closely monitor the bank for lower risk, potentially resulting in higher risk. In the case where $\beta = \frac{1}{2}$, an increase in capital has no impact on risk, as the influence of bondholders on the board precisely counterbalances the influence of shareholders.

The implementation of a quota on bondholder representatives also affects the expected bank profit.

Lemma 5 *The expected bank profit decreases as the proportion of bondholder representatives on the bank board increases.*

Proof: See the appendix.

From Eq (14), we see that bank profit increases as project risk rises. In line with Lemma 3, an increased in the proportion of bondholder representatives leads to reduced risk, consequently resulting in lower bank profit. This results is consistent with the findings of Dittmann et al. (2010) and Güner et al. (2008), who find that the presence of creditors on firms' boards has adverse effects for shareholders.

1.4.2 Optimal levels of capital requirements and bondholder representatives quota

The optimization of regulator's expected utility, as per Eq (8), within the framework where the regulator introduces a bondholder representatives quota alongside the capital regulatory constraint leads to the following result

Proposition 2 *There exists a level of capital requirement K_β^* and a quota of bondholder representatives β^* that maximizes the expected utility of the regulator, with*

$$K_\beta^* = 1 - (x_M - \mu) \tag{16}$$

and

$$\beta^* = \frac{p^2 \left[\left(\frac{\alpha}{1-\alpha}\right)\frac{c}{e_h} + \lambda\right] - 8r\left(\frac{\alpha}{1-\alpha}\right)\left[\tau - \frac{1}{2} - e_h\right]\left(\mu - \frac{c}{e_h}\right)}{p^2 \left[\left(\frac{\alpha}{1-\alpha}\right)\frac{c}{e_h} + 2\lambda\right] - 8r\left(\frac{\alpha}{1-\alpha}\right)\left[\tau - \frac{1}{2} - e_h\right]\left(\mu - \frac{c}{e_h}\right)} \tag{17}$$

where $p \in \left(\frac{8r\left(\frac{\alpha}{1-\alpha}\right)\left[\tau - \frac{1}{2} - e_h\right]\left(\mu - \frac{c}{e_h}\right)}{\left(\frac{\alpha}{1-\alpha}\right)\frac{c}{e_h} + \lambda}, 1\right)$

Proof: See the appendix.

Our model demonstrates that the optimal framework for the regulator is to implement a capital constraint K_β^* alongside a quota specifying a proportion β^* of bondholder representatives on the bank's board.The optimal levels of K_β^* and β^* strikes a balance between minimizing the risk of default and maximizing profitability.

The required capital $K_\beta^* = 1 - x_L$ precisely corresponds to the potential losses in total assets when the project return is low, thus being positively influenced by the project outcome differences μ. The optimal value β^* is influenced by bankruptcy costs λ, the manager's cost of supplying high effort c, the cost of capital τ, and the three parameters influencing outcome probabilities (p, r and μ) as follows

Corollary 2 *The optimal capital requirement level K_β^* increases with an increase in the project outcome difference μ.The optimal bondholder representatives quota β^* decreases with an increase in the cost of capital τ, the industry-specific parameter r, or the cost of capital*

τ, and increases with an increase in the social cost of bankruptcy λ, the cost of supply high effort c, or the economic parameter p.

The optimal required capital increases as project outcome differences increases. In other words, the regulator imposes higher capital requirement if potential losses in the bank's assets is higher. The proportion of bondholder representatives increases as the social cost of bankruptcy or the cost of supplying high effort rises. On the other hand, the proportion of bondholder representatives decreases as project outcome differences, the cost of capital, or the industry specific parameter increases.

The project risk the board sets for the level of capital requirement K_β^* and β^*, given θ_β is (see Eq (15))[4]

$$\theta_\beta\left(K_\beta^*, \beta^*\right) = \frac{pc}{4re_h\left(\mu - \frac{c}{e_h}\right)} \tag{18}$$

Unlike the framework in which the regulator relies only on a capital constraint, the optimal risk choice $\theta_\beta\left(K_\beta^*, \beta^*\right)$ is not influenced by the social cost of bankruptcy and the cost of capital. The board's choice of the optimal risk level relies not only on the manager's cost to generate a high level of effort c, but also on the three parameters influencing outcome probabilities (p, r and μ), as outlined below

Lemma 6 *The optimal risk decreases (higher $\theta_\beta\left(K_\beta^*, \beta^*\right)$) with an increase in the economic parameter p or the cost of supply high effort c, while it increases with an increase in the industry-specific parameter r or the project outcome difference μ.*

Proof: See the appendix.

The derivative of $\theta_\beta\left(K_\beta^*, \beta^*\right)$ with respect to λ shows that project risk increases as the social cost of bankruptcy increases. On the contrary, the derivatives with respect to τ shows that project risk decreases when the cost of capital increases. This effectively eliminates the impact of both the "leverage effect" and the "bondholder effect" on project risk setting.

Next, we compare the two regulatory frameworks to determine whether the two regulatory tools are complement or substitute, and which framework provides higher benefit for the different stakeholders at play.

[4] The level of risk $\theta_\beta\left(K_1^*, \beta_1^*\right)$ is similar to the findings of Kronenberger & Weiskirchner-Merten (2022), when firms are able to commit to a project.

1.5 Framework comparison

We demonstrate the optimality of the regulator's choice in adopting a framework that incorporates a quota on debtholder representatives alongside capital requirements. Subsequently, we investigate whether the regulator uses the debtholder representatives quota as a regulatory complement or a substitute to the capital constraint. This is achieved by comparing the optimal level of capital and risk in the two frameworks. A debtholder representatives quota is considered as a substitute for capital requirements if it is associated with both a lower capital level and a reduced risk level compared to the framework solely reliant on a capital constraint. Conversely, a debtholder representatives quota is considered as a complement to capital regulation if it is associated with both a higher capital level and a lower risk level than in a framework without a quota. The comparison of the optimal capital and risk in the two frameworks gives the following results

Proposition 3 *The optimal capital in the framework imposing both a capital constraint and a debtholder representatives quota is lower than in the framework solely reliant on the constraint on capital ($K_\beta^* < K^*$) for $\lambda < \overline{\lambda}$; conversely for $\lambda \geq \overline{\lambda}$, where* $\overline{\lambda} = \left(\frac{\alpha}{1-\alpha}\right)\left[\frac{8r}{p^2}\left[\tau - \frac{1}{2} - e_h\right]\left(\mu - \frac{c}{e_h}\right) - \frac{c}{e_h}\right]$.

Proof: See the appendix.

Proposition 4 *The optimal risk level in the framework imposing both a capital constraint and a debtholder representatives quota is higher than in the framework with solely the capital constraint ($\theta_1\left(K_\beta^*, \beta^*\right) < \theta_1\left(K^*\right)$) for $\lambda < \overline{\lambda}$; conversely for $\lambda \geq \overline{\lambda}$.*

Proof: See the appendix.

When the cost of bankruptcy falls below the threshold $\overline{\lambda}$, the regulator uses the debtholder representatives quota to reduce the capital constraint, considering the costliness for the bank profit to hold more capital. Despite the debtholder representatives quota contributing to risk reduction (ref. Lemma 3), it fails to offset the increase in risk stemming from a reduction in capital. Consequently, the simultaneous reduction of the capital constraint and implementation of a debtholder representatives quota result in a decreased optimal risk level when bankruptcy costs are not excessively high. In this context, the debtholder representatives quota cannot be considered as a substitute for capital; although it allows for the maximization of the regulator's expected utility, it does so at the expense of financial stability. Our model further demonstrates that when the cost of bankruptcy exceeds the threshold $\overline{\lambda}$, the combined impact of the two regulatory tools results in both a higher capital level and a lower risk level than in the framework solely reliant on the capital constraint. Hence, we can infer that the regulator uses the debtholder representatives quota as a complement to the capital constraint when the cost of bankruptcy is relatively high.

We further examine which framework yields greater benefits for both shareholders and debtholders. We find that the implementation of a framework incorporating a debtholder representatives quota positively influences bank profits only for lower values of bankruptcy costs

Proposition 5 *For $\lambda < \overline{\lambda}$, the expected utility of shareholders is higher when the regulator imposes a capital level K^*_β and a bondholder representatives quota β^* compared to a framework with only the constraint on capital K^*; conversely for $\lambda \geq \overline{\lambda}$.*

Proof: See the appendix.

Bank profit is an increasing function of risk. Propositions 3 and 4 show that implementing a framework with both a constraint on capital and a debtholder representatives quota leads to a lower capital level and a higher risk level compared to the framework with only capital requirements when bankruptcy costs are not excessively high. These two effects contribute to an increase in bank profits, driven by higher expected returns associated with increased risk, coupled with lower capital reducing the cost of financing. However, the lower risk level resulting from a more stringent capital constraint and the presence of a debtholder representatives quota when bankruptcy costs are excessively high reduced the expected utility of shareholders compared to the framework without such a quota.

Contrary to expectations, the expected utility of bondholders is not always higher when they have representatives on the board of directors.

Proposition 6 *The expected utility of bondholders is higher in a framework where the regulator imposes a capital level K^*_β and a bondholder representatives quota β^* compared to a* *framework with only the constraint on capital K^* for $\lambda > \overline{\lambda}$; conversely for $\lambda \geq \overline{\lambda}$.*

Proof: See the appendix.

The interest of bondholders and the regulator can differ, as the regulator considers the maximization of bank profit alongside minimizing default risk when determining optimal capital and the bondholder representatives quota. Our model demonstrates that when bankruptcy costs are relatively low ($\lambda < \overline{\lambda}$), the expected utility of bondholders is higher when there is no quota imposing a minimum of their representatives on the board. In this case, the presence of bondholder representatives does not compensate for the risk-increasing effect of the decrease in capital. Bondholder have a higher expected utility in a framework with a quota compared to a framework without a quota only when bankruptcy costs are relatively high ($\lambda < \overline{\lambda}$), resulting in higher optimal capital and lower risk.

In summary, when bankruptcy costs are relatively high, the regulator uses the debtholder representative quota to reinforce the financial stability. While this results in higher expected utility for bondholders, shareholders experience lower expected utility compared to a framework without a quota on debtholder representatives. Conversely, for lower bankruptcy costs, the regulator utilizes the debtholder representatives quota to decrease the capital constraint, thereby boosting bank profits, albeit at the expense of financial stability. In this case, the implementation of a quota on debtholder representatives is associated with higher expected utility for shareholders and, conversely, lower expected utility for bondholders.

1.6 Conclusion

This paper aims to theoretically determine whether it is optimal for a regulator to consider the discipline exerted by bondholders through their representation on bank boards as a substitute or a complement to capital requirements in order to limit the risk of bank default. We explore a one-period discrete model where the regulator selects between two regulatory frameworks. One framework impose only a minimum capital requirement, while the other combines this requirement with a quota that mandates a minimum number of bondholder representatives on the bank's board. The regulator's social objectives encompass the preservation of financial stability by reducing the risk of bank failure, all the while ensuring the bank remains profitable.

Our model demonstrates that the optimal regulatory framework integrates both a capital constraint and a debtholder representatives quota. By comparing the optimal levels of capital and risk in the two frameworks available to the regulator, we show that in situations with high bankruptcy costs, the regulator utilizes the debtholder representative quota as a complement to capital regulation, reinforcing financial stability. Conversely, in scenarios with lower bankruptcy costs, our findings indicate that the regulator does not substitute the debtholder representatives quota for capital requirements. Instead, they use the debtholder representatives quota to reduce the capital constraint, resulting in increased risk and enhanced bank profits, albeit at the expense of financial stability.

We additionally show that shareholders experience reduced expected utility in a framework with a debtholder representatives quota compared to a framework without such a quota in situations with high bankruptcy costs. Conversely, their expected utility increase when bankruptcy costs are relatively low. Contrary to expectations, the expected utility of bondholders is not always higher in a regulatory framework with a bondholder representatives quota. Their expected utility is only higher when there is a quota compared to a framework without quota in situations with high bankruptcy costs. Otherwise, they prefer a framework where only a capital constraint is implemented in situations with low bankruptcy costs.

Our research yields crucial policy implications. Firstly, in scenarios where the costs associated with bank failures are relatively high, the influence of market discipline exerted by bondholders, facilitated through their representatives on bank boards, emerges as a complement to regulatory capital for enhancing financial stability. The 2007-2008 crisis demonstrated how high the costs associated with bank failures are. In this context our results underscore the significance of Pillar 3 of the Basel 2 and 3 accords, emphasizing the role of market discipline alongside supervisory measures.

Secondly, our findings contribute significantly to the ongoing policy discussions concerning the most effective forms of corporate governance in banks for ensuring financial stability. Traditional corporate governance, primarily centered on shareholder interests, often overlooks the unique features of banks. This discrepancy is acknowledged in proposals by authoritative bodies like the BCBS (2010) and the European Union (2010), which advocate for differentiated corporate governance of banks from those of non-financial firms. The aim is not only to enhance shareholder welfare but also to consider the interests of debtholders and regulators. The IMF (2014) suggests that board representation for debtholders could enhance monitoring, underscoring the need for careful analysis before implementation. Our study addresses this need by demonstrating that the inclusion of bondholder representatives on bank boards is an effective way to reduce excessive bank risk-taking when bankruptcy costs are relative high. Therefore, the presence of bondholder representatives could allow for bank board structures that more adequately represent bondholders' interests, leading to better alignment with regulators' objectives as a consequence. However, our study shows that a simple recommendation to include bondholder representatives will not be sufficient; it is necessary for the regulator to mandate the implementation of a quota to ensure a minimum number of bondholder representatives. Firstly, shareholders will have an interest in appointing directors representing bondholder interests only under the condition that it increases their utility. Similarly, bondholders will have an interest in being represented on the board only when it increases their utility. Given our results and the opposing interests of shareholders and bondholders, not imposing a quota would mean never having bondholder representatives on the boards of banks.

Appendix

Proof of Lemma 1: The derivative of Eq (11) with respect to K is

$$\frac{\partial\theta_1}{\partial K} = \frac{p}{4r\left(\mu - \frac{c}{e_h}\right)} > 0 \tag{19}$$

The optimal project risk decreases (higher θ_1) as the level of capital requirement increases.

Proof of Proposition 1: For easy manipulation, we establish some identities. We decompose Eq (11) into:

$$\theta_1 = \underbrace{\frac{p}{4r\left(\mu - \frac{c}{e_h}\right)}\left[x_L - 1 + \frac{c}{e_h}\right]}_{\theta_1^{K=0}} + \underbrace{\frac{p}{4r\left(\mu - \frac{c}{e_h}\right)}}_{\frac{\partial\theta_1}{\partial K}}K \tag{20}$$

where $\theta_1^{K=0}$ is the level of risk the board chooses when capital requirement is zero (i.e., $K = 0$) and $\frac{\partial\theta_1}{\partial K}$ is derivative of θ_1 with respect to capital K (ref. Lemma 1). This implies $\theta_1 = \theta_1^{K=0} + \frac{\partial\theta_1}{\partial K}K$. The expected utility of the regulator, as defined in Eq (8) is rewrite as:

$$E\left[U_R|\theta_1\right] = \alpha\left[\left(\tfrac{1-\theta_1 p}{2} - \theta_1^2 r + e_h\right)\left[x_H - (1-K) - \tfrac{c}{e_h}\right] + (\theta_1 p + \theta_1^2 r)\left[x_M - (1-K)\right] - \tau K\right] - (1-\alpha)\lambda\left(\tfrac{1-\theta_1 p}{2} - e_h\right) \tag{21}$$

The first order conditions with respect to K is

$$\frac{\partial\theta_1}{\partial K}\frac{p}{2}\left[x_M - (1-K)\right] + \left(\tfrac{1+\theta_1 p}{2} + e_h\right) - \frac{\partial\theta_1}{\partial K}\left[\tfrac{p}{2} + 2\theta_1 r\right]\left(\mu - \frac{c}{e_h}\right) - \tau + \left(\tfrac{1-\alpha}{\alpha}\right)\lambda\frac{\partial\theta_1}{\partial K}\frac{p}{2} = 0 \tag{22}$$

We simplify and get

$$\frac{\partial\theta_1}{\partial K}\frac{p}{2}\left[x_L - (1-K) + \tfrac{c}{e_h} + \left(\tfrac{1-\alpha}{\alpha}\right)\lambda\right] + \left(\tfrac{1+\theta_1^{K=0}p}{2} + e_h\right) + \frac{\partial\theta_1}{\partial K}\frac{p}{2}K - 2\frac{\partial\theta_1}{\partial K}\left(\theta_1^{K=0} + \frac{\partial\theta_1}{\partial K}K\right)r\left(\mu - w_H\right) - \tau = 0 \tag{23}$$

Dividing through by $\frac{\partial\theta_1}{\partial K}$, we obtain

$$\frac{p}{2}K + \frac{p}{2}K - 2\frac{\partial\theta_1}{\partial K}Kr\left(\mu - \frac{c}{e_h}\right) = \frac{p}{2}\left[1 - x_L - \tfrac{c}{e_h} - \left(\tfrac{1-\alpha}{\alpha}\right)\lambda\right] + \frac{1}{\frac{\partial\theta_1}{\partial K}}\left(\tau - \tfrac{1}{2} - e_h\right) - \frac{\theta_1^{K=0}}{\frac{\partial\theta_1}{\partial K}}\frac{p}{2} + 2\theta_1^{K=0}r\left(\mu - \frac{c}{e_h}\right) \tag{24}$$

We insert in the values of $\frac{\partial\theta_1}{\partial K}$ and $\theta_1^{K=0}$ as defined in Eq (20). We then obtain

$$\frac{p}{2}K = \frac{p}{2}\left[1 - x_L - \frac{c}{e_h} - \frac{1-\alpha}{\alpha}\lambda\right] + \frac{4r}{p}\left[\tau - \frac{1}{2} - e_h\right]\left(\mu - \frac{c}{e_h}\right) \tag{25}$$

Finally, the optimal required capital impose is

$$K^{*}=1-x_{L}-\frac{c}{e_{h}}-\left(\frac{1-\alpha}{\alpha}\right)\lambda+\frac{8r}{p^{2}}\left[\tau-\frac{1}{2}-e_{h}\right]\left(\mu-\frac{c}{e_{h}}\right) \tag{26}$$

Proof of corollary 1:The derivative of Eq (12) with respect to p, λ, c, r, μ and τ are as follows

$$\frac{\partial K^{*}}{\partial p}=-\frac{16r}{p^{3}}\left[\tau-\frac{1}{2}-e_{h}\right]\left(\mu-\frac{c}{e_{h}}\right)<0 \tag{27}$$

$$\frac{\partial K^{*}}{\partial \lambda}=\left(\frac{\alpha-1}{\alpha}\right)<0 \tag{28}$$

$$\frac{\partial K^{*}}{\partial c}=-\frac{1}{e_{h}}-\frac{8r}{p^{2}}\left[\tau-\frac{1}{2}-e_{h}\right]\frac{1}{e_{h}}<0 \tag{29}$$

$$\frac{\partial K^{*}}{\partial r}=\frac{8}{p^{2}}\left[\tau-\frac{1}{2}-e_{h}\right]\left(\mu-\frac{c}{e_{h}}\right)>0 \tag{30}$$

$$\frac{\partial K^{*}}{\partial \mu}=\frac{8r}{p^{2}}\left(\mu-\frac{c}{e_{h}}\right)>0 \tag{31}$$

$$\frac{\partial K^{*}}{\partial \tau}=\frac{8}{p^{2}}\left[\tau-\frac{1}{2}-e_{h}\right]>0 \tag{32}$$

The optimal capital requirement K^{*} decreases as p, c or λ increases. Conversely, the optimal capital requirement increases as r, μ or τ increases.

Proof of Lemma 2: The derivative of Eq (13) with respect to τ, r, μ,c, λ, and p are as follows

$$\frac{\partial \theta_{1}\left(K^{*}\right)}{\partial \tau}=\frac{2}{p}>0 \tag{33}$$

$$\frac{\partial \theta_{1}\left(K^{*}\right)}{\partial r}=\frac{p}{4r^{2}}\left(\frac{1-\alpha}{\alpha}\right)\lambda>0 \tag{34}$$

$$\frac{\partial \theta_{1}\left(K^{*}\right)}{\partial \mu}=\frac{p}{4r\left(\mu-\frac{c}{e_{h}}\right)^{2}}\left(\frac{1-\alpha}{\alpha}\right)\lambda>0 \tag{35}$$

$$\frac{\partial \theta_1 (K^*)}{\partial c} = -\frac{p}{4re_h \left(\mu - \frac{c}{e_h}\right)^2} \left(\frac{1-\alpha}{\alpha}\right) \lambda < 0 \tag{36}$$

$$\frac{\partial \theta_1 (K^*)}{\partial \lambda} = -\frac{p}{4r \left(\mu - \frac{c}{e_h}\right)} \left(\frac{1-\alpha}{\alpha}\right) < 0 \tag{37}$$

$$\frac{\partial \theta_1 (K^*)}{\partial p} = - - \frac{1}{4r \left(\mu - \frac{c}{e_h}\right)} \left(\frac{1-\alpha}{\alpha}\right) \lambda - \frac{2}{p^2} \left[\tau - \frac{1}{2} - e_h\right] < 0 \tag{38}$$

The project risk that the board sets with the optimal capital requirement K^* decreases (higher $\theta_1 (K^*)$) as τ, r or μ increases. Conversely $\theta_1 (K^*)$ increases as c, λ or p increases.

Proof of Lemma 3: The derivative of Eq (15) with respect to β is

$$\frac{\partial \theta_\beta}{\partial \beta} = \frac{p}{4r \left(\mu - \frac{c}{e_h}\right)} \frac{[(1-K) - x_L]}{(1-\beta)^2} > 0 \tag{39}$$

Proof of Lemma 4: The derivative of Eq (15) with respect to K is

$$\frac{\partial \theta_\beta}{\partial K} = \frac{p}{4r \left(\mu - \frac{c}{e_h}\right)} \left[1 - \left(\frac{\beta}{1-\beta}\right)\right] \tag{40}$$

$$\frac{\partial \theta_\beta}{\partial K} > 0 \text{ for } \beta < \frac{1}{2} \tag{41}$$

$$\frac{\partial \theta_\beta}{\partial K} < 0 \text{ for } \beta < \frac{1}{2} \tag{42}$$

$$\frac{\partial \theta_\beta}{\partial K} = 0 \text{ for } \beta = \frac{1}{2} \tag{43}$$

Proof of Lemma 5: For a level of project risk θ_β, expected bank profit is

$$E[U_S|\theta_\beta] = \left(\frac{1-\theta_\beta p}{2} - \theta_\beta^2 r + e_h\right) \left[x_H - (1-K) - \frac{c}{e_h}\right] + \left(\theta_\beta p + \theta_\beta^2 r\right) [x_M - (1-K)] - \tau K \tag{44}$$

The derivative of Eq (44) with respect to β is

$$\frac{\partial E[U_S|\theta_\beta]}{\partial \beta} = \frac{\partial \theta_\beta}{\partial \beta}\left[\frac{p}{2}\left(x_L-(1-K)+\frac{c}{e_h}\right)-2\theta_\beta r\left(\mu-\frac{c}{e_h}\right)\right] \tag{45}$$

$$\tag{46}$$

$$= \underbrace{\frac{\partial \theta_\beta}{\partial \beta}}_{>0}\underbrace{\frac{\partial E[U_S|\theta_\beta]}{\partial \theta_\beta}}_{<0} < 0 \tag{47}$$

Proof of Proposition 2: We first establish some identities. The derivatives of Eq (15) with respect to capital K is:

$$\frac{\partial \theta_\beta}{\partial K} = \frac{p}{4r\left(\mu-\frac{c}{e_h}\right)}\left(1-\frac{\beta}{1-\beta}\right) \tag{48}$$

and the derivative of Eq (15) with respect to β is

$$\frac{\partial \theta_\beta}{\partial \beta} = \frac{p}{4r\left(\mu-\frac{c}{e_h}\right)}\cdot\frac{1}{(1-\beta)^2}\left[(1-K)-x_L\right] \tag{49}$$

The first-order condition of Eq (8) with respect to K is

$$\frac{\partial \theta_\beta}{\partial K}\frac{p}{2}\left[x_M-(1-K)\right]+\left(\frac{1+\theta_\beta p}{2}+e_h\right)-\frac{\partial \theta_\beta}{\partial K}\left[\frac{p}{2}+2\theta_\beta r\right]\left(\mu-\frac{c}{e_h}\right)-\tau+\left(\frac{1-\alpha}{\alpha}\right)\lambda\frac{\partial \theta_\beta}{\partial K}\frac{p}{2}=0 \tag{50}$$

Simplifying, we obtain

$$\frac{\partial \theta_\beta}{\partial K}\left[\frac{p}{2}\left[x_L-(1-K)+\frac{c}{e_h}+\left(\frac{1-\alpha}{\alpha}\right)\lambda\right]-2\theta_\beta r\left(\mu-\frac{c}{e_h}\right)\right]+\left(\frac{1+\theta_\beta p}{2}+e_h\right)-\tau=0 \tag{51}$$

The first-order condition of Eq (8) with respect to β is

$$\frac{\partial \theta_\beta}{\partial \beta}\left[\frac{p}{2}\left[x_L-(1-K)+\frac{c}{e_h}+\frac{1-\alpha}{\alpha}\lambda\right]-2\theta_\beta r\left(\mu-\frac{c}{e_h}\right)\right]=0 \tag{52}$$

From Eq (52), we obtain the following equation

$$\frac{p}{2}\left[x_L-(1-K)+\frac{c}{e_h}+\left(\frac{1-\alpha}{\alpha}\right)\lambda\right]-2\theta_\beta r\left(\mu-\frac{c}{e_h}\right)=0 \tag{53}$$

and

$$\frac{\partial \theta_\beta}{\partial \beta} = \frac{p}{4r\left(\mu-\frac{c}{e_h}\right)}\cdot\frac{1}{(1-\beta)^2}\left[(1-K)-x_L\right]=0 \tag{54}$$

There are two possible solutions.

Case 1

From Eq (54) we obtain $K_{\beta}^{*} = 1 - x_L$. Inserting the value of K_{β}^{*} into Eq (50), we get

$$\frac{p^2\lambda}{8r\left(\mu - \frac{c}{e_h}\right)}\left(1 - \frac{\beta}{1-\beta}\right)\left(\frac{1-\alpha}{\alpha}\right) + \left(\frac{1}{2} + e_h - \tau\right) + \frac{p^2 c}{8re_h\left(\mu - \frac{c}{e_h}\right)} = 0 \tag{55}$$

Simplifying, we obtain:

$$\frac{\beta}{1-\beta}\left(\frac{1-\alpha}{\alpha}\right)\lambda = \frac{c}{e_h} + \left(\frac{\alpha-1}{\alpha}\right)\lambda - \frac{8r}{p^2}\left[\tau - \frac{1}{2} - e_h\right]\left(\mu - \frac{c}{e_h}\right) \tag{56}$$

Finally, we solve for β

$$\beta^{*} = \frac{p^2\left[\frac{c}{e_h} + \left(\frac{1-\alpha}{\alpha}\right)\lambda\right] - 8r\left[\tau - \frac{1}{2} - e_h\right]\left(\mu - \frac{c}{e_h}\right)}{p^2\left[\frac{c}{e_h} + 2\left(\frac{1-\alpha}{\alpha}\right)\lambda\right] - 8r\left[\tau - \frac{1}{2} - e_h\right]\left(\mu - \frac{c}{e_h}\right)} \tag{57}$$

where $p \in \left(\frac{8r\left(\frac{\alpha}{1-\alpha}\right)\left[\tau - \frac{1}{2} - e_h\right]\left(\mu - \frac{c}{e_h}\right)}{\left(\frac{\alpha}{1-\alpha}\right)\frac{c}{e_h} + \lambda}, 1\right)$

Case 2:

From Eq (53), we get

$$\theta_{\beta} = \frac{p}{4r\left(\mu - \frac{c}{e_h}\right)}\left[x_L - (1-K) + \frac{c}{e_h} + \left(\frac{1-\alpha}{\alpha}\right)\lambda\right] \tag{58}$$

and from Eq (54), we have

$$\theta_{\beta} = \frac{2(\tau - e_h) - 1}{p} \tag{59}$$

Equating Eq (58) and Eq (59), we simply and get

$$K_{\beta 2}^{*} = 1 - x_L - \frac{c}{e_h} + \left(\frac{\alpha-1}{\alpha}\right)\lambda + \frac{8r}{p^2}\left[\tau - \frac{1}{2} - e_h\right]\left(\mu - \frac{c}{e_h}\right) \tag{60}$$

We insert the value of $K_{\beta 2}^{*}$ into Eq (52), we obtain

$$\beta_2^{*} = \frac{p^2\lambda}{p^2\left[\left(\frac{\alpha}{1-\alpha}\right)\frac{c}{e_h} + 2\lambda\right] - 8r\left(\frac{\alpha}{1-\alpha}\right)\left[\tau - \frac{1}{2} - e_h\right]\left(\mu - \frac{c}{e_h}\right)} \tag{61}$$

We focus only on the case where the regulator imposes capital requirement K_β^* and a proportion of bondholder representatives β^* for the reason in the proof of proposition 4.

Proof of corollary 3: The derivative of Eq (16) with respect to μ is as follows

$$\frac{\partial K_\beta^*}{\partial \mu} = 1 > 0 \tag{62}$$

The derivative of Eq (17) with respect to p, λ, c, r, μ and τ are as follows

$$\frac{\partial \beta^*}{\partial \mu} = \frac{-8r\left(\frac{\alpha}{1-\alpha}\right)\lambda p^2\left[\tau - \frac{1}{2} - e_h\right]}{\left[p^2\left[\left(\frac{\alpha}{1-\alpha}\right)\frac{c}{e_h} + 2\lambda\right] - 8r\left(\frac{\alpha}{1-\alpha}\right)\left[\tau - \frac{1}{2} - e_h\right]\left(\mu - \frac{c}{e_h}\right)\right]^2} < 0 \tag{63}$$

$$\frac{\partial \beta^*}{\partial \tau} = \frac{-8r\left(\frac{\alpha}{1-\alpha}\right)\lambda p^2\left(\mu - \frac{c}{e_h}\right)}{\left[p^2\left[\left(\frac{\alpha}{1-\alpha}\right)\frac{c}{e_h} + 2\lambda\right] - 8r\left(\frac{\alpha}{1-\alpha}\right)\left[\tau - \frac{1}{2} - e_h\right]\left(\mu - \frac{c}{e_h}\right)\right]^2} < 0 \tag{64}$$

$$\frac{\partial \beta^*}{\partial r} = \frac{-8\left(\frac{\alpha}{1-\alpha}\right)\lambda p^2\left[\tau - \frac{1}{2} - e_h\right]\left(\mu - \frac{c}{e_h}\right)}{\left[p^2\left[\left(\frac{\alpha}{1-\alpha}\right)\frac{c}{e_h} + 2\lambda\right] - 8r\left(\frac{\alpha}{1-\alpha}\right)\left[\tau - \frac{1}{2} - e_h\right]\left(\mu - \frac{c}{e_h}\right)\right]^2} < 0 \tag{65}$$

$$\frac{\partial \beta^*}{\partial \lambda} = \frac{8rp^2\left(\frac{\alpha}{1-\alpha}\right)\left[\tau - \frac{1}{2} - e_h\right]\left(\mu - \frac{c}{e_h}\right) - p^4\left(\frac{\alpha}{1-\alpha}\right)\frac{c}{e_h}}{\left[p^2\left[\left(\frac{\alpha}{1-\alpha}\right)\frac{c}{e_h} + 2\lambda\right] - 8r\left(\frac{\alpha}{1-\alpha}\right)\left[\tau - \frac{1}{2} - e_h\right]\left(\mu - \frac{c}{e_h}\right)\right]^2} > 0 \tag{66}$$

$$\frac{\partial \beta^*}{\partial c} = \frac{p^2\left(\frac{\alpha}{1-\alpha}\right)\frac{1}{e_h}}{\left[p^2\left[\left(\frac{\alpha}{1-\alpha}\right)\frac{c}{e_h} + 2\lambda\right] - 8r\left(\frac{\alpha}{1-\alpha}\right)\left[\tau - \frac{1}{2} - e_h\right]\left(\mu - \frac{c}{e_h}\right)\right]^2} > 0 \tag{67}$$

$$\frac{\partial \beta^*}{\partial p} = \frac{16rp^2\left(\frac{\alpha}{1-\alpha}\right)\lambda\left[\tau - \frac{1}{2} - e_h\right]\left(\mu - \frac{c}{e_h}\right)}{\left[p^2\left[\left(\frac{\alpha}{1-\alpha}\right)\frac{c}{e_h} + 2\lambda\right] - 8r\left(\frac{\alpha}{1-\alpha}\right)\left[\tau - \frac{1}{2} - e_h\right]\left(\mu - \frac{c}{e_h}\right)\right]^2} > 0 \tag{68}$$

Proof of Lemma 6: The derivative of Eq (18) with respect to r, μ, c, and p are as follows

$$\frac{\partial \theta_\beta\left(K_\beta^*, \beta^*\right)}{\partial r} = -\frac{pc}{4r^2 e_h\left(\mu - \frac{c}{e_h}\right)} < 0 \tag{69}$$

$$\frac{\partial \theta_\beta\left(K_\beta^*, \beta^*\right)}{\partial \mu} = -\frac{pc}{4re_h\left(\mu - \frac{c}{e_h}\right)^2} < 0 \tag{70}$$

$$\frac{\partial\theta_\beta\left(K_\beta^*,\beta^*\right)}{\partial c}=-\frac{p\mu}{4re_h\left(\mu-\frac{c}{e_h}\right)^2}>0 \tag{71}$$

$$\frac{\partial\theta_\beta\left(K_\beta^*,\beta^*\right)}{\partial p}=-\frac{c}{4re_h\left(\mu-\frac{c}{e_h}\right)}>0 \tag{72}$$

Proof of Proposition 3: The difference between K^* and $K_{\beta 1}^*$ gives

$$K^*-K_\beta^*=-\frac{c}{e_h}+\left(\frac{\alpha-1}{\alpha}\right)\lambda+\frac{8r}{p^2}\left[\tau-\frac{1}{2}-e_h\right]\left(\mu-\frac{c}{e_h}\right)>0 \tag{73}$$

$$\text{for }\lambda<\overline{\lambda}=\left(\frac{\alpha}{1-\alpha}\right)\left[\frac{8r}{p^2}\left[\tau-\frac{1}{2}-e_h\right]\left(\mu-\frac{c}{e_h}\right)-\frac{c}{e_h}\right] \tag{74}$$

Proof of Proposition 4: For a level of capital requirement K^*, from Eq (11), the level of risk the board sets is

$$\theta_1\left(K^*\right)=\frac{p}{4r\left(\mu-\frac{c}{e_h}\right)}\left(\frac{\alpha-1}{\alpha}\right)\lambda+\frac{2}{p}\left[\tau-\frac{1}{2}-e_h\right] \tag{75}$$

For a level of capital requirement K_β^* and a proportion of bondholder representatives β^*, the level of risk the board chooses is

$$\theta_\beta\left(K_\beta^*,\beta^*\right)=\frac{pc}{4re_h\left(\mu-\frac{c}{e_h}\right)} \tag{76}$$

The difference gives

$$\theta_1\left(K^*\right)-\theta_\beta\left(K_\beta^*,\beta^*\right)=\frac{p}{4r\left(\mu-\frac{c}{e_h}\right)}\left[\left(\frac{\alpha-1}{\alpha}\right)\lambda-\frac{c}{e_h}\right]+\frac{2}{p}\left[\tau-\frac{1}{2}-e_h\right]>0 \tag{77}$$

$$\text{for }\lambda<\overline{\lambda}=\left(\frac{\alpha}{1-\alpha}\right)\left[\frac{8r}{p^2}\left[\tau-\frac{1}{2}-e_h\right]\left(\mu-\frac{c}{e_h}\right)-\frac{c}{e_h}\right]$$

Note, for a level of capital requirement $K_{\beta 2}^*$ and a proportion of bondholder representatives β_2^*, the level of risk the board sets is

$$\theta_\beta\left(K_2^*,\beta_2\right)=\frac{2}{p}\left[\tau-\frac{1}{2}-e_h\right]>1\quad\text{for }p\in(0,1)\,,\ r\in(0,(1-p)/2)\,,\text{and }e\in(0,(1-p)/2) \tag{78}$$

$\theta_\beta\left(K_2^*, \beta_2\right)$ falls outside the admission region.

Proof of Proposition 5: The expected profit when the regulator implements only capital requirements is

$$E\left[U_S\left(\theta_1\left(K^*\right), K^*\right)\right] = \left(\tfrac{1+\theta_1(K^*)p}{2} + e_h\right)\left[x_M - \left(1-K^*\right)\right] + \left(\tfrac{1-\theta_1(K^*)p}{2} - \theta_1\left(K^*\right)^2 r + e_h\right)\left[\mu - \tfrac{c}{e_h}\right] - \tau K^* \tag{79}$$

Inserting in the values of K^* and $\theta_1\left(K^*\right)$, we simplify and get:

$$= \frac{p^2}{16r\left(\mu - \frac{c}{e_h}\right)}\left(\tfrac{1-\alpha}{\alpha}\right)^2\lambda^2 - \tfrac{4r}{p^2}\left[\tau - \tfrac{1}{2} - e_h\right]^2\left(\mu - \tfrac{c}{e_h}\right) + \left(1 + 2e_h - \tau\right)\left(\mu - \tfrac{c}{e_h}\right) + \left(x_M - 1\right)\tau \tag{80}$$

When the regulator combines capital requirement with a quota of bondholder representatives to the bank's board, the expected bank profit is

$$E\left[U_S\left(\theta_\beta\left(K_\beta^*, \beta^*\right), K_\beta^*\right)\right] = \left(\tfrac{1+\theta_\beta\left(K_\beta^*, \beta^*\right)p}{2} + e_h\right)\left[x_M - \left(1-K_\beta^*\right)\right] + \left(\tfrac{1-\theta_\beta\left(K_\beta^*, \beta^*\right)p}{2} - \theta_\beta\left(K_\beta^*, \beta^*\right)^2 r + e_h\right)\left[\mu - \tfrac{c}{e_h}\right] - \tau K_\beta^* \tag{81}$$

We insert in the values of K_β^* and $\theta_\beta\left(K_\beta^*, \beta^*\right)$ and obtain:

$$E\left[U_S\left(\theta_\beta\left(K_\beta^*, \beta^*\right), K_\beta^*\right)\right] = \frac{p^2c^2}{16re_h^2\left(\mu - \frac{c}{e_h}\right)} + \left(1 + 2e_h\right)\left(\mu - \frac{c}{2e_h}\right) + \left(x_M - 1\right)\tau \tag{82}$$

The difference between $E\left[U_S\left(\theta_\beta\left(K_\beta^*, \beta^*\right), K_\beta^*\right)\right]$ and $E\left[U_S\left(\theta_1\left(K^*\right), K^*\right)\right]$ gives

$$= \frac{p^2\left[\left(\frac{c}{e_h}\right)^2 - \left(\frac{1-\alpha}{\alpha}\right)^2\lambda^2\right]}{16r\left(\mu - \frac{c}{e_h}\right)} - \left(\tau - \frac{1}{2} - e_h\right)\frac{c}{e_h} + \frac{4r}{p^2}\left[\tau - \frac{1}{2} - e_h\right]^2\left(\mu - \frac{c}{e_h}\right) > 0 \tag{83}$$

$$\text{for } \lambda < \overline{\lambda} = \left(\frac{\alpha}{1-\alpha}\right)\left[\frac{8r}{p^2}\left[\tau - \frac{1}{2} - e_h\right]\left(\mu - \frac{c}{e_h}\right) - \frac{c}{e_h}\right]$$

Proof of Proposition 6:

Under the framework where the regulator imposes only capital requirements, the expected utility given a level of capital requirement K^* and the level of risk the board sets $\theta_1(K^*)$ is

$$\begin{aligned} E\left[U_D|\theta_1(K^*),K^*\right] &= \left(\frac{1+\theta_1(K^*)}{2}+e_h\right)(1-K^*)+\left(\frac{1-\theta_1(K^*)}{2}-e_h\right)x_L \quad (84) \\ &= \left[\tau-\frac{p^2\lambda\left(\frac{1-\alpha}{\alpha}\right)}{8r\left(\mu-\frac{c}{e_h}\right)}\right]\left(x_L+\frac{c}{e_h}+\left(\frac{1-\alpha}{\alpha}\right)\lambda-\frac{8r}{p^2}\left[\tau-\frac{1}{2}-e_h\right]\left(\mu-\frac{c}{e_h}\right)\right) \\ &+\left[(1-\tau)+\frac{p^2\lambda\left(\frac{1-\alpha}{\alpha}\right)}{8r\left(\mu-\frac{c}{e_h}\right)}\right](x_M-\mu) \end{aligned}$$

Simplifying we get

$$= \left[\tau-\frac{p^2\lambda\left(\frac{1-\alpha}{\alpha}\right)}{8r\left(\mu-\frac{c}{e_h}\right)}\right]\left(\frac{c}{e_h}+\left(\frac{1-\alpha}{\alpha}\right)\lambda-\frac{8r}{p^2}\left[\tau-\frac{1}{2}-e_h\right]\left(\mu-\frac{c}{e_h}\right)\right)+x_L \quad (85)$$

Under the framework where the regulator imposes a quota of bondholder representatives β^* and a level of capital requirement K_β^*, the expected utility of bondholders is

$$\begin{aligned} E\left[U_D|\theta_\beta\left(K_\beta^*,\beta^*\right),K_\beta^*\right] &= \left(\frac{1+\theta_\beta\left(K_\beta^*,\beta^*\right)}{2}+e_h\right)\left(1-K_\beta^*\right)+\left(\frac{1-\theta_\beta\left(K_\beta^*,\beta^*\right)}{2}-e_h\right)(x_M-\mu) \quad (86) \\ &= \left(\frac{1+\theta_\beta\left(K_\beta^*,\beta^*\right)}{2}+e_h\right)x_L+\left(\frac{1-\theta_\beta\left(K_\beta^*,\beta^*\right)}{2}-e_h\right)x_L \\ &= x_L \end{aligned}$$

The difference $E\left[U_D|\theta_\beta\left(K_\beta^*,\beta^*\right),K_\beta^*\right]$ less $E\left[U_D|\theta_1(K^*),K^*\right]$ gives

$$\left[\frac{p^2\lambda\left(\frac{1-\alpha}{\alpha}\right)}{8r\left(\mu-\frac{c}{e_h}\right)}-\tau\right]\left(\frac{c}{e_h}+\left(\frac{1-\alpha}{\alpha}\right)\lambda-\frac{8r}{p^2}\left[\tau-\frac{1}{2}-e_h\right]\left(\mu-\frac{c}{e_h}\right)\right)>0 \quad (87)$$

$$\text{for } \lambda>\overline{\lambda}=\left(\frac{\alpha}{1-\alpha}\right)\left[\frac{8r}{p^2}\left[\tau-\frac{1}{2}-e_h\right]\left(\mu-\frac{c}{e_h}\right)-\frac{c}{e_h}\right]$$

Chapter 2

Bondholder representatives on bank boards and bank risk: does institutional and cultural environments matter?

This paper draws from the working paper "Bank risk and bondholder representatives on boards: the role of institutional and cultural factors" co-authored with Phan Huy Hien Tran.

2.1 Introduction

Bank risk-taking is important for its performance but could pose a threat to the bank's survival and the stability of the national financial system if it leads to a financial crisis (European Commission report, 2014). To promote financial stability, several instruments have been identified. Amongst them is market discipline. It is one of the three pillars generally accepted by regulators and scholars to limit bank risk-shifting incentives that are exacerbated by financial safety nets. Pillar 3 of Basel II explicitly emphasizes strengthening market discipline as a tool to enhance bank stability. Bliss & Flannery (2002) characterize market discipline by two distinct features: market monitoring and market influence. [1] The concept of market discipline in banking is to use private investors as monitors to limit excessive risk-taking driven by financial safety nets (Flannery & Bliss, 2019). Given that the banking sector transmits financial instability to the economy (V. Acharya et al., 2014), identifying factors that influence the market's incentives to monitor banks' risk is important for designing optimal regulatory frameworks.

An instrument for debtholders to exert influence over managerial decisions is through board representation. Board positions have the potential to facilitate bondholders' monitoring, surpassing the efficacy of loan covenants. This enhanced oversight capacity arises from the board's ability to discipline management by influencing compensation structures and approving corporate strategies (Byrd & Mizruchi, 2005; Tirole, 2010). Among bank stakeholders, bondholders' preferences align most closely with those of supervisors when it comes to directly disciplining banks to prevent excessive risk-taking. Evaluating project risk falls within the purview of the board's advisory role, enabling the establishment of an equilibrium between a bank's risk exposure and its corresponding actions. Kronenberger & Weiskirchner-Merten (2022) demonstrated in their theoretical framework that when non-financial firms appoint bank representatives to their boards, i.e., directors affiliated with loan-providing commercial banks, it serves as a mechanism to curb excessive risk-taking. Distinguin et al.

[1] Market discipline has two distinct components: market monitoring and market influence (Bliss & Flannery, 2002). Market monitoring refers to the hypothesis that investors are able to detect changes in a bank's risk condition and incorporate them into security prices. Market influence refers to the ability of investors and regulators to change the risk-taking behavior of banks.

(2023) use a unique dataset that brings together information on bondholders, shareholders, and boards of directors of European listed banks. They find that the influence of directors affiliated with bondholders on European bank boards significantly reduces bank risk without adversely affecting profitability.

We aim to contribute to the existing literature by analyzing whether the discipline exerted by bondholders through their representatives on bank boards is contingent on the regulatory, legal environment, and cultural environments of a country. One of these factors can be considered a substitute for the risk-reducing effect of bondholder representatives if it leads to a decrease in risk but also reduces the strength of bondholder representatives in reducing risk. Conversely, the regulatory, legal environment or cultural environment is considered as a complement if it leads to a decrease in risk and also to an increase in the strength of bondholder representatives in reducing risk.

We expect that the risk-reducing effect of bondholders through their representatives does not hold in all countries, depending on the regulatory, legal environments, and national culture. Stronger supervision aims to reduce bank risk-taking (Fonseca & González, 2010), therefore, in countries where supervisors are stricter in their approach to assessing and verifying the degree of capital at risk in banks, the need for debtholders to monitor banks' risk-taking may reduce. Higher capital requirements act as a financial cushion that can absorb losses during economic downturns or unexpected financial crises. Agoraki et al. (2011) show that capital requirement is associated with lower risk, hence in countries where capital requirements are high, the incentives for debtholders to monitor banks may reduce. Moreover, debtholders might be more confident in pressuring managers to reduce risk in countries where legal protection for debtholders is high. In countries where legal protection afforded to shareholders is high, the need for stronger monitoring by debtholders might increase to reduce the tendency of shareholders' expropriation. Culture, defined as the "collective programming of the mind which distinguishes one group from another" (Hofstede, 2011), has been stressed by a significant strand of literature as influential in shaping financial decision-making (Delis & Mylonidis, 2015). National culture not only has a direct influence on the risk preferences of bank managers but also exerts an indirect impact through its influence on the needs and risk preferences of the customers they serve (Storey & Easingwood, 1993).

High individualistic societies are associated with less risk aversion (Brunnermeier, 2009), therefore, the risk-reducing effect of debtholders in highly individualistic countries might be reduced. In contrast, countries with high values of long-term orientation are associated with more risk aversion (Hofstede, 2011), therefore, the market discipline exerted by debtholders might increase in countries with higher degree of long-term orientation values.

Our work contributes to the literature in that it is (to the best of my knowledge) the first paper that studies the impact of bank regulation/ supervision, legal qualities, and national culture on the market discipline exerted by bondholder representatives in monitoring bank risk-taking. It capitalizes on a unique dataset of board ties between European-listed financial institutions and their bondholders after the implementation of the Banking Recovery and Resolution Directive (BRRD) in 2016. We collected data on 105 out of 155 European banks listed on the stock market and carefully collected information on 1,381 directors and 82,503 bondholders during the period spanning from 2016 to 2018. Our focus on European banks stems from two key reasons. Firstly, in 2017, bondholders of several European financial institutions, including three Italian banks and Banco Popular in Spain, experienced financial losses after the introduction of the BRRD in 2016. Secondly, a notable number of European banks have appointed at least one bondholder representative to their board of directors. Our results indicate that bondholders through their representatives on bank boards significantly reduce bank risk, irrespective of the factor (i.e., regulatory, legal environments, and national cultural values). However, the magnitude of this impact varies. It is stronger for a higher capital stringency, creditor rights, shareholder rights, and individualism, while weaker for a higher supervisory power and long-term orientation. Our results further show that supervisory power is a substitute for bondholder representatives' risk-reducing effect. Our results are robust to alternative estimation proxies of bank risk, and definitions of bondholder representatives.

These results contribute to the growing literature on bondholder monitoring, market discipline, and corporate governance of banks. The study adds to the existing literature on the efficacy of bondholder representatives as a mechanism for strengthening market discipline. We also contribute valuable insights to the ongoing policy discussions concerning the optimal corporate governance models for banks, particularly in terms of achieving financial stability that benefits all stakeholders. It emphasizes the potentially vital role that bondholder representatives can play in addressing the complex web of agency issues that affect the various parties involved with banks.

The rest of the paper is organized as follows. Section 2 discusses hypotheses development. Section 3 describes the data and variables. Section 4 Empirical methodology. Section 5 discusses the empirical results. Section 6 concludes the paper.

2.1.1 Hypothesis development

The market discipline exerted by bondholders through their representatives on the board can be affected by variations in regulatory and legal environments, as well as differences in national cultural values across countries. We aim to investigate the impact of regulatory and legal environments, along with national culture, on the risk-reducing effects of bondholder representatives. Distinguin et al. (2023) show that the presence of bondholder representatives reduces bank risk.

An important aspect of supervision is the power of supervisory authorities to obtain information from banks and take actions to influence the behavior of banks. Stronger supervision power aims to reduce bank risk-taking. Therefore, the incentive for debtholders to monitor banks' risk-taking in countries where supervisors are stricter in their approach to assessing and verifying the degree of capital at risk in banks is reduced. Fonseca & González (2010) find evidence that tighter supervision power reduces the market's incentives to control bank risk. We therefore expect the risk-reducing impact of bondholder representatives to decrease in countries with stronger supervisory power. Our first hypothesis is:

H1. Stronger supervision power decreases the market discipline exerted by bondholder representatives in reducing bank risk.

Capital stringency measures the amount of capital banks must hold and the stringency of regulations regarding the nature and source of regulatory capital. Capital regulation serves the purpose of mitigating banks' risk-shifting tendencies, especially when a government safety net is in place. Admati et al. (2013) argue that imposing significantly higher capital requirements on banks can effectively reduce risk-shifting incentives and enhance overall financial stability (also see Flannery (2014) and Thakor (2014)). Therefore, in countries where capital requirements are higher, the incentive for bondholder representatives to monitor bank risk-taking may reduce since capital requirements themselves act as a risk-reducing mechanism. We therefore expect the risk-reducing effect of bondholder representatives to decrease in countries where capital stringency is stronger.

H2. Tighter capital stringency decreases the market discipline bondholder representatives exert in reducing bank risk.

Creditor rights measure the legal protection afforded to creditors in scenarios involving the reorganization or liquidation of the debtor. Higher creditor rights reinforce the power of creditors and might be more confident to pressure bank managers to reduce risk. V. V. Acharya et al. (2011) find that stronger creditor rights lead to reduced corporate risk-taking. We therefore expect the risk-reducing effect of bondholder representatives to increase in countries with higher creditor rights. Our third hypothesis is:

H3. Higher creditor rights increase the market discipline bondholder representatives exert in reducing bank risk.

Shareholder rights measure the legal protection of shareholders against expropriation by managers. Stronger shareholder rights give more power to the shareholders. In this case, the debtholder to monitor bank risk-taking becomes very important. Therefore, in countries where legal protection afforded to shareholders is high, debtholders are incentivized to increase the monitoring of banks. We expect the risk-reducing effect of bondholder representatives to increase in countries with stronger shareholder rights

H4. More shareholder rights increase the market discipline bondholder representatives exert in reducing bank risk.

Cultural values indeed cause considerable differences in risk-averse and risk-taking in societies (Rieger et al., 2011). Countries characterized by individualistic cultural values are known for their emphasis on individual advancement, regardless of group goals. In contrast, countries with collectivist cultures prioritize societal and workgroup goals over individual gain and needs. Breuer et al. (2014) find a positive association between individualism and risk-taking. We expect that bondholder representatives' risk-reducing effect to decrease as the degree of a country's individualism values increases. The fifth hypothesis:

H5. Higher degree of individualism values in countries decreases the market discipline exerted by bondholder representatives in reducing bank risk.

The next national cultural value to consider is long-term orientation. This value assesses how individuals in a society prioritize future rewards and exhibit persistence in pursuing their goals, even when confronted with challenges (Hofstede, 2001). In contrast, individuals with a short-term orientation tend to be more focused on the present and the past. Long-term orientation societies are expected to be more cautious about making risky decisions, and therefore, more risk-averse (Hofstede, 2011). We therefore expect bondholder representatives to exert a stronger reducing effect on bank risk in countries with a higher degree of long-term orientation. The sixth hypothesis is:

H6. Higher degree of long-term orientation values of a country increases the market discipline exerted by bondholder representatives in reducing bank risk.

2.2 Sample and description

2.2.1 Sample selection

Our research focuses on publicly listed commercial banks and bank holding companies across 15 European nations namely Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom. We only consider listed banks because data regarding the board structure of non-listed banks is unavailable. Additionally, most non-listed banks do not issue bonds. To address our research question, we collected data from various sources to build a comprehensive database covering board of directors, risk metrics, bank regulations, legal variables, and national cultural values. We obtained information about the composition of the board of directors from BoardEx. Ownership structure, bondholders, and annual financials data were obtained from BankFocus and Bloomberg. Our dataset includes 105 banks from 2016 to 2018, consisting of 79 commercial banks and 26 bank holding companies. We also collected data on bondholders for the year 2017, totaling 82,503 bondholders in all. Following the literature, we assume that the board structure remains stable throughout our analysis period of 2016-2018, as the literature on board structure suggests relatively consistent board terms typically ranging from 3 to 4 years. (Crutchley et al., 2002; Yermack, 2004). On average, our sample accounts for roughly 97% of the total assets of all listed banks covered by Bloomberg.

Country-level bank supervisory and capital regulation variables are obtained from the database made available by Barth et al. (2013). We retrieve information on country-level legal quality from various sources, primarily from La Porta et al. (2000); Djankov et al. (2008). Hofstede's cultural framework is our main source of national cultural norms. Bank-level data are from the Bloomberg (market data) and Bankfocus (financial statement) databases. To address outliers in our financial data, we applied winsorization at the 1% and 99% levels. Table 1 provides detailed variable definitions and summary statistics.

Table 1: **Variable definitions and summary statistics**
This table provides definitions, sources, and summary statistics for the variables used in our analyses for the period 2016 to 2018. We report means, medians, standard deviations, min, and max on all the regression variables used to examine bank risk and bondholder representatives on board: the role of legal and cultural factors.

Variable	Description	Mean	Median	Std. dev.	Min	Max
Panel A. Main Variables						
PropBondRep	Proportion of bank board directors affiliated to bondholdesr by current/past employment. (%) (Source: BoardEx, Bloomberg).	17.66	15	18.36	0	84.62
BondRepIndx	Index measuring the strength of relationship between a director and bondholder (see Section 3.4.2).	0.45	0.5	.38	0	12
DBondRep	A dummy taking a value of 1 if at least a director is bondholder representatives.	0.62	0.48	0	1	84.62
LnZscore	Logarithm of return on assets plus capital asset ratio divided by the standard deviation of asset returns We use 3-year rolling window average and standard deviation of return on assets, respectively, and *car* is the equity to total assets ratio at date t. A higher zscore indicates that a bank has a lower risk of insolvency (Source: Bloomberg)	4.31	4.39	1.33	0.43	8.36
SDROA	Standard deviation of the return on assets (Source: Bloomberg).	0.30	0.10	0.74	0.002	5.70
MES	Marginal Expected Shortfall, as defined by V. V. Acharya et al. (2017), measures the marginal contribution of a bank to systemic risk through the Expected Shortfall of the financial system.	0.02	0.02	0.01	0.01	0.05
DCoVaR	Delta-CoVaR corresponds to the Value at Risk of the financial system given a specific event affecting a particular bank, as introduced by Brownlees & Engle (2017).	0.00	0.00	0.00	0.00	0.00
Panel B. Bank-level and macroeconomic controls						
Size	Natural logarithm of bank total assets (Source: Bloomberg).	10.73	10.45	1.99	5.12	14.63
GrowthTA	Annual growth rate of total assets (Source: Bloomberg).	2.53	2.53	9.50	-18.75	36.53
EquityTA	Ratio of bank equity to total assets (%) (Source: Bloomberg).	8.16	7.18	3.62	2.15	20.45
LoanRatio	Gross loan divided by total assets (%) (Source: Bloomberg)	58.19	63.99	20.71	1.95	87.48
DepositRatio	Total deposit divided by total assets (%) (Source: Bloomberg).	54.47	57.50	17.84	7.25	89.79
OperatingRatio	Ratio of total operating expenses to total operating income (%) (Source: Bloomberg).	3.09	2.12	5.74	-18.78	26.26
BoardSize	Natural logarithm of the number of directors on the board (Source: BoardEx).	2.45	2.48	0.37	1.39	3.30

BoardTier	A binary indicator that takes a value of one if the bank has a one-tier board and the value of 0 if the bank has a dual board (Source: BoardEx).	.625	1	0.49	0	1
GDP	Growth rate of real GDP (Source: World bank)	1.92	1.82	0.62	-0.19	3.17
Inflation	Change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified interval. (Source: World bank)	1.04	1.07	1.12	-1.47	6.65
Panel C. Country-level bank regulatory variables						
Supervision	(1) Does the supervisory agency have the right to meet with external auditors to discuss their report without the bank's approval? (2). Are auditors required by law to communicate directly to the supervisory agency any suspected involvement of bank directors or senior managers in fraudulent activities or insider abuse? (3) Can supervisors take legal action against external auditors for negligence? (4) Can the supervisory authority force a bank to change its internal organizational structure? (5) Are off-balance sheet items disclosed to supervisors? (6) Can the supervisory agency order the bank's directors or management to set aside provisions to cover actual or potential losses? (7) Can the supervisory agency suspend directors' decision to distribute dividends, bonuses or management fees? (8) Can the supervisory agency legally declare that a bank is insolvent, superseding the rights of bank shareholders? (9) Does the Banking Law give the supervisory agency authority to intervene, suspending some or all ownership rights in a problem bank? (10) Can the supervisory agency or any other government agency supersede shareholder rights, remove and replace management or directors in bank restructuring and reorganization? A higher total value indicates a wider and stronger authority for bank supervisors. (Source:Barth et al. (2013)).	10.10	11	2.34	4	13
CapString	The Capital Stringency Index is determined by answering a series of yes/no questions related to a bank's capital-asset ratio. The questions include: (1) Is the capital-asset ratio in line with the Basel I guidelines? (2) Is the capital-asset ratio in line with the Basel II guidelines? (3) Does the minimum capital-asset ratio vary based on credit risk? (4) Does the minimum capital-asset ratio vary based on market risk? (5) Which of the following are deducted from the book value of capital before minimum capital adequacy is determined: Market value of loan losses not realized in accounting books? Unrealized losses in the securities portfolios? Unrealized foreign exchange losses? (6) What fraction of revaluation gains is allowed as part of capital? (7) Are the sources of funds used as capital verified by regulatory/supervisory authorities? (8) Can the initial disbursement or subsequent injections of capital be done with assets other than cash or government securities? (9) Can initial disbursement of capital be done with borrowed funds? The index ranges from 0 to 11, with a higher value indicating stricter capital stringency. (Source: Barth et al. (2013)).	5.96	6	1.79	3	9
Panel D. Country-level legal quality variables						

CreditorRights	Creditor rights index. The yes/no responses to the following elements are coded as 1/0: (i) if creditors' consent is required to file for reorganization, (ii) if secured creditors can take possession of collateral assets once the reorganization petition has been approved (no automatic stay), (iii) if secured creditors are ranked first in the distribution of the proceeds that result from the disposition of the assets of a bankrupt firm, and (iv) whether the debtor does not retain the administration of its property pending the resolution of the reorganization. The index ranges from 0 to 4, with higher value indicating stronger creditor protection (Source: La Porta et al. (2000) and Djankov et al. (2008)).	1.91	2	1.11	0	4
ShareholderRights	Revised anti-director rights index The yes/no responses to the following elements are coded as 1/0: (i) if a country allows shareholders to mail their proxy vote to the firm, (ii) whether or not shareholders are required to deposit their shares prior to the General Shareholders' Meeting, (iii) whether cumulative voting or proportional representation of minorities on the board of directors is allowed, (iv) if an oppressed minorities mechanism is in place, (v) if the minimum percentage of share capital that entitles a shareholder to call for an Extraordinary Shareholders' Meeting is less than or equal to 10% (the sample median), and (vi) if shareholders have preemptive rights that can only be waived by a shareholders' vote. The index ranges from 0 to 6, with higher value indicating stronger shareholder protection (Source: La Porta et al. (2000) and Djankov et al. (2008)).	3.27	3	0.94	2	5
Panel E. Country-level national culture variables						
Individualism/ Collectivism	It measures the extent to which individuals in a society prioritize their personal needs and goals over their groups' goals and well-being. High score indicates high individualist society (Source: Greet Hofstedes website, Hofstede Insights)	68.58	69	12.32	27	89
Long-term Orientation	It describes how every society has to maintain some links with its past while dealing with the challenges of the present and future, and societies prioritize these two existential goals differently (Source: Greet)	60.24	61	14.39	28	83
Panel F: Instrumental Variable						
DirectFlights	Number of direct scheduled airline flights from the bank headquarter to the headquarter of firms in the S&P Europe 350 Index (Source: Website of the airports)	24.50	29	11.21	0	39

2.2.2 Proxy to measure the presence of bondholder representatives

We follow Distinguin et al. (2023) to proxy the presence of bondholder representatives on bank boards by examining whether a bank director can be classified as a bondholder representative by establishing their affiliation with at least one bondholder. To achieve this, we collected comprehensive data on the list of bondholders for each bank in the year 2017, as well as the biographies of board directors. We employed two criteria to determine if a director is affiliated with at least one bondholder: (1) if they are currently or have been employed by a bondholder, or (2) if they currently serve or have served on the board of directors of a bondholder. We counted the number of bondholder representatives for each bank and calculated the percentage of bondholder representatives on the board. This represents the proportion of bondholder representatives on bank boards (*PropBondRep*).

2.2.3 Proxies for bank risk

We consider two distinct measures of individual bank risk. First, the Z-score (*LnZscore*). We employ the Z-score as a proxy for bank insolvency. Z-score equals the return on assets plus the capital asset ratio divided by the standard deviation of asset returns. We employ a 3-year moving window used to estimate standard deviations for each bank each year. A higher Z-score indicates greater bank stability, as it is inversely related to the likelihood of bank insolvency. To account for the skewed distribution of the Z-score, we use the natural logarithm of the Z-score, which is normally distributed. Valencia & Laeven (2008) and Lepetit & Strobel (2015), among others, have recently used the Z-score as a proxy for bank insolvency risk. Second, we use the standard deviation of the return on assets (*SDROA*), a risk measure commonly used in the literature including Laeven & Levine (2009).

We also consider two commonly used measures of systemic risk. The first, Marginal Expected Shortfall (*MES*), introduced by V. V. Acharya et al. (2017) and Brownlees & Engle (2017), is defined as the marginal contribution of a bank to systemic risk as measured by the Expected Shortfall of the financial system. The second measure, Delta-CoVaR (*DCoVaR*), introduced by Tobias & Brunnermeier (2016), corresponds to the Value at Risk of the financial system obtained conditionally on a specific event affecting a given bank. One advantage of these risk measures is that it is based on market, rather than accounting data. A higher (lower) value of *LnZscore* (*SDROA*, *MES*, and *DCoVaR*) signifies decreased risk.

2.2.4 Proxies for bank regulation, legal environments, and national cultural values

Our regulatory variables include the strength of the supervisory power (*Supervision*) and capital stringency (*CapString*) are from (Barth et al., 2013). The supervisory power measures for each country, i.e., whether the supervisory authorities have the power to take specific actions to prevent and correct problems. It ranges from 0 to 14, with a higher value indicating higher supervisory power. Capital stringency measures whether capital requirement reflects certain risk elements and deducts certain market value losses from capital before minimum capital adequacy is determined. It ranges from 0 to 10, higher values indicate greater stringency.

We follow Porta et al. (1998), and Brockman & Unlu (2009) by proxying the strength of a country's legal environment with creditor rights (*CreditorRights*) and shareholder rights (*ShareholderRights*). These indexes are taken from Porta et al. (1998) and Djankov et al. (2007, 2008). Creditors measure the legal protection of creditors in case of reorganization or liquidation of the debtor. The index ranges from 0 to 4, with a higher value indicating stronger creditor protection (see Table 1 for computation of these variables). Shareholder rights index measures the level of shareholder rights for each country, i.e., the legal protection of shareholders against expropriation by managers. It ranges from 0 to 6. A higher value indicates stronger shareholder protection. Finally, we follow Kanagaretnam et al. (2014) and Ashraf et al. (2016) the individualism/collectivism (*Individualism*) and long-term orientation/short-term orientation (*LongTOrientation*) dimensions from the cultural framework of Hofstede (2001) to measure the degree of individualism and long-term orientation in a country In contrast to collectivism, individualism measures how individuals in a society prioritize their personal needs and goals over the goals and well-being of their groups. A higher score of *Individualism* indicates a society with strong individualistic values, while a lower score indicates a society with strong collectivist values. In contrast to short-term orientation, long-term orientation describes how society maintains some links with its past while dealing with the challenges of the present and future and societies prioritize, these two existential goals differently. A higher score of *LongTOrientation* indicates high long-term orientation values, while a lower score indicates countries with short-term orientation values.

2.2.5 Summary statistics

Table 1 shows the descriptive statistics of our variables. The proportion of bondholder representatives has an average of 17.66% and a standard deviation of 18.36. Further statistics on bondholder representatives can be found in Table A1 and A2 of the appendix. Our observations indicate that banks with bondholder representatives tend to exhibit larger size, higher market funding ratios, and lower equity ratios compared to banks without bondholder representatives. Additionally, banks with bondholder representatives typically have a higher average number of directors, with an average of 14 directors compared to 11 for banks without bondholder representatives. Moreover, a significant number of banks with bondholder representatives adopt a two-tier board structure. This structure, as argued by Solomon (2020), facilitates the inclusion of representatives from diverse stakeholders.

The mean (median) of supervisory power is 10.10 (11) with a standard deviation of 2.34. The mean (median) of creditor rights is 1.91 (2) with a standard deviation of 1.11. The mean (median) individualism/ collectivism is 68.58 (69) with a standard deviation of 12.32, indicating that our sample covers a diverse set of banks and countries with large variations in board composition, regulations, legal environment, and culture.

Figure 1 illustrates significant differences in regulatory, legal environments, and national cultural values among our samples.

2.3 Empirical methodology

2.3.1 Econometric specification

The economic specification we use to investigate the impact of regulatory, legal environment, and national culture values on how bondholder representatives influence bank risk is as follows

$$\begin{aligned} Y_{ijt} &= \beta_0 + \beta_1 PropBondRep_{jt} + \beta_2 PropBondRep_{jt} * Factor_{jt} \\ &+ \sum_m \theta_m BankControls_{ijt} + \sum_n \gamma_n CountryControls_{jt} \end{aligned} \tag{1}$$

where i, j, and t stand, respectively, for bank, country, and time. The dependent variable

Y_{ijt} alternatively stands for our risk measure (*LnZscore*, *SDROA*, *MES*, and *DCoVaR*).

Our first variable of interest, $PropBondRep_{jt}$ captures the influence of bondholder representatives on banks' board when "Factor" is at the least. The variable "Factors" stands for bank regulatory factors (supervision and capital stringency), legal environments factors (creditor rights and shareholder rights), and national culture values (individualism/collectivism and long-term orientation/short-term orientation). We expect the coefficient associated with $PropBondRep_{jt}$ to be significant and positive for the risk measure logarithm of Z-score (*LnZscore*) and negative for standard deviation of return on assets (*SDROA*), marginal expected shortfall (*MES*), and Delta-CoVaR (*DCoVaR*) in line with the hypothesis that bondholders through their affiliate directors exert market discipline.

Our second variable of interest is the interaction term *PropBondRep*Factor*, represents the influence of a unit change in "*Factor*" on the market discipline enforced by bondholder representatives in mitigating bank risk. A significant and positive (negative) coefficient of the interaction *PropBondRep*Factor*, for the risk measure *LnZscore* (*SDROA*, *MES*, and *DCoVaR*) indicates an increase in the market discipline exerted by bondholder representatives for a unit increase in the variable "Factors". In contrast, a significant and negative (positive) coefficient of the interaction *PropBondRep*Factor*, for the risk measure *LnZscore* (*SDROA*, *MES*, and *DCoVaR*) indicates a decrease in the market discipline exerted by bondholder representatives for a unit increase in the variable "Factor". To fully capture the impact of "Factor" on the market discipline exerted by bondholder representatives, we compute the marginal impact of bondholder representatives' influence in reducing bank risk at different degrees of each "*Factor*".

We estimate all regressions over the period 2016-2018 using a country random-effects regression approach. This method, commonly used in the literature (Claessens et al., 2002; Dahya et al., 2008; Durnev & Kim, 2005; La Porta et al., 2002), explicitly considers the correlated errors among observations within a country and produces consistent standard errors. We also validate the suitability of this specification through the Breusch & Pagan (1980) Lagrange multiplier test, which rejects the null hypothesis of independent errors within countries for all risk regressions.

Data descriptions and sources of each control variable are presented in Table 1. We follow the existing literature and control for both individual and country-level factors that might also influence bank risk-taking. The literature on financial firms generally uses the natural logarithm of total assets (*Size*), equity to total assets (*EquityTA*), loan to total asset (*LoanRatio*), and deposit to total assets (*DepositRatio*). Pathan (2009) and Minton et al. (2014) argue that the role of the board of directors is viewed as crucial in monitoring a bank's risks. To allow for this, we control for board size (*BoardSize*) and board tier (*BoardTier*). We measure board size as the natural logarithm of the number of directors on bank boards. The Boardtier is a dummy variable taking the value of one if the bank has a one-tier board and the value of 0 if the bank has a dual board (tier-two). We address potential multicollinearity issues by orthogonalizing the relevant variables (see Table A3). We examine the correlation between our variables of interest by computing the variance inflation factors (VIF), which have a mean value of 1.81 with a maximum of 2.88 (see Table A4).

2.3.2 Endogeneity issue and estimation methodology

Addressing potential endogeneity issues between bank risk and the proportion of bondholder representatives, we use an instrumental variable (IV) model using a two-stage least squares instrumental variable regression. Hermalin & Weisbach (1998) have questioned the composition and the effectiveness of board of directors. Following Distinguin et al. (2023), we use the number of direct scheduled airline flights from the bank headquarters to the headquarters of firms in the S&P 350 European index as an instrumental variable. The literature on board composition, suggests that the number of direct flights to and from a firm's headquarters city can serve as a suitable instrument for instrumenting board composition, it can influence the number of available potential directors that the firm can look for (Bernile et al., 2018; Bernstein et al., 2016; Giroud, 2013). The reason behind the selection of our instrumental variable (IV) is based on the idea that an increased number of flights available for directors can enhance the ease of recruiting directors from companies listed in the S&P 350 European index. In our sample, where 97.55% of bondholders are financial institutions, but these institutions account for only 15.5% of the firms in the S&P 350 European index, a higher frequency of direct flights would, assuming candidates have similar qualifications, decrease the probability of recruiting directors specifically associated with bondholders to the board.

We check the strength of our instruments by verifying the first-stage F-statistic and performing the Anderson canonical correlation LM test to determine its p-value. We reject the null hypothesis of the Anderson canonical correlation LM test, as all F-statistics exceed ten, indicating that our instruments are strong.

Column (1) of each Table reports the first stage IV regression result for the risk measure *LnZscore*. Similar results are obtained for the other dependent variables *SDROA*, *MES*, and *DCoVaR*. The result shows a negative relationship between the IV and the index representing the influence of bondholder representatives. This finding is in line with our expectations, indicating that a higher number of flights between the bank's headquarters and the headquarters of companies in the S&P 350 European index promotes the recruitment of directors from these companies. Consequently, this reduces the likelihood of having directors on the board with strong connections to bondholders.

2.4 Empirical results

We examine the impact of bank regulatory factors, legal environment, and national cultural values on the market discipline bondholder representatives exert in reducing bank risk, we run the model in Eq (1). To examine the overall impact of "*Factor*" on the market discipline exerted by bondholder representatives, we compute the marginal effect of bondholder representatives risk reducing influence at a different level of each "*Factor*". Columns (2) to (5) of each Table report the second stage regression of our instrumental variable approach for the proxies of our risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR*.

2.4.1 Bondholder representatives and bank risk under different environments

2.4.1.1 Role of the strength of supervision

Our hypothesis *H1*, posits that stronger supervision power will decrease the market discipline bondholder representatives exert in reducing bank risk. Table 2 presents the result of estimating Eq (1) where "Factor" represents the strength of supervision. The results are in line with the hypothesis. The coefficients *PropBondRep* in columns (2) to (5) are all significant and positive(negative) for the risk measure *LnZscore* (*SDROA*, *MES*, *DCoVaR*) signifying that bondholder representatives on banks board effectively reduce bank risk in countries where supervisors have the lowest power. However, the coefficients of the interaction term *PropBondRep*Supervision* are significant and negative (positive) for the risk measure *LnZscore* (*SDROA*, *MES*) indicating that supervision power has a decreasing impact on the risk-reducing effect of bondholder representatives.

Below Table 2 reports the impact of supervision on market discipline exerted by bondholder representatives at different strengthen of supervisory power. The marginal impact analysis on the risk-reducing effect of bondholder representatives at various levels of supervisory power reveals that bondholder representatives effectively reduce bank risk, regardless of a country's level of supervision. However, the risk-reducing effect decreases as the strength of a country's supervision increases. This result supports the substitution hypothesis, suggesting that in countries with weak supervisory powers, bondholder representatives can provide an alternative means of reducing excessive bank risk-taking. A plausible explanation for this result could be that, because monitoring banks carries costs, bondholder representatives may reduce their monitoring efforts if they believe that supervisory authorities are effective in gathering information from banks and taking actions to influence bank behavior. The finding is consistent with that of Cubillas et al. (2012), who find that market discipline weakens after a banking crisis, and the weakening is higher in countries with more supervisory power before the banking crisis. Considering that the sample average yearly individual bank risk *LnZscore* (*SDROA*), is 4.31 (0.30), the result indicates an economic meaningful impact and evidence of the negative impact of supervision on market discipline bondholder representatives exert. The coefficients of column (4) and (5), reports the impact of supervision on market discipline bondholder representatives exert in monitoring bank risk (systemic risk). We observe that the economic impact is similar considering the sample average.

Table 2: **Role of supervision on the risk-reducing effect of bondholder representatives**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(5)
	IV 1st Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage
PropBondRep		0.206***	-0.128***	-0.00110***	-0.0000837*
		(5.23)	(-5.84)	(-6.12)	(-1.70)
PropDebtRep*Supervision		-0.00790***	0.00592***	0.0000282**	-0.00000448
		(-3.15)	(4.24)	(2.53)	(-1.31)
Direct_flights	-0.245***				
	(-3.05)				
Supervision	-1.529***	0.359***	-0.251***	-0.00128***	-0.0000759
	(-3.92)	(4.56)	(-5.73)	(-3.75)	(-0.75)
Size	10.41***	-1.344***	0.609***	0.0140***	0.00322***
	(9.42)	(-4.79)	(3.90)	(10.71)	(9.25)
GrowthTA	-2.351***	0.381***	-0.0883	-0.00161***	0.0000958
	(-2.65)	(3.88)	(-1.61)	(-3.08)	(0.71)
EquityTA	-0.928	0.00161	0.118***	-0.000154	0.0000556
	(-0.98)	(0.02)	(2.58)	(-0.36)	(0.46)
LoanRatio	-0.116***	0.0239***	-0.00544**	-0.000163***	-0.0000234***
	(-2.69)	(5.67)	(-2.32)	(-8.83)	(-4.47)
DepositRatio	-0.0444	0.00311	-0.000255	-0.000133***	-0.000000978
	(-0.84)	(0.66)	(-0.10)	(-5.40)	(-0.15)
OperatingRatio	-0.114	0.0329***	-0.0138**	-0.000289***	-0.0000317*
	(-0.80)	(2.62)	(-1.97)	(-4.87)	(-1.92)
BoardSize	-1.482*	0.0262	-0.146***	-0.00175***	-0.000532***
	(-1.71)	(0.33)	(-3.35)	(-4.27)	(-5.20)
BoardTier	-5.555***	0.495**	-0.144	-0.00294***	-0.000887***
	(-2.91)	(2.26)	(-1.18)	(-3.14)	(-3.06)
GDP	-0.0284	0.612***	-0.312***	-0.00300***	-0.000272*
	(-0.02)	(5.27)	(-4.83)	(-5.24)	(-1.66)
Inflation	-2.000**	0.202**	-0.117**	-0.000484	0.000358***
	(-2.47)	(2.36)	(-2.48)	(-1.15)	(3.30)
CreditorRights	2.963***	-0.743***	0.411***	0.00324***	0.000121
	(3.33)	(-6.61)	(6.58)	(6.27)	(0.90)
CapString	0.122	0.117***	-0.0126	-0.00183***	-0.000241***
	(0.25)	(2.78)	(-0.54)	(-8.85)	(-3.94)
Constant	47.91***	-4.273***	4.591***	0.0736***	0.0101***
	(6.14)	(-2.85)	(5.51)	(10.78)	(5.36)
Country random effect	Yes	Yes	Yes	Yes	Yes
No. of Observations	309	309	309	277	286
Marginal effect: Supervision at:					
Q25		0.178***	-0.107***	-0.0010***	-0.0001**
		(0.034)	(0.019)	(0.0002)	(0.000)
Q50		0.150***	-0.086***	-0.0009***	-0.00011***
		(0.030)	(0.016)	(0.0001)	(0.000)
Q75		0.123***	-0.066***	-0.0008***	-.00013***
		(0.028)	(0.015)	(0.0001)	(0.000)

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *PropBondRep*Supervision*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*PropBondRep*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different supervision strengths is reported at the end of each column.

2.4.1.2 Role of capital stringency

Our hypothesis *H2*, states that stronger capital stringency will decrease the market discipline bondholder representatives exert in reducing bank risk. Table 3 reports the estimation of Eq (1) where the variable "Factor" represents capital stringency. The results are not in line with *H2* for the individual bank risk *LnZscore* and *SDROA*. The coefficients *PropBondRep* in columns (2) to (5) are all significant and positive (negative) for the risk measure *LnZscore* (*SDROA*, *MES*, *DCoVaR*) signifying that bondholder representatives on banks board effectively reduce bank risk in countries with the lowest level of capital regulation. The coefficients of the interaction term *PropBondRep*CapString* are significant and positive (negative) for the individual risk measure *LnZscore* (*SDROA*) indicating that the strength of a country's capital stringency has an increasing impact on the risk-reducing effect of bondholder representatives. In contrast, we see a decreasing impact on bondholder representatives' risk-reducing effect for our systemic risk measures (*MES* and *DCoVaR*).

Below each column in Table 3, we report the impact of capital stringency on the risk-reducing effect by bondholder representatives under varying degrees of capital stringency. The marginal impact analysis on the risk-reducing effect of bondholder representatives at various degrees of capital stringency reveals that bondholder representatives effectively reduce bank risk, irrespective of the strength of a country's capital stringency. However, the risk-reducing effect on individual bank risk (systemic risk) increases (decreases) as the strength of a country's capital stringency increases. Our result is in line with V. V. Acharya et al. (2011) who find stronger creditor rights in bankruptcy affect corporate investment choice by reducing corporate risk-taking.

Table 3: **Role of capital stringency on the risk-reducing effect of bondholder representatives**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(5)
	IV 1st Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage
PropBondRep		0.0664**	-0.0381**	-0.000979***	-0.000208***
		(2.02)	(-2.05)	(-6.26)	(-4.88)
PropBondRep*CapString		0.0101***	-0.00469**	0.0000365**	0.0000144***
		(2.94)	(-2.41)	(2.27)	(3.03)
Directflights	-0.245***				
	(-3.05)				
CapString	0.122	-0.0981	0.0951**	-0.00233***	-0.000520***
	(0.25)	(-1.29)	(2.21)	(-6.84)	(-5.00)
Size	10.41***	-1.333***	0.577***	0.0134***	0.00315***
	(9.42)	(-4.75)	(3.63)	(10.10)	(9.15)
GrowthTA	-2.351***	0.381***	-0.0813	-0.00137***	0.000111
	(-2.65)	(3.86)	(-1.45)	(-2.63)	(0.84)
EquityTA	-0.928	-0.000470	0.122***	-0.0000610	0.0000625
	(-0.98)	(-0.01)	(2.62)	(-0.14)	(0.53)
LoanRatio	-0.116***	0.0264***	-0.00642***	-0.000147***	-0.0000194***
	(-2.69)	(6.07)	(-2.61)	(-7.63)	(-3.62)
DepositRatio	-0.0444	0.00153	0.000600	-0.000129***	-0.00000382
	(-0.84)	(0.32)	(0.22)	(-5.25)	(-0.59)
OperatingRatio	-0.114	0.0315**	-0.0126*	-0.000289***	-0.0000327**
	(-0.80)	(2.50)	(-1.76)	(-4.85)	(-2.01)
BoardSize	-1.482*	0.107	-0.191***	-0.00162***	-0.000442***
	(-1.71)	(1.33)	(-4.16)	(-3.84)	(-4.29)
BoardTier	-5.555***	0.541**	-0.175	-0.00297***	-0.000849***
	(-2.91)	(2.47)	(-1.41)	(-3.17)	(-2.97)
GDP	-0.0284	0.639***	-0.316***	-0.00278***	-0.000212
	(-0.02)	(5.44)	(-4.75)	(-4.80)	(-1.31)
Inflation	-2.000**	0.218**	-0.121**	-0.000315	0.000389***
	(-2.47)	(2.53)	(-2.49)	(-0.74)	(3.62)
CreditorRights	2.963***	-0.733***	0.391***	0.00295***	0.0000940
	(3.33)	(-6.52)	(6.14)	(5.68)	(0.70)
Supervision	-1.529***	0.176***	-0.114***	-0.000680***	-0.000180***
	(-3.92)	(3.33)	(-3.79)	(-2.77)	(-2.59)
Constant	47.91***	-1.274	2.560***	0.0680***	0.0126***
	(6.14)	(-0.95)	(3.36)	(10.96)	(7.40)
Country random effect	Yes	Yes	Yes	Yes	Yes
No. of Observations	309	309	309	277	286
Marginal effect: CapString at:					
Q25		0.092***	-0.050***	-0.00086***	-0.00016***
		(0.029)	(0.016)	(0.0001)	(0.000)
Q50		0.117***	-0.062***	-0.00080***	-0.00011***
		(0.028)	(0.016)	(0.0001)	(0.000)
Q75		0.142***	-0.073***	-0.00071***	-0.00005
		(0.029)	(0.016)	(0.0001)	(0.000)

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *PropBondRep*CapiString*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*PropBondRep*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different supervision strengths is reported at the end of each column.

2.4.1.3 Role of creditor rights

We examine hypothesis *H3*, which posits that stronger creditor rights will increase the market discipline bondholder representatives exert in reducing bank risk. We run the model in Eq (1) where “Factor” represents creditor rights. The result is provided in Table 4 and is in line with *H3*. The coefficients *PropBondRep* in columns (2) to (5) are all significant and positive(negative) for the risk measure *LnZscore* (*SDROA*, *MES*, *DCoVaR*) indicating that bondholder representatives on banks board effectively reduce bank risk in countries with no creditor rights. The coefficients of the interaction term *PropBondRep*CreditorRights* are significant and positive (negative) for the measure *LnZscore* (*SDROA* and *MES*) suggesting that the strength country’s creditor rights have an increasing impact on the risk-reducing effect of bondholder representatives.

We report below each column of Table 4 the impact of creditor rights on the risk-reducing effect by bondholder representatives under varying degrees of creditor rights. The marginal impact analysis on the risk-reducing effect of bondholder representatives at various degrees of creditor rights reveals that bondholder representatives effectively reduce bank risk, irrespective of the strength of a country’s creditor rights. The risk-reducing effect increases as the strength of a country’s creditor rights increases. A possible explanation for this result is stronger creditor rights give bondholder representatives more power to influence bank risk-taking behavior. We report the market discipline bondholder representatives exert at a quarterly level of creditor rights at the bottom of each column.

Table 4: **Role of credit rights on the risk-reducing effect of bondholder representatives**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(5)
	IV 1st Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage
PropBondRep		0.0875***	-0.0338**	-0.000734***	-0.000126***
		(3.08)	(-2.22)	(-5.26)	(-3.48)
PropBondRep*CreditorRights		0.0171***	-0.0159***	-0.0000356*	-0.00000196
		(4.05)	(-7.03)	(-1.90)	(-0.35)
Directflights	-0.245***				
	(-3.05)				
CreditorRights	2.963***	-1.102***	0.755***	0.00389***	0.000169
	(3.33)	(-7.34)	(9.39)	(5.88)	(0.93)
Size	10.41***	-1.295***	0.580***	0.0139***	0.00325***
	(9.42)	(-4.69)	(3.93)	(10.54)	(9.33)
GrowthTA	-2.351***	0.384***	-0.0952*	-0.00159***	0.0000804
	(-2.65)	(3.95)	(-1.83)	(-3.03)	(0.59)
EQ_TA	-0.928	-0.0520	0.165***	0.00000714	0.0000606
	(-0.98)	(-0.63)	(3.77)	(0.02)	(0.50)
LoanRatio	-0.116***	0.0219***	-0.00368	-0.000158***	-0.0000237***
	(-2.69)	(5.24)	(-1.64)	(-8.52)	(-4.52)
DepositRatio	-0.0444	0.00459	-0.00171	-0.000133***	-0.00000145
	(-0.84)	(0.98)	(-0.68)	(-5.35)	(-0.22)
OperatingRatio	-0.114	0.0304**	-0.0117*	-0.000280***	-0.0000319*
	(-0.80)	(2.44)	(-1.76)	(-4.67)	(-1.92)
BoardSize	-1.482*	0.0566	-0.171***	-0.00188***	-0.000515***
	(-1.71)	(0.73)	(-4.11)	(-4.59)	(-5.06)
BoardTier	-5.555***	0.481**	-0.124	-0.00301***	-0.000869***
	(-2.91)	(2.22)	(-1.07)	(-3.20)	(-2.99)
GDP	-0.0284	0.585***	-0.292***	-0.00297***	-0.000277*
	(-0.02)	(5.11)	(-4.76)	(-5.17)	(-1.70)
Inflation	-2.000**	0.233***	-0.149***	-0.000511	0.000355***
	(-2.47)	(2.75)	(-3.28)	(-1.21)	(3.25)
CapString	0.122	0.0734*	0.0232	-0.00169***	-0.000259***
	(0.25)	(1.79)	(1.06)	(-8.36)	(-4.34)
Supervision	-1.529***	0.187***	-0.124***	-0.000680***	-0.000171**
	(-3.92)	(3.57)	(-4.41)	(-2.76)	(-2.43)
Constant	47.91***	-1.412	2.336***	0.0647***	0.0112***
	(6.14)	(-1.08)	(3.32)	(10.45)	(6.65)
Country random effect	Yes	Yes	Yes	Yes	Yes
No. of Observations	309	309	309	277	286
Marginal effect: CreditorRights at:					
Q25		0.105***	-0.050***	-0.00076***	-0.000128***
		(0.028)	(0.015)	(0.000)	(0.000)
Q50		0.122***	-0.066***	-0.00081***	-0.000130***
		(0.027)	(0.015)	(0.000)	(0.000)
Q75		0.139***	-0.081***	-0.00084***	-0.000132***
		(0.028)	-0.050***	(0.000)	(0.000)

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *PropBondRep*CreditorRights*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*PropBondRep*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different supervision strengths is reported at the end of each column.

2.4.1.4 Role of shareholder rights

We examine hypothesis *H4*, which posits that stronger shareholder rights will increase the market discipline ‘exerted by bondholder representatives in reducing bank risk. We run Equation (1) where "Factor" represents creditor rights of a country. The results, as presented in Table 5 are in line with the hypothesis. The coefficients for *PropBondRep* in columns (2), (4), and (5) are all significant and positive (negative) for the risk measures *LnZscore* (*MES*, *DCoVaR*). This suggests that bondholder representatives on bank boards effectively mitigate bank risk in countries with the lowest level of shareholder rights. Furthermore, the coefficients of the interaction term *PropBondRep*ShareholderRights* are significant and positive (negative) for the measure *LnZscore* (*MES*, *DCoVaR*), suggesting that the strength of a country's shareholder rights has an increasing impact on the risk-reducing effect of bondholder representatives.

Below each column of Table 5, we provide a detailed breakdown of the market discipline exerted by bondholder representatives at different levels of shareholder rights at the bottom of each column. The marginal impact analysis on the risk-reducing effect of bondholder representatives at various levels of shareholder rights reveals that bondholder representatives effectively reduce bank risk, regardless of the strength of a country's creditor rights. However, the risk-reducing effect increases as the strength of a country's shareholder rights increases. One possible explanation for this result could be that, in the presence of stronger shareholder rights, the need for more robust monitoring by bondholders increases to reduce bank risk.

Table 5: **Role of shareholder rights on the risk-reducing effect of bondholder representatives**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(5)
	IV 1st Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage
PropBondRep		0.0768**	-0.0169	-0.000830***	-0.000167***
		(2.25)	(-0.89)	(-5.03)	(-3.80)
PropBondRep*ShareholderRights		0.0123**	-0.0133***	0.00000223	0.0000112
		(2.20)	(-4.29)	(0.09)	(1.49)
Directflights	-0.247***				
	(-3.04)				
ShareholderRights	2.491**	-0.393**	0.498***	0.00126*	0.0000948
	(2.20)	(-2.34)	(5.39)	(1.72)	(0.45)
Size	10.94***	-1.454***	0.645***	0.0147***	0.00321***
	(9.96)	(-4.83)	(3.89)	(10.47)	(8.75)
GrowthTA	-2.634***	0.391***	-0.103*	-0.00146***	0.0000692
	(-2.92)	(3.65)	(-1.74)	(-2.72)	(0.50)
EquityTA	-0.589	-0.0898	0.186***	0.000222	0.0000657
	(-0.62)	(-1.07)	(4.04)	(0.53)	(0.56)
LoanRatio	-0.136***	0.0295***	-0.00815***	-0.000182***	-0.0000235***
	(-3.19)	(6.32)	(-3.17)	(-9.25)	(-4.29)
DepositRatio	0.00154	-0.00902**	0.00626**	-0.0000636***	0.000000832
	(0.03)	(-2.02)	(2.55)	(-2.88)	(0.14)
OperatingRatio	-0.0901	0.0254**	-0.00905	-0.000263***	-0.0000313*
	(-0.63)	(1.98)	(-1.28)	(-4.37)	(-1.90)
BoardSize	-1.501*	0.0524	-0.155***	-0.00204***	-0.000521***
	(-1.72)	(0.64)	(-3.45)	(-4.81)	(-5.07)
BoardTier	-8.084***	1.033***	-0.447***	-0.00572***	-0.00102***
	(-4.44)	(3.77)	(-2.96)	(-4.92)	(-2.99)
GDP	-1.252	0.734***	-0.431***	-0.00403***	-0.000394**
	(-0.87)	(5.64)	(-6.01)	(-6.33)	(-2.25)
Inflation	-0.883	-0.0802	0.0433	0.000749**	0.000397***
	(-1.19)	(-1.18)	(1.16)	(2.30)	(4.52)
CapString	-0.270	0.161***	-0.0506**	-0.00192***	-0.000279***
	(-0.54)	(3.50)	(-2.00)	(-8.78)	(-4.33)
Supervision	-1.001**	0.129***	-0.0540**	-0.000516**	-0.000117*
	(-2.23)	(2.68)	(-2.04)	(-2.22)	(-1.75)
Constant	43.75***	-2.048	1.874**	0.0679***	0.0109***
	(4.92)	(-1.51)	(2.50)	(10.73)	(6.36)
Country random effect	Yes	Yes	Yes	Yes	Yes
No. of Observations	309	309	309	277	286
M. effect: ShareholderRights_at:					
Q25		0.095***	-0.037***	-0.00083***	-0.00015***
		(0.030)	(0.017)	(0.000)	(0.000)
Q50		0.114***	-0.057***	-0.00082***	-0.00013***
		(0.029)	(0.016)	(0.000)	(0.000)
Q75		0.132***	-0.077***	-0.00082***	-0.00011***
		(0.029)	(0.016)	(0.000)	(0.000)

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *PropBondRep*ShareholderRights*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*PropBondRep*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different supervision strengths is reported at the end of each column.

2.4.1.5 Role of individualism/collectivism

Table 6 presents the results of estimating Eq (1) with "Factor" representing the degree of individualism/collectivism values in a country. In contrast to our hypothesis H5, which posits more individualistic values in a country decreases the market discipline exerted by bondholder representatives in reducing bank risk. The coefficients for *PropBondRep* in columns (2) to (4) are not significant for the risk measures *LnZscore*, *SDROA*, and *MES*. This suggests that bondholder representatives on bank boards are less effective in mitigating bank risk in countries with the strongest collectivistic values. However, the coefficients of the interaction term *PropBondRep*Individualism* are significant and negative for the risk measures *SDROA* and *MES*, indicating that the degree of a society's individualism has an increasing impact on the risk-reducing effect of bondholder representatives.

Below each column in Table 6, we report the impact of individualism on the risk-reducing effect by bondholder representatives under varying degrees of a country's individualism values. The marginal impact analysis on the risk-reducing effect of bondholder representatives at various degrees of a society's individualism reveals a significant increase (columns (3) to (5)) in the effectiveness of bondholder representatives in reducing bank risk as the degree of a society's individualism increases. One possible explanation for this result could be that, in individualistic societies, bondholder representatives prioritize the interests of their constituents over the broader objectives of the board. Our findings also indicate that in more collectivist societies, the market discipline exerted by bondholder representatives decreases. This result aligns with the cushioning hypothesis, which suggests that individuals in collectivist societies are more inclined to take on additional risk because they anticipate assistance from their social networks in case of failure (Hsee & Weber, 1999).

Table 6: **Role of individualism on the risk-reducing effect of bondholder representatives**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(5)
	IV 1st Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage
PropBondRep		0.0630	0.0153	-0.00000928	-0.000122**
		(1.43)	(0.63)	(-0.04)	(-2.01)
PropBondRep*Individualism		0.000623	-0.00114***	-0.0000081***	0.000000111
		(1.35)	(-4.54)	(-3.47)	(0.17)
Directflights	-0.231***				
	(-2.91)				
Individualism	0.125	-0.00768	0.0291***	0.000113*	0.00000998
	(1.56)	(-0.67)	(4.66)	(1.90)	(0.65)
Size	10.62***	-1.116***	0.617***	0.0111***	0.00299***
	(9.73)	(-3.70)	(3.75)	(7.35)	(8.06)
GrowthTA	-2.585***	0.348***	-0.127**	-0.00138**	0.0000627
	(-2.89)	(3.19)	(-2.12)	(-2.22)	(0.41)
EquityTA	-0.754	0.00489	0.150***	-0.000285	-0.000000215
	(-0.81)	(0.06)	(3.33)	(-0.61)	(-0.00)
LoanRatio	-0.109**	0.0222***	-0.00522**	-0.000148***	-0.0000214***
	(-2.53)	(5.25)	(-2.26)	(-7.26)	(-3.99)
DepositRatio	-0.0203	0.00153	0.00292	-0.0000993***	0.00000229
	(-0.37)	(0.32)	(1.11)	(-3.64)	(0.32)
OperatingRatio	-0.124	0.0310**	-0.0148**	-0.000300***	-0.0000330*
	(-0.88)	(2.39)	(-2.09)	(-4.49)	(-1.91)
BoardSize	-0.940	0.0865	-0.115***	-0.00234***	-0.000603***
	(-1.07)	(1.12)	(-2.73)	(-5.35)	(-5.74)
BoardTier	-5.966***	0.418*	-0.209	-0.00172	-0.000725**
	(-3.13)	(1.78)	(-1.63)	(-1.58)	(-2.32)
GDP	0.626	0.633***	-0.263***	-0.00357***	-0.000259
	(0.44)	(5.14)	(-3.91)	(-5.30)	(-1.48)
Inflation	-2.000**	0.192**	-0.111**	-0.000369	0.000302***
	(-2.52)	(2.16)	(-2.30)	(-0.78)	(2.66)
CreditorRights	2.372**	-0.706***	0.369***	0.00288***	0.0000726
	(2.49)	(-6.58)	(6.29)	(5.29)	(0.53)
Supervision	-1.541***	0.168***	-0.133***	-0.000485*	-0.000139*
	(-3.96)	(3.00)	(-4.34)	(-1.77)	(-1.88)
Constant	38.27***	-0.567	1.068	0.0406***	0.00814***
	(3.89)	(-0.44)	(1.50)	(5.93)	(4.64)
Country random effect	309	309	309	277	286
No. of Observations					
Marginal effect: Individualism at					
Q25		0.0779**	-0.0121	-0.0002	-0.0001**
		(0.0367)	(0.0201)	(0.000)	(0.000)
Q50		0.0935***	-0.0406**	-0.0004**	-.0001***
		(0.0313)	(0.0171)	(0.000)	(0.000)
Q75		0.1091***	-0.0692***	-0.0006***	-.0001***
		(0.0296)	(0.0162)	(0.000)	(0.000)

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *PropBondRep*Individualism*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*PropBondRep*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different supervision strengths is reported at the end of each column.

2.4.1.6 Role of long-term orientation/short-term orientation

We examine hypothesis *H6*, which posits that more long-term orientation values in a society increase the market discipline bondholder representatives exert in reducing bank risk. We run Equation (1) when "Factor" represents the degree of a country's long-term orientation values. The results, as presented in Table 7, are not in line with *H6*. The coefficients for *PropBondRep* in columns (2) to (5) are all significant and positive (or negative) for the risk measures *LnZscore* (*SDROA*, *MES*, *DCoVaR*). This suggests that bondholder representatives on bank boards effectively mitigate bank risk in countries where short-term orientation values are the most pronounced. However, the coefficients of the interaction term *PropBondRep*LongTOrientation*, are significant and negative (positive) for our individual bank risk measures *LnZscore* and *SDROA*, suggesting that the degree of a country's long-term orientation values have a decreasing impact on the risk-reducing effect of bondholder representatives.

Below each column in Table 7, we report the impact of long-term orientation values on the risk-reducing effect by bondholder representatives under varying degrees of a country's individualism values. The marginal impact analysis on the risk-reducing effect of bondholder representatives at various levels of long-term orientation values reveals that bondholder representatives effectively reduce bank risk, regardless of the degree of a country's long-term orientation values. However, the risk-reducing effect decreases as the degree of a country's long-term orientation values increases. This result supports the substitution hypothesis, suggesting that in countries with more short-term orientation values, bondholder representatives can provide an alternative means of reducing excessive bank risk-taking.

Table 7: **Role of long-term orientation on the risk-reducing effect of bondholder representatives**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(5)
	IV 1st Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage
PropBondRep		0.204***	-0.107***	-0.000724***	-0.000109**
		(5.59)	(-5.07)	(-3.59)	(-2.17)
PropBondRep*LongTOrientation		-0.00141***	0.000733***	0.00000153	-6.20e-08
		(-3.48)	(3.11)	(0.68)	(-0.11)
Directflights	-0.261***				
	(-3.32)				
LongtermLrientation	0.172***	0.0281***	-0.00382	-0.0000545	-0.00000830
	(2.74)	(3.11)	(-0.73)	(-1.11)	(-0.64)
Size	10.85***	-1.201***	0.563***	0.0113***	0.00295***
	(9.98)	(-4.63)	(3.74)	(8.11)	(8.61)
GrowthTA	-2.071**	0.349***	-0.0468	-0.00129**	0.0000739
	(-2.35)	(3.90)	(-0.90)	(-2.31)	(0.57)
EquityTA	-0.434	0.00540	0.164***	-0.000483	-0.0000366
	(-0.46)	(0.07)	(3.60)	(-1.04)	(-0.31)
LoanRatio	-0.103**	0.0221***	-0.00375*	-0.000145***	-0.0000226***
	(-2.42)	(5.74)	(-1.68)	(-7.15)	(-4.41)
DepositRatio	-0.0332	0.00411	-0.000318	-0.000110***	-0.000000496
	(-0.63)	(0.91)	(-0.12)	(-3.99)	(-0.07)
OperatingRatio	-0.168	0.0305**	-0.0152**	-0.000290***	-0.0000294*
	(-1.19)	(2.40)	(-2.06)	(-4.24)	(-1.69)
BoardSize	-1.219	0.131*	-0.165***	-0.00257***	-0.000655***
	(-1.49)	(1.82)	(-3.95)	(-5.86)	(-6.63)
BoardTier	-4.793**	0.387**	-0.0694	-0.00183*	-0.000725***
	(-2.53)	(1.97)	(-0.61)	(-1.78)	(-2.62)
GDP	0.139	0.582***	-0.267***	-0.00331***	-0.000330**
	(0.10)	(5.20)	(-4.10)	(-5.15)	(-1.99)
Inflation	-1.698**	0.302***	-0.135***	-0.000632	0.000290***
	(-2.15)	(3.71)	(-2.85)	(-1.34)	(2.64)
CreditorRights	3.307***	-0.754***	0.418***	0.00273***	0.000120
	(3.74)	(-6.69)	(6.38)	(4.63)	(0.84)
Supervision	-1.890***	0.189***	-0.143***	-0.000439	-0.000118
	(-4.64)	(3.29)	(-4.29)	(-1.48)	(-1.51)
Constant	39.40***	-3.240***	3.290***	0.0526***	0.00937***
	(4.95)	(-2.85)	(4.99)	(8.05)	(6.03)
Country random effect	Yes	Yes	Yes	Yes	Yes
No. of Observations	309	309	309	277	286
M. effects: LongTOrientation at:					
Q25		0.168***	-0.089***	-0.00069***	-0.00011***
		(0.030)	(0.017)	(0.00)	(0.00)
Q50		0.133***	-0.071***	-0.00065***	-0.00011***
		(0.026)	(0.015)	(0.00)	(0.00)
Q75		0.098***	-0.052***	-0.00061***	-0.00011***
		0.025	(0.015)	(0.00)	(0.00)

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *PropBondRep*LongTOrientation*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*PropBondRep*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different supervision strengths is reported at the end of each column.

2.4.2 Robustness tests

We conducted several robustness checks to confirm that the identification of bondholder representatives' influence on bank boards did not affect our results.

In our main analysis, we use the proportion of bondholder representatives (*PropBondRep*) to conduct our analysis. This approach allows for easy interpretation of our results.

We rely on an index developed by Distinguin et al. (2023) to ensure the robustness of our analysis. This index utilizes individual scores that are based on two criteria designed to measure the strength of the relationship between a director and a bondholder. A score of one is assigned for each criterion if it is satisfied; otherwise, a score of zero is given. The first criterion examines whether a director is currently employed by a bondholder, indicating a potentially strong and direct bondholder influence. The second criterion considers whether the director's affiliation with bondholders is current or in the past. If a bank director is currently employed by a bondholder, the director may feel duty-bound to prioritize the interests of that bondholder due to the potential risk of losing their job. However, if the director's relationship with the bondholder is in the past, the bondholder's influence on the director's decision-making is likely to be less direct. Consequently, their impact on the bank's operations should be comparatively less significant than in the first scenario. We quantify the level of relatedness between directors and bondholders by using a scoring system. First, an individual "score of relatedness" is computed for each director by summing the scores associated with the two criteria. Next, we compute an overall "score of relatedness" at the bank level by averaging the individual scores of all directors within the bank. These "scores of relatedness" are then utilized to generate the bondholder representatives' index (*BondRepIndex*). To create the index, banks are ranked based on their positive "score of relatedness" into deciles, resulting in a range from 1 to 10. A higher index score indicates a stronger influence of bondholders on the bank's board, signifying a greater level of bondholder representation within the decision-making processes of the bank. The results when we rerun Eq (1) with bondholder representatives' index (*BondRepIndex*) can be found from Table A5 to A10.

An additional way to determine if bondholder representatives are present is to use a dummy variable. This variable takes a value of one if there is at least one director affiliated with a bondholder, whether the relationship is current or in the past. This variable is referred to as *DBondRep*. The results obtained after re-running Eq (1) are presented in Tables A11 to A16.

We re-estimated all regressions with country fixed effects instead of random effects using the proportion of bondholder representatives (*PropBondRep*) on the board as a proxy for market discipline. Tables A17 to A22 report the results.

2.5 Conclusion

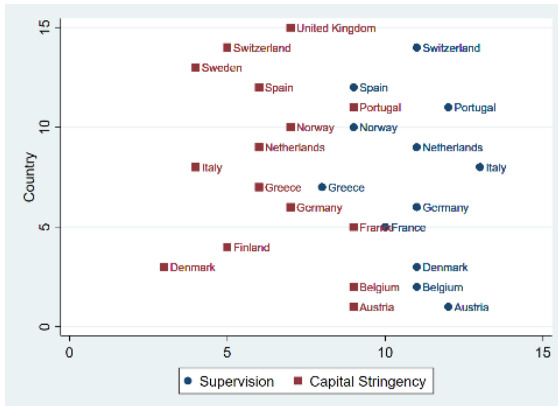
The purpose of this paper is to analyze whether bondholders' representatives can discipline banks' behavior effectively and whether this discipline varies depending on the regulatory, legal, and cultural environment of a country. We used a dataset that brings together information on bondholders, shareholders, and boards of directors of European listed banks.

Our study identified three key factors that influence the market discipline exerted by bondholder representatives: regulatory quality, legal quality, and national cultural norms. Our results show that bondholders' representatives significantly reduce banks' risk-taking, regardless of the environment. However, the magnitude of this impact varies depending on the environment. It is stronger in countries with higher capital stringency, creditor rights, shareholder rights, and individualism values, while weaker in countries with higher supervisory power and long-term orientation. These results emphasize the importance of bondholder representatives as a mechanism for mitigating bank risk. Furthermore, our findings reveal that supervisory power can act as a substitute for the risk-reducing effect of bondholder representatives. In other words, when regulatory authorities exert a higher degree of supervisory control, it can partially offset the impact of bondholder representatives in reducing risk. This finding highlights the interplay between various regulatory and governance mechanisms in influencing bank behavior and underscores the importance of a balanced approach to risk management.

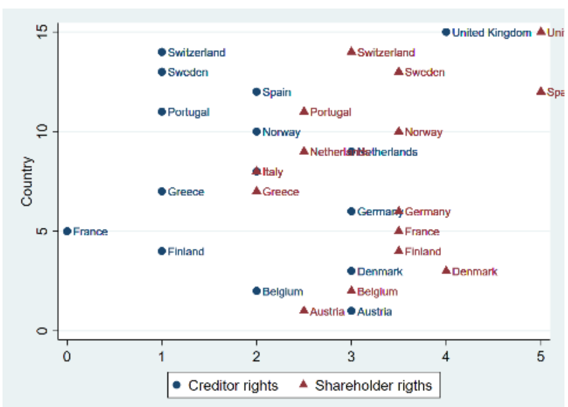
Our findings have significant policy implications. They support the idea that market discipline from bondholders can enhance financial stability. This underscores the importance of Pillar 3 in the Basel 2 and 3 accords, which emphasizes enhanced disclosure to strengthen market discipline in the banking sector. Our results throw more light on the role of institutions and culture on the market discipline exerted by bondholders. Thus, the market discipline mechanism is particularly more effective in countries with higher capital stringency, creditor rights, shareholder rights, and individualism values.

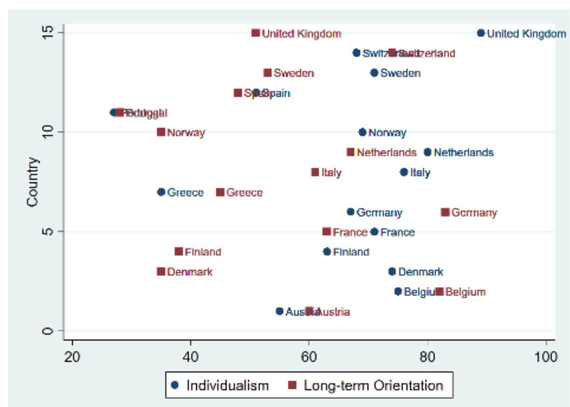
In conclusion, our study adds valuable insights to the growing body of research on bondholder monitoring, market discipline, and corporate governance within the banking sector. It contributes to ongoing policy discussions and reforms about optimal corporate governance models for banks, particularly in the pursuit of financial stability that benefits all stakeholders. Our research underscores the vital role that bondholder representatives can play in addressing complex agency issues that affect various parties involved in the banking sector.

Appendix



(a) Regulatory environments





(b) Legal environments (c) National cultural values

Figure 1: It plots variations in regulatory (supervisory power and capital stringency), legal environments (creditor rights and shareholder rights), and national cultural values (individualism and long-term orientation) among our sample.

Table A1: **Distribution of banks by country in 2017**

Country	Number of listed commercial banks & bank-holdings in the sample	Number of banks with at least one bondholder representatives
Austria	5	5
Belgium	2	2
Denmark	5	5
Finland	2	2
France	9	4
Germany	9	7
Greece	3	2
Italy	15	6
Netherlands	5	3
Norway	4	1
Portugal	2	2
Spain	8	6
Sweden	6	4
Switzerland	21	14
United Kingdom	9	6
Total	105	66

The table shows the number of banks in our sample by country in 2017 and the number of those banks with at least one bondholder representative.

Table A2: **Descriptive statistics of bondholder representatives on the board of directors**

	Mean	Std dev	Min.	Max.
Banks with at least one bondholder representative(%)	62.85	-	-	-
Number of directors	14.27	4.73	7	32
Number of bondholder representatives (among banks with at least one representative)	4	2.50	1	11
Proportion of banks that have at least one bondholder representative	28.58	15.65	5.55	84.61

This table provides information about the presence of at least one bondholder representative on the boards of directors of banks. It shows the average percentage of banks with such representation, the number of directors who have at least one bondholder representative on their board, and other statistics related to the number of affiliated directors.

Table A3: **Correlation and multicollinearity**

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1) PropBondRep	1.000																
(2) Supervision	-0.204	1.000															
(3) CapString	0.056	-0.040	1.000														
(4) CreditorRights	0.172	0.011	0.008	1.000													
(6) individualism	0.118	-0.046	-0.211	0.362	0.128	1.000											
(7) longTOrientation	0.041	0.388	0.084	-0.117	-0.294	0.215	1.000										
(8) Size	0.611	-0.120	0.177	0.023	0.168	0.003	-0.058	1.000									
(9) GrowthTA	-0.322	0.015	-0.010	0.056	0.092	0.158	-0.058	-0.345	1.000								
(10) EquityTA	-0.314	0.004	0.098	-0.049	-0.094	-0.112	-0.184	-0.417	0.000	1.000							
(11) LoanRatio	-0.230	0.024	-0.069	-0.173	-0.102	-0.124	-0.120	-0.223	0.035	0.317	1.000						
(12) DepositRatio	-0.258	0.179	-0.169	0.241	-0.063	-0.120	0.028	-0.423	0.221	0.063	0.001	1.000					
(13) OperatingRatio	-0.005	0.038	0.048	0.118	0.008	0.049	0.158	0.002	0.061	-0.061	-0.224	0.089	1.000				
(14) BoardSize	0.178	0.100	0.384	-0.024	0.009	-0.236	-0.075	0.461	-0.112	-0.022	-0.152	-0.282	0.045	1.000			
(15) BoardTier	0.016	-0.243	-0.027	-0.309	0.165	0.038	-0.194	0.241	-0.055	-0.002	-0.086	-0.175	-0.110	0.131	1.000		
(16) GDP	0.075	-0.258	0.090	0.053	0.359	-0.269	-0.097	0.019	0.013	-0.100	-0.036	0.148	0.046	-0.050	-0.179	1.000	
(17) Inflation	0.064	-0.256	0.216	0.384	0.201	0.161	-0.254	0.092	0.011	-0.012	-0.088	-0.117	0.005	0.102	-0.062	0.127	1.000

Table A4: Variance inflation factor

	VIF	1/VIF
Size	2.877	.348
CreditorRights	2.373	.421
ShareholderRights	2.358	.424
Supervision	2.164	.462
individualism	2.013	.497
PropBondRep	1.939	.516
longTOrientation	1.839	.544
BoardSize	1.733	.577
DepositRatio	1.68	.595
BoardTier	1.653	.605
CapString	1.631	.613
EquityTA	1.58	.633
Inflation	1.565	.639
GDP	1.548	.646
GrowthTA	1.318	.759
LoanRatio	1.305	.766
OperatingRatio	1.125	.889
Mean VIF	**1.806**	.

Table A5: **Robustness check (1): Using bondholder representatives index *BondRepIndex*: role of supervision**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(6)
	IV 1st Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage
BondRepIndex		9.333***	-6.278***	-0.0443***	-0.00255
		(5.59)	(-6.85)	(-5.62)	(-1.20)
BondRepIndex*Supervision		-0.439***	0.360***	0.00117**	-0.000273*
		(-3.68)	(5.51)	(2.09)	(-1.69)
Directflights	-0.00614***				
	(-3.81)				
Supervision	-0.0176**	0.295***	-0.241***	-0.000632**	0.0000491
	(-2.24)	(4.22)	(-6.27)	(-1.99)	(0.52)
Size	0.127***	-0.597***	0.296***	0.00705***	0.00173***
	(10.40)	(-4.46)	(4.03)	(10.78)	(10.06)
GrowthTA	-0.00349*	0.0289***	-0.00578	-0.0000445	0.0000268**
	(-1.89)	(3.35)	(-1.22)	(-1.12)	(2.49)
EquityTA	-0.0129**	0.0305	0.0171	-0.000212	-0.0000130
	(-2.40)	(1.19)	(1.21)	(-1.54)	(-0.35)
LoanRatio	-0.00179**	0.0185***	-0.00257	-0.000128***	-0.0000179***
	(-2.07)	(5.05)	(-1.28)	(-7.53)	(-3.71)
DepositRatio	-0.000439	0.000374	0.00102	-0.0000886***	0.00000510
	(-0.41)	(0.08)	(0.41)	(-3.83)	(0.79)
OperatingRatio	-0.00325	0.0336***	-0.0139**	-0.000331***	-0.0000346**
	(-1.14)	(2.66)	(-2.00)	(-5.44)	(-2.08)
BoardSize	-0.0770	-0.104	-0.337***	-0.00374***	-0.00150***
	(-1.46)	(-0.46)	(-2.73)	(-3.27)	(-4.92)
BoardTier	-0.215***	0.834***	-0.314**	-0.00569***	-0.00127***
	(-5.62)	(2.97)	(-2.04)	(-4.50)	(-3.55)
GDP	0.0362	0.409***	-0.199***	-0.00157***	-0.0000613
	(1.31)	(3.39)	(-3.00)	(-2.66)	(-0.36)
Inflation	-0.0413**	0.151*	-0.0890**	-0.0000569	0.000385***
	(-2.54)	(1.90)	(-2.05)	(-0.15)	(3.69)
CreditorRights	0.0172	-0.436***	0.242***	0.00148***	-0.000128
	(0.96)	(-5.65)	(5.73)	(4.12)	(-1.24)
CapString	0.00617	0.111***	-0.0140	-0.00178***	-0.000217***
	(0.62)	(2.65)	(-0.61)	(-8.53)	(-3.53)
Constant	-0.103	2.875***	1.949***	-0.000172	-0.00634***
	(-0.51)	(2.74)	(3.38)	(-0.03)	(-4.27)
Country random effect	Yes	Yes	Yes	Yes	Yes
No. of Observations	309	309	309	277	286
Marginal effect: Supervision_at:					
Q25		7.796***	-5.016***	-0.0402***	-0.0035**
		(1.38)	(0.76)	(0.01)	(0.00)
Q50		6.260***	-3.755***	-0.0361***	-0.00446***
		(1.18)	(0.65)	(0.01)	(0.00)
Q75		4.724***	-2.493***	-0.0321***	-0.00541***
		(1.10)	(0.60)	(0.01)	(0.00)

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *BondRepIndex**Supervision*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*BondRepIndex*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different supervision strengths is reported at the end of each column.

Table A6: **Robustness check (1): Using bondholder representatives (*BondRepIndex*): role of capital stringency**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(6)
	IV 1st Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage
BondRepIndex		2.791**	-1.244	-0.0449***	-0.00974***
		(1.99)	(-1.58)	(-6.60)	(-5.29)
BondRepIndex*CapString		0.355**	-0.228**	0.00236***	0.000797***
		(2.23)	(-2.55)	(3.04)	(3.63)
Directflights	-0.00614***				
	(-3.81)				
CapString	0.00617	-0.0976	0.127**	-0.00273***	-0.000625***
	(0.62)	(-1.11)	(2.57)	(-6.78)	(-5.21)
Size	0.127***	-0.609***	0.300***	0.00674***	0.00166***
	(10.40)	(-4.46)	(3.91)	(10.30)	(9.79)
GrowthTA	-0.00349*	0.0286***	-0.00533	-0.0000316	0.0000278***
	(-1.89)	(3.27)	(-1.08)	(-0.80)	(2.64)
EquityTA	-0.0129**	0.0273	0.0198	-0.000202	-0.0000141
	(-2.40)	(1.05)	(1.36)	(-1.49)	(-0.39)
LoanRatio	-0.00179**	0.0206***	-0.00381*	-0.000108***	-0.0000125**
	(-2.07)	(5.30)	(-1.75)	(-6.02)	(-2.51)
DepositRatio	-0.000439	-0.00145	0.00235	-0.0000881***	0.00000104
	(-0.41)	(-0.32)	(0.91)	(-3.86)	(0.16)
OperatingRatio	-0.00325	0.0337***	-0.0138*	-0.000329***	-0.0000339**
	(-1.14)	(2.62)	(-1.92)	(-5.45)	(-2.08)
BoardSize	-0.0770	0.0759	-0.469***	-0.00337***	-0.00123***
	(-1.46)	(0.33)	(-3.61)	(-2.94)	(-4.06)
BoardTier	-0.215***	0.911***	-0.373**	-0.00556***	-0.00119***
	(-5.62)	(3.20)	(-2.33)	(-4.43)	(-3.39)
GDP	0.0362	0.426***	-0.209***	-0.00158***	-0.0000264
	(1.31)	(3.47)	(-3.04)	(-2.70)	(-0.16)
Inflation	-0.0413**	0.159**	-0.0933**	0.0000395	0.000410***
	(-2.54)	(1.97)	(-2.06)	(0.10)	(4.00)
CreditorRights	0.0172	-0.421***	0.230***	0.00144***	-0.000128
	(0.96)	(-5.40)	(5.24)	(4.05)	(-1.27)
Supervision	-0.0176**	0.0680*	-0.0556***	-0.000157	-0.000111**
	(-2.24)	(1.78)	(-2.58)	(-0.87)	(-2.05)
Constant	-0.103	6.022***	-0.462	0.000567	-0.00260*
	(-0.51)	(6.11)	(-0.83)	(0.12)	(-1.90)
Country random effect	Yes	Yes	Yes	Yes	Yes
No. of Observations	309	309	309	277	286
Marginal effect: CapString_at:					
Q25		4.034***	-2.043***	-0.037***	-0.0069***
		(1.15)	(0.65)	(0.01)	(0.00)
Q50		5.277***	-2.843***	-0.028***	-0.00415***
		(1.14)	(0.64)	(0.01)	(0.00)
Q75		6.520***	-3.643***	-0.02**	-0.00136
		(1.14)	(0.78)	(0.01)	(0.00)

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *BondRepIndex*CapString*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*BondRepIndex*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different levels of capital stringency is reported at the end of each column.

Table A7: **Robustness check (1): Using bondholder representatives index *BondRepIndex*: role of creditor rights**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(5)
	IV 1st Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage
BondRepIndex		3.369***	-0.832	-0.0307***	-0.00503***
		(2.93)	(-1.42)	(-5.33)	(-3.38)
BondRepIndex*CreditorRights		0.772***	-0.954***	-0.000977	-0.000127
		(3.77)	(-9.16)	(-1.05)	(-0.48)
Directflights	-0.00614***				
	(-3.81)				
CreditorRights	0.0172	-0.848***	0.758***	0.00196***	-0.0000723
	(0.96)	(-6.17)	(10.86)	(3.31)	(-0.42)
Size	0.127***	-0.603***	0.312***	0.00706***	0.00173***
	(10.40)	(-4.50)	(4.58)	(10.72)	(10.03)
GrowthTA	-0.00349*	0.0316***	-0.00981**	-0.0000462	0.0000249**
	(-1.89)	(3.65)	(-2.22)	(-1.14)	(2.28)
EquityTA	-0.0129**	0.0143	0.0356***	-0.000184	-0.00000964
	(-2.40)	(0.55)	(2.71)	(-1.33)	(-0.26)
LoanRatio	-0.00179**	0.0171***	-0.00104	-0.000126***	-0.0000184***
	(-2.07)	(4.67)	(-0.56)	(-7.37)	(-3.81)
DepositRatio	-0.000439	0.00204	-0.00139	-0.0000872***	0.00000392
	(-0.41)	(0.45)	(-0.60)	(-3.72)	(0.60)
OperatingRatio	-0.00325	0.0321**	-0.0122*	-0.000329***	-0.0000338**
	(-1.14)	(2.54)	(-1.90)	(-5.37)	(-2.02)
BoardSize	-0.0770	-0.00198	-0.428***	-0.00409***	-0.00144***
	(-1.46)	(-0.01)	(-3.76)	(-3.59)	(-4.73)
BoardTier	-0.215***	0.892***	-0.365**	-0.00589***	-0.00124***
	(-5.62)	(3.19)	(-2.57)	(-4.64)	(-3.44)
GDP	0.0362	0.377***	-0.158**	-0.00158***	-0.0000493
	(1.31)	(3.12)	(-2.57)	(-2.66)	(-0.29)
Inflation	-0.0413**	0.182**	-0.130***	-0.0000790	0.000386***
	(-2.54)	(2.29)	(-3.20)	(-0.20)	(3.68)
CapString	0.00617	0.0724*	0.0190	-0.00167***	-0.000245***
	(0.62)	(1.77)	(0.91)	(-8.23)	(-4.13)
Supervision	-0.0176**	0.0769**	-0.0608***	-0.0000722	-0.0000805
	(-2.24)	(2.06)	(-3.19)	(-0.39)	(-1.46)
Constant	-0.103	6.056***	-1.084**	-0.00705	-0.00511***
	(-0.51)	(6.66)	(-2.34)	(-1.59)	(-3.97)
Country random effect	Yes	Yes	Yes	Yes	Yes
No. of Observations	309	309	309	277	286
M. effect: CreditorRights_at:					
Q25		4.141***	-1.785***	-0.0316***	-0.00515***
		(1.10)	(0.56)	(0.01)	(0.00)
Q50		4.912***	-2.739***	-0.0326***	-0.00528***
		(1.10)	(0.55)	(0.01)	(0.00)
Q75		5.684***	-3.693***	-0.0335***	-0.00541***
		(1.12)	(0.57)	(0.01)	(0.00)

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *BondRepIndex*CreditorRights*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*BondRepIndex*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different degree of creditor rights is reported at the end of each column.

Table A8: **Robustness check (1): Using bondholder representatives index (*BondRepIndex*): role of shareholder rights**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(5)
	IV 1st Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage
BondRepIndex		1.955	0.274	-0.0344***	-0.00702***
		(1.36)	(0.35)	(-4.84)	(-3.72)
BondRepIndex*ShareholderRights		0.825***	-0.812***	0.000353	0.000533
		(3.11)	(-5.63)	(0.29)	(1.50)
Directflights	-0.00616***				
	(-3.82)				
ShareholderRights	0.0217	-0.351**	0.523***	-0.0000416	-0.000151
	(0.96)	(-2.13)	(5.84)	(-0.06)	(-0.70)
Size	0.129***	-0.658***	0.319***	0.00732***	0.00168***
	(10.66)	(-4.73)	(4.22)	(10.93)	(9.67)
GrowthTA	-0.00378**	0.0304***	-0.00846*	-0.0000337	0.0000252**
	(-2.03)	(3.34)	(-1.71)	(-0.82)	(2.27)
EquityTA	-0.0123**	0.00988	0.0353**	-0.000172	-0.0000197
	(-2.28)	(0.38)	(2.47)	(-1.25)	(-0.53)
LoanRatio	-0.00189**	0.0228***	-0.00480**	-0.000136***	-0.0000164***
	(-2.23)	(6.02)	(-2.33)	(-7.95)	(-3.37)
DepositRatio	-0.000185	-0.00703	0.00477**	-0.0000491**	0.00000192
	(-0.18)	(-1.58)	(1.97)	(-2.22)	(0.31)
OperatingRatio	-0.00311	0.0284**	-0.0102	-0.000321***	-0.0000358**
	(-1.09)	(2.18)	(-1.43)	(-5.22)	(-2.14)
BoardSize	-0.0769	-0.0163	-0.382***	-0.00437***	-0.00145***
	(-1.46)	(-0.07)	(-3.03)	(-3.79)	(-4.73)
BoardTier	-0.231***	1.147***	-0.497***	-0.00711***	-0.00116***
	(-6.38)	(3.84)	(-3.06)	(-5.27)	(-3.14)
GDP	0.0266	0.462***	-0.289***	-0.00196***	-0.0000702
	(0.93)	(3.65)	(-4.20)	(-3.29)	(-0.41)
Inflation	-0.0349**	-0.0136	0.00491	0.000505	0.000336***
	(-2.35)	(-0.19)	(0.12)	(1.48)	(3.58)
CapString	0.00331	0.124***	-0.0355	-0.00171***	-0.000224***
	(0.33)	(2.85)	(-1.49)	(-7.96)	(-3.61)
Supervision	-0.0131	0.0685*	-0.0218	-0.000111	-0.0000656
	(-1.47)	(1.66)	(-0.97)	(-0.55)	(-1.10)
Constant	-0.173	6.183***	-1.673***	-0.00515	-0.00439***
	(-0.79)	(5.62)	(-2.79)	(-1.00)	(-2.92)
Country random effect	Yes	Yes	Yes	Yes	Yes
No. of Observations	309	309	309	277	286
Marginal effect: ShareholderRights at:					
Q25		3.192***	-0.944	-0.0338***	-0.00621***
		(1.23)	(0.67)	(0.01)	(0.00)
Q50		4.42***	-2.162***	-0.0332***	-0.00541***
		(1.13)	(0.61)	(0.01)	(0.00)
Q75		5.66***	-3.380***	-0.0327***	-0.00461***
		(1.17)	(0.64)	(0.01)	(0.00)

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *BondRepIndex*ShareholderRights*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*BondRepIndex*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different degree of shareholder rights is reported at the end of each column.

Table A9: **Robustness check (1): Using bondholder representatives index (*BondRepIndex*): role of individualism**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(5)
	IV 1st Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage
BondRepIndex		-0.771	4.981***	-0.00486	-0.00538*
		(-0.36)	(4.53)	(-0.43)	(-1.84)
BondRepIndex*Individualism		0.0651***	-0.101***	-0.000251**	0.0000123
		(2.62)	(-7.90)	(-1.99)	(0.36)
Directflights	-0.00617***				
	(-3.86)				
Individualism	-0.00207	-0.00772	0.0466***	-0.00000475	-0.0000145
	(-1.28)	(-0.54)	(6.31)	(-0.07)	(-0.75)
Size	0.128***	-0.478***	0.256***	0.00578***	0.00162***
	(10.50)	(-3.56)	(3.69)	(7.85)	(9.14)
GrowthTA	-0.00303	0.0228***	-0.00902**	-0.0000198	0.0000283**
	(-1.61)	(2.60)	(-1.99)	(-0.43)	(2.49)
EquityTA	-0.0130**	0.0288	0.0264**	-0.000235	-0.0000267
	(-2.44)	(1.11)	(1.97)	(-1.52)	(-0.69)
LoanRatio	-0.00193**	0.0186***	-0.00328*	-0.000125***	-0.0000174***
	(-2.22)	(4.98)	(-1.70)	(-6.50)	(-3.45)
DepositRatio	-0.000892	0.00344	0.00107	-0.0000921***	0.00000267
	(-0.80)	(0.71)	(0.43)	(-3.44)	(0.38)
OperatingRatio	-0.00301	0.0284**	-0.0118*	-0.000308***	-0.0000333*
	(-1.06)	(2.23)	(-1.78)	(-4.49)	(-1.93)
BoardSize	-0.0906*	0.332	-0.410***	-0.00723***	-0.00193***
	(-1.70)	(1.42)	(-3.37)	(-5.53)	(-6.00)
BoardTier	-0.212***	0.599**	-0.296**	-0.00321**	-0.000952***
	(-5.53)	(2.16)	(-2.06)	(-2.28)	(-2.61)
GDP	0.0276	0.594***	-0.239***	-0.00317***	-0.000159
	(0.97)	(4.78)	(-3.73)	(-4.54)	(-0.88)
Inflation	-0.0389**	0.134*	-0.0774*	-0.0000616	0.000341***
	(-2.43)	(1.70)	(-1.90)	(-0.14)	(3.20)
CreditorRights	0.0252	-0.535***	0.242***	0.00193***	-0.0000538
	(1.32)	(-6.28)	(5.49)	(4.31)	(-0.45)
Supervision	-0.0172**	0.0696*	-0.0688***	-0.0000109	-0.0000571
	(-2.20)	(1.84)	(-3.52)	(-0.05)	(-1.01)
Constant	0.123	4.482***	-2.786***	0.00130	-0.00356*
	(0.46)	(3.20)	(-3.85)	(0.17)	(-1.82)
Country random effect	Yes	Yes	Yes	Yes	Yes
No. of Observations	309	309	309	277	286
Marginal effect: Individualism_at:					
Q25		0.857	2.443***	-0.0111	-0.0051**
		(1.63)	(0.84)	(0.01)	(0.00)
Q50		2.485**	-0.092	-0.0174**	-0.0047***
		(1.24)	(0.64)	(0.01)	(0.00)
Q75		4.11***	-2.629***	-0.0236***	-0.0045**
		(1.10)	(0.56)	(0.01)	(0.00)

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *BondRepIndex*Individualism*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*BondRepIndex*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different degree of individualism/collectivism is reported at the end of each column.

Table A10: **Robustness check (1): Using bondholder representatives index (*BondRepIndex*): role of long-term orientation**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(6)
	IV 1st Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage
BondRepIndex		8.530***	-4.954***	-0.0289***	-0.00428*
		(5.21)	(-5.26)	(-3.13)	(-1.88)
BondRepIndex*LongTOrientation		-0.0585***	0.0374***	0.0000424	-0.00000683
		(-3.09)	(3.43)	(0.39)	(-0.25)
Directflights	-0.00627***				
	(-3.94)				
LongTOrientation	0.00246*	0.0403***	-0.0134**	-0.0000712	-0.0000133
	(1.94)	(3.94)	(-2.27)	(-1.22)	(-0.89)
Size	0.130***	-0.596***	0.309***	0.00615***	0.00163***
	(10.62)	(-4.59)	(4.13)	(8.59)	(9.38)
GrowthTA	-0.00322*	0.0290***	-0.00439	-0.0000387	0.0000235**
	(-1.75)	(3.49)	(-0.92)	(-0.88)	(2.17)
EquityTA	-0.0105**	0.0404*	0.0260*	-0.000301**	-0.0000405
	(-1.96)	(1.66)	(1.86)	(-2.01)	(-1.11)
LoanRatio	-0.00162*	0.0185***	-0.00179	-0.000121***	-0.0000186***
	(-1.88)	(5.21)	(-0.88)	(-6.33)	(-3.81)
DepositRatio	-0.000309	0.00221	0.000421	-0.0000754***	0.00000433
	(-0.29)	(0.50)	(0.16)	(-2.89)	(0.65)
OperatingRatio	-0.00399	0.0300**	-0.0151**	-0.000318***	-0.0000292*
	(-1.39)	(2.36)	(-2.06)	(-4.55)	(-1.69)
BoardSize	-0.0584	0.229	-0.421***	-0.00658***	-0.00187***
	(-1.17)	(1.09)	(-3.47)	(-5.34)	(-6.38)
BoardTier	-0.206***	0.891***	-0.335**	-0.00434***	-0.00111***
	(-5.38)	(3.40)	(-2.22)	(-3.17)	(-3.17)
GDP	0.0398	0.377***	-0.150**	-0.00224***	-0.000144
	(1.46)	(3.15)	(-2.18)	(-3.34)	(-0.82)
Inflation	-0.0357**	0.265***	-0.125***	-0.000341	0.000308***
	(-2.23)	(3.36)	(-2.74)	(-0.77)	(2.84)
CreditorRights	0.0212	-0.443***	0.257***	0.00138***	-0.000123
	(1.18)	(-5.69)	(5.74)	(3.32)	(-1.16)
Supervision	-0.0226***	0.0601	-0.0760***	0.0000810	-0.0000298
	(-2.74)	(1.49)	(-3.26)	(0.37)	(-0.50)
Constant	-0.292	2.430**	0.897	0.000358	-0.00386**
	(-1.30)	(2.18)	(1.40)	(0.06)	(-2.35)
Country random effect	Yes	Yes	Yes	Yes	Yes
No. of Observations	309	309	309	277	286
Marginal effect: LongTOrientation					
_at:					
Q25		7.067***	-4.018***	-0.0278***	-0.0044**
		(1.31)	(0.75)	(0.01)	(0.00)
Q50		5.605***	-3.083***	-0.0267***	-0.0046***
		(1.10)	(0.63)	(0.01)	(0.00)
Q75		4.143***	-2.148***	-0.0256***	-0.0048***
		(1.10)	(0.61)	(0.01)	(0.00)

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *BondRepIndex*LongTOrientation*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*BondRepIndex*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different degree of society's long term orientation values is reported at the end of each column.

Table A11: **Robustness check (2): Using the presence of at least one bondholder (*DBondRep*): role of supervision**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(5)
	IV 1st Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage
DBondRep		6.365***	-4.655***	-0.0281***	-0.00106
		(4.92)	(-6.56)	(-4.63)	(-0.64)
DBondRep*Supervision		-0.308***	0.289***	0.000651	-0.000263*
		(-3.00)	(5.15)	(1.34)	(-1.94)
Directflights	-0.00900***				
	(-4.12)				
Supervision	-0.0241**	0.272***	-0.246***	-0.000403	0.0000883
	(-2.27)	(3.58)	(-5.92)	(-1.16)	(0.86)
Size	0.142***	-0.438***	0.208***	0.00592***	0.00159***
	(8.61)	(-4.19)	(3.63)	(12.14)	(11.60)
GrowthTA	-0.00328	0.0219***	-0.00186	0.0000258	0.0000368***
	(-1.31)	(2.69)	(-0.42)	(0.71)	(3.69)
EquityTA	-0.0263***	0.0515*	0.00677	-0.000357**	-0.0000419
	(-3.62)	(1.78)	(0.43)	(-2.30)	(-1.01)
LoanRatio	-0.000770	0.0125***	0.000581	-0.000101***	-0.0000117**
	(-0.66)	(3.53)	(0.30)	(-5.88)	(-2.41)
DepositRatio	0.00144	-0.00595	0.00411	-0.0000501**	0.0000132*
	(1.00)	(-1.30)	(1.64)	(-2.11)	(1.92)
OperatingRatio	-0.00348	0.0284**	-0.0108	-0.000340***	-0.0000321*
	(-0.90)	(2.28)	(-1.58)	(-5.51)	(-1.96)
BoardSize	-0.0365	-0.331	-0.215*	-0.00175	-0.00128***
	(-0.51)	(-1.50)	(-1.78)	(-1.59)	(-4.22)
BoardTier	-0.322***	0.849***	-0.314**	-0.00611***	-0.00128***
	(-6.20)	(2.96)	(-2.00)	(-4.61)	(-3.59)
GDP	0.0522	0.406***	-0.194***	-0.00147**	-0.0000278
	(1.40)	(3.34)	(-2.92)	(-2.46)	(-0.16)
Inflation	-0.0526**	0.118	-0.0691	0.000216	0.000406***
	(-2.39)	(1.53)	(-1.64)	(0.59)	(4.01)
CreditorRights	-0.00946	-0.307***	0.169***	0.000818**	-0.000252**
	(-0.39)	(-4.05)	(4.08)	(2.38)	(-2.47)
CapString	0.0141	0.0964**	-0.0110	-0.00174***	-0.000190***
	(1.05)	(2.23)	(-0.46)	(-8.20)	(-3.04)
Constant	-0.0604	2.607**	2.337***	0.00152	-0.00649***
	(-0.22)	(2.33)	(3.81)	(0.29)	(-4.15)
Country random effect	Yes	Yes	Yes	Yes	Yes
No. of Observations	309	309	309	277	286
Marginal effects: Supervision_at:					
Q25		5.288***	-3.643***	-0.0257***	-0.0019
		(1.02)	(0.56)	(0.00)	(0.00)
Q50		4.212***	-2.632***	-0.0235***	-0.0028***
		(0.83)	(0.45)	(0.00)	(0.00)
Q75		3.135***	-1.620***	-0.0212***	-0.0038***
		(0.75)	(0.41)	(0.00)	(0.00)

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *DBondRep*Supervision*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*DBondRep*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different supervision strengths is reported at the end of each column.

Table A12: **Robustness check (2): Using the presence of at least one bondholder (*DBondRep*): role of capital stringency**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(5)
	IV 1st Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage
DBondRep		2.084*	-0.695	-0.0342***	-0.00786***
		(1.91)	(-1.14)	(-6.56)	(-5.43)
DBondRepCapString		0.201	-0.178**	0.00227***	0.000735***
		(1.43)	(-2.26)	(3.34)	(3.84)
Directflights	-0.00900***				
	(-4.12)				
CapString	0.0141	-0.0719	0.140**	-0.00304***	-0.000702***
	(1.05)	(-0.72)	(2.48)	(-6.61)	(-5.17)
Size	0.142***	-0.451***	0.219***	0.00571***	0.00153***
	(8.61)	(-4.24)	(3.67)	(11.83)	(11.26)
GrowthTA	-0.00328	0.0219***	-0.00183	0.0000316	0.0000373***
	(-1.31)	(2.65)	(-0.40)	(0.89)	(3.81)
EquityTA	-0.0263***	0.0488*	0.00921	-0.000378**	-0.0000496
	(-3.62)	(1.67)	(0.56)	(-2.48)	(-1.22)
LoanRatio	-0.000770	0.0138***	-0.000555	-0.0000784***	-0.00000576
	(-0.66)	(3.67)	(-0.26)	(-4.35)	(-1.14)
DepositRatio	0.00144	-0.00789*	0.00589**	-0.0000530**	0.00000810
	(1.00)	(-1.71)	(2.27)	(-2.28)	(1.20)
OperatingRatio	-0.00348	0.0294**	-0.0117*	-0.000337***	-0.0000300*
	(-0.90)	(2.34)	(-1.66)	(-5.56)	(-1.87)
BoardSize	-0.0365	-0.221	-0.316**	-0.00141	-0.00104***
	(-0.51)	(-0.99)	(-2.52)	(-1.30)	(-3.45)
BoardTier	-0.322***	0.918***	-0.379**	-0.00596***	-0.00121***
	(-6.20)	(3.17)	(-2.33)	(-4.59)	(-3.45)
GDP	0.0522	0.416***	-0.203***	-0.00157***	-0.00000425
	(1.40)	(3.38)	(-2.95)	(-2.67)	(-0.03)
Inflation	-0.0526**	0.125	-0.0757*	0.000256	0.000428***
	(-2.39)	(1.61)	(-1.73)	(0.71)	(4.32)
CreditorRights	-0.00946	-0.307***	0.169***	0.000829**	-0.000260***
	(-0.39)	(-4.01)	(3.94)	(2.45)	(-2.61)
Supervision	-0.0241**	0.0624	-0.0501**	-0.000117	-0.000129**
	(-2.27)	(1.63)	(-2.33)	(-0.66)	(-2.36)
Constant	-0.0604	5.576***	-0.407	0.00604	-0.00138
	(-0.22)	(5.34)	(-0.70)	(1.23)	(-0.96)
Country random effect	Yes	Yes	Yes	Yes	Yes
No. of Observations	309	309	309	277	286
Marginal effect: CapString_at:					
Q25		2.789***	-1.318***	-0.0262***	-0.0052***
		(0.82)	(0.46)	(0.00)	(0.00)
Q50		3.493***	-1.941***	-0.0182***	-0.0027***
		(0.79)	(0.44)	(0.00)	(0.00)
Q75		4.198***	-2.564***	-0.0103**	-0.0001
		(1.03)	(0.58)	(0.00)	(0.00)

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *DBondRep*CapString*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*DBondRep*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different level of capital stringency is reported at the end of each column.

Table A13: **Robustness check (2): Using the presence of at least one bondholder (*DBondRep*): role of creditor rights**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(5)
	IV 1st Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage
DBondRep		2.161***	-0.198	-0.0207***	-0.00338***
		(2.68)	(-0.49)	(-5.27)	(-3.20)
DBondRep*CreditorRights		0.637***	-0.908***	-0.000510	-0.000150
		(3.50)	(-10.06)	(-0.62)	(-0.64)
Directflights	-0.00900***				
	(-4.12)				
CreditorRights	-0.00946	-0.760***	0.815***	0.00117*	-0.000171
	(-0.39)	(-5.08)	(10.99)	(1.83)	(-0.91)
Size	0.142***	-0.465***	0.247***	0.00595***	0.00159***
	(8.61)	(-4.45)	(4.78)	(12.15)	(11.50)
GrowthTA	-0.00328	0.0252***	-0.00678*	0.0000240	0.0000351***
	(-1.31)	(3.08)	(-1.67)	(0.65)	(3.46)
EquityTA	-0.0263***	0.0386	0.0248*	-0.000344**	-0.0000359
	(-3.62)	(1.33)	(1.73)	(-2.20)	(-0.86)
LoanRatio	-0.000770	0.0117***	0.00158	-0.0000999***	-0.0000126***
	(-0.66)	(3.31)	(0.91)	(-5.81)	(-2.59)
DepositRatio	0.00144	-0.00459	0.00157	-0.0000480**	0.0000109
	(1.00)	(-1.00)	(0.69)	(-2.00)	(1.57)
OperatingRatio	-0.00348	0.0277**	-0.00947	-0.000342***	-0.0000302*
	(-0.90)	(2.23)	(-1.54)	(-5.53)	(-1.83)
BoardSize	-0.0365	-0.245	-0.304***	-0.00195*	-0.00122***
	(-0.51)	(-1.12)	(-2.81)	(-1.78)	(-4.01)
BoardTier	-0.322***	0.934***	-0.409***	-0.00628***	-0.00124***
	(-6.20)	(3.28)	(-2.90)	(-4.75)	(-3.45)
GDP	0.0522	0.364***	-0.132**	-0.00148**	-0.00000249
	(1.40)	(2.99)	(-2.19)	(-2.46)	(-0.01)
Inflation	-0.0526**	0.152**	-0.116***	0.000193	0.000412***
	(-2.39)	(1.98)	(-3.05)	(0.53)	(4.04)
CapString	0.0141	0.0555	0.0291	-0.00165***	-0.000230***
	(1.05)	(1.35)	(1.43)	(-8.16)	(-3.89)
Supervision	-0.0241**	0.0660*	-0.0494***	0.0000157	-0.0000780
	(-2.27)	(1.78)	(-2.69)	(0.09)	(-1.41)
Constant	-0.0604	5.869***	-1.271***	-0.00381	-0.00481***
	(-0.22)	(6.42)	(-2.80)	(-0.87)	(-3.75)
Country random effect	Yes	Yes	Yes	Yes	Yes
No. of Observations	309	309	309	277	286
M effect: CreditorRights _at:					
Q25		2.797***	-1.105***	-0.0212***	-0.0035***
		(0.76)	(0.38)	(0.00)	(0.00)
Q50		3.434***	-2.013***	-0.0217***	-0.0036***
		(0.75)	(0.37)	(0.00)	(0.00)
Q75		4.070***	-2.921***	-0.0222***	-0.0038***
		(0.79)	(0.39)	(0.00)	(0.00)

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *DBondRep*CreditorRights*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*DBondRep*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different degree of creditor rights is reported at the end of each column.

Table A14: **Robustness check (2): Using the presence of at least one bondholder (*DBondRep*): role of shareholder rights**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(5)
	IV 1st Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage
DBondRep		0.748	0.765	-0.0239***	-0.00516***
		(0.68)	(1.27)	(-4.43)	(-3.53)
DBondRep*ShareholderRights		0.747***	-0.734***	0.000508	0.000458
		(3.17)	(-5.72)	(0.46)	(1.46)
Directflights	-0.00899***				
	(-4.12)				
ShareholderRights	-0.0136	-0.279	0.519***	-0.00107	-0.000369
	(-0.45)	(-1.54)	(5.28)	(-1.30)	(-1.54)
Size	0.142***	-0.510***	0.243***	0.00616***	0.00153***
	(8.70)	(-4.77)	(4.18)	(12.50)	(11.12)
GrowthTA	-0.00310	0.0223***	-0.00412	0.0000413	0.0000369***
	(-1.23)	(2.65)	(-0.90)	(1.12)	(3.59)
EquityTA	-0.0267***	0.0372	0.0217	-0.000356**	-0.0000536
	(-3.68)	(1.24)	(1.33)	(-2.27)	(-1.25)
LoanRatio	-0.000716	0.0165***	-0.00171	-0.000105***	-0.00000962*
	(-0.62)	(4.58)	(-0.87)	(-6.08)	(-1.96)
DepositRatio	0.00130	-0.0112**	0.00646***	-0.0000190	0.00000720
	(0.94)	(-2.48)	(2.64)	(-0.83)	(1.10)
OperatingRatio	-0.00356	0.0247*	-0.00806	-0.000335***	-0.0000340**
	(-0.92)	(1.93)	(-1.16)	(-5.40)	(-2.05)
BoardSize	-0.0366	-0.239	-0.277**	-0.00215**	-0.00122***
	(-0.51)	(-1.06)	(-2.26)	(-1.96)	(-3.98)
BoardTier	-0.313***	1.055***	-0.443***	-0.00690***	-0.00104***
	(-6.38)	(3.72)	(-2.88)	(-5.24)	(-3.04)
GDP	0.0580	0.398***	-0.255***	-0.00147**	0.0000480
	(1.50)	(3.06)	(-3.60)	(-2.40)	(0.26)
Inflation	-0.0561***	0.00583	-0.00626	0.000520	0.000314***
	(-2.80)	(0.08)	(-0.15)	(1.53)	(3.25)
CapString	0.0158	0.0947**	-0.0228	-0.00158***	-0.000182***
	(1.17)	(2.14)	(-0.95)	(-7.36)	(-2.92)
Supervision	-0.0269**	0.0916**	-0.0329	-0.000189	-0.000101
	(-2.23)	(2.10)	(-1.38)	(-0.93)	(-1.57)
Constant	-0.0158	5.548***	-1.401**	0.000928	-0.00331**
	(-0.05)	(5.13)	(-2.38)	(0.18)	(-2.24)
Country random effect	Yes	Yes	Yes	Yes	Yes
No. of Observations	309	309	309	277	286
M. effect: ShareholderRights at:					
Q25		1.868**	-0.335	-0.0231***	-0.00447***
		(0.89)	(0.48)	(0.00)	(0.00)
Q50		2.990***	-1.436***	-0.0223***	-0.00378***
		(0.79)	(0.42)	(0.00)	(0.00)
Q75		4.111***	-2.536***	-0.0215***	-0.0031***
		(0.82)	(0.45)	(0.00)	(0.00)

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *DBondRep*ShareholderRights*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*DBondRep*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different degree of shareholder rights is reported at the end of each column.

Table A15: **Robustness check (2): Using the presence of at least one bondholder (*DBondRep*): role of individualism**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(5)
	IV 1st Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage
DBondRep		-2.928*	5.827***	-0.0100	-0.00377
		(-1.71)	(6.76)	(-1.08)	(-1.58)
DBondRep*Individualism		0.0758***	-0.101***	-0.0000755	0.00000996
		(3.60)	(-9.55)	(-0.67)	(0.34)
Directflights	-0.00929***				
	(-4.36)				
Individualism	-0.00724***	-0.0216	0.0658***	-0.000113	-0.0000292
	(-3.36)	(-1.20)	(7.29)	(-1.29)	(-1.19)
Size	0.145***	-0.337***	0.162***	0.00504***	0.00149***
	(8.93)	(-3.30)	(3.15)	(9.24)	(10.61)
GrowthTA	-0.00164	0.0154*	-0.00392	0.0000486	0.0000406***
	(-0.66)	(1.91)	(-0.97)	(1.16)	(3.78)
EquityTA	-0.0273***	0.0482*	0.0145	-0.000365**	-0.0000504
	(-3.85)	(1.67)	(1.00)	(-2.07)	(-1.16)
LoanRatio	-0.00123	0.0147***	-0.00117	-0.000104***	-0.0000129**
	(-1.06)	(4.18)	(-0.66)	(-5.33)	(-2.55)
DepositRatio	-0.0000926	0.00166	0.00101	-0.0000730***	0.00000587
	(-0.06)	(0.35)	(0.43)	(-2.70)	(0.82)
OperatingRatio	-0.00271	0.0221*	-0.00709	-0.000309***	-0.0000295*
	(-0.71)	(1.80)	(-1.15)	(-4.46)	(-1.74)
BoardSize	-0.0965	0.262	-0.395***	-0.00620***	-0.00187***
	(-1.36)	(1.16)	(-3.49)	(-4.97)	(-5.87)
BoardTier	-0.307***	0.542**	-0.251*	-0.00336**	-0.000891**
	(-6.00)	(2.02)	(-1.86)	(-2.34)	(-2.55)
GDP	0.0200	0.622***	-0.233***	-0.00328***	-0.000190
	(0.53)	(5.18)	(-3.85)	(-4.72)	(-1.07)
Inflation	-0.0461**	0.105	-0.0629*	0.000112	0.000373***
	(-2.17)	(1.42)	(-1.70)	(0.28)	(3.64)
CreditorRights	0.0202	-0.456***	0.171***	0.00166***	-0.0000957
	(0.79)	(-5.56)	(4.15)	(3.82)	(-0.81)
Supervision	-0.0231**	0.0529	-0.0509***	0.0000489	-0.0000547
	(-2.21)	(1.45)	(-2.78)	(0.25)	(-0.98)
Constant	0.730**	4.646***	-3.561***	0.0122	-0.00169
	(2.04)	(2.95)	(-4.50)	(1.52)	(-0.78)
Country random effect	309	309	309	277	286
No. of Observations	309	309	309	277	286
M. effect: Individualism at:					
Q25		-1.032	3.296***	-0.0118*	-0.0035**
		(1.25)	(0.63)	(0.01)	(0.00)
Q50		0.862	0.765*	-0.0137***	-0.0032***
		(0.88)	(0.44)	(0.00)	(0.00)
Q75		2.758***	-1.764***	-0.0156***	-0.0030***
		(0.72)	(0.36)	(0.00)	(0.00)

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *DBondRep*Individualism*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*DBondRep*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different degree of individualism/collectivism values is reported at the end of each column.

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Table A16: **Robustness check (2): Using the presence of at least one bondholder (*DBondRep*): role of individualism**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(5)
	IV 1st Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage	IV 2nd Stage
DBondRep		5.934***	-4.015***	-0.0162**	-0.00231
		(4.44)	(-5.25)	(-2.23)	(-1.25)
DBondRep*LongTOrientation		-0.0392**	0.0337***	-0.0000230	-0.0000159
		(-2.36)	(3.56)	(-0.25)	(-0.67)
Directflights	-0.00876***				
	(-4.04)				
LongTOrientation	0.000975	0.0481***	-0.0233***	-0.0000565	-0.0000138
	(0.56)	(3.94)	(-3.33)	(-0.83)	(-0.78)
Size	0.144***	-0.457***	0.239***	0.00527***	0.00150***
	(8.65)	(-4.35)	(3.98)	(9.74)	(10.66)
GrowthTA	-0.00317	0.0250***	-0.00248	0.0000141	0.0000324***
	(-1.26)	(3.12)	(-0.54)	(0.35)	(3.19)
EquityTA	-0.0244***	0.0760***	0.00656	-0.000448***	-0.0000717*
	(-3.34)	(2.69)	(0.41)	(-2.62)	(-1.70)
LoanRatio	-0.000734	0.0135***	0.000902	-0.000101***	-0.0000139***
	(-0.62)	(3.87)	(0.45)	(-5.23)	(-2.81)
DepositRatio	0.00141	-0.00423	0.00345	-0.0000426	0.0000113
	(0.98)	(-0.93)	(1.33)	(-1.59)	(1.59)
OperatingRatio	-0.00369	0.0230*	-0.0114	-0.000322***	-0.0000242
	(-0.95)	(1.87)	(-1.62)	(-4.59)	(-1.44)
BoardSize	-0.0100	-0.0466	-0.280**	-0.00486***	-0.00167***
	(-0.15)	(-0.22)	(-2.36)	(-4.11)	(-5.70)
BoardTier	-0.323***	1.049***	-0.429***	-0.00488***	-0.00117***
	(-6.17)	(3.68)	(-2.63)	(-3.35)	(-3.20)
GDP	0.0567	0.372***	-0.132*	-0.00223***	-0.000132
	(1.52)	(3.04)	(-1.89)	(-3.27)	(-0.73)
Inflation	-0.0468**	0.238***	-0.121***	-0.0000932	0.000332***
	(-2.14)	(3.03)	(-2.70)	(-0.22)	(3.08)
CreditorRights	-0.0103	-0.285***	0.174***	0.000807**	-0.000259**
	(-0.42)	(-3.82)	(4.07)	(2.07)	(-2.51)
Supervision	-0.0259**	0.0333	-0.0615***	0.000191	-0.0000161
	(-2.31)	(0.87)	(-2.80)	(0.92)	(-0.28)
Constant	-0.132	1.480	1.759***	0.00198	-0.00338**
	(-0.43)	(1.28)	(2.66)	(0.31)	(-1.99)
Country random effect	Yes	Yes	Yes	Yes	Yes
No. of Observations	309	309	309	277	286
M. effect: LongTOrientation at:					
Q25		4.954***	-3.172***	-0.0168***	-0.0027**
		(1.02)	(0.58)	(0.01)	(0.00)
Q50		3.975***	-2.329***	-0.0173***	-0.0031***
		(0.80)	(0.46)	(0.00)	(0.00)
Q75		2.997***	-1.486***	-0.0179***	-0.0035***
		(0.76)	(0.44)	(0.01)	(0.00)

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *DBondRep*LongTOrientation*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*DBondRep*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different degree of individualism/collectivism values is reported at the end of each column.

Table A17: **Robustness Check (3): Using country fixed effects; role of supervision**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(6)
	IV	IV	IV	IV	IV
	1st Stage	2nd Stage	2nd Stage	2nd Stage	2nd Stage
PropBondRep		0.228***	-0.155***	-0.000774***	-0.0000618
		(6.70)	(-8.18)	(-5.03)	(-1.32)
PropBondRep*Supervision		-0.0131***	0.0106***	0.0000213**	-0.00000573*
		(-5.77)	(8.41)	(2.10)	(-1.76)
Directflights	-0.270***				
	(-3.62)				
Size	5.655***	-0.528***	0.241***	0.00636***	0.00175***
	(10.19)	(-4.04)	(3.31)	(10.49)	(9.48)
GrowthTA	-0.113	0.0267***	-0.00891**	-0.0000389	0.0000199
	(-1.31)	(3.33)	(-2.00)	(-0.92)	(1.64)
EquityTA	0.137	-0.0162	0.0414***	0.000213*	0.0000978***
	(0.53)	(-0.72)	(3.28)	(1.87)	(2.83)
LoanRatio	-0.181***	0.0290***	-0.00673**	-0.000181***	-0.0000306***
	(-4.64)	(6.01)	(-2.51)	(-8.08)	(-4.57)
DepositRatio	-0.248***	0.0237***	-0.00743*	-0.000236***	-0.0000238**
	(-4.35)	(3.17)	(-1.78)	(-5.93)	(-2.19)
OperatingRatio	-0.243*	0.0269**	-0.0114	-0.000309***	-0.0000394**
	(-1.93)	(2.17)	(-1.64)	(-5.26)	(-2.26)
BoardSize	0.0133	0.291	-0.624***	-0.00569***	-0.00126***
	(0.00)	(1.21)	(-4.65)	(-4.46)	(-3.42)
BoardTier	-7.474***	0.735***	-0.370***	-0.00273***	-0.000885***
	(-3.54)	(3.13)	(-2.82)	(-2.63)	(-2.69)
GDP	0.528	0.383**	-0.0454	-0.00278***	-0.000923***
	(0.30)	(2.57)	(-0.55)	(-3.48)	(-3.95)
Inflation	-0.0625	0.130*	0.00185	0.000867**	0.000569***
	(-0.07)	(1.78)	(0.05)	(2.39)	(5.18)
Constant	-8.905	3.221***	0.962*	-0.0000188	-0.00583***
	(-0.86)	(3.36)	(1.80)	(-0.00)	(-3.85)
Country fixed effect	Yes	Yes	Yes	Yes	Yes
No. of Observations	309	309	309	277	286

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *PropBondRep*Supervision*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*PropBondRep*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different supervision strengths is reported at the end of each column.

Table A18: **Robustness Check (3): Using country fixed effects; role of capital stringency**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(6)
	IV	IV	IV	IV	IV
	1st Stage	2nd Stage	2nd Stage	2nd Stage	2nd Stage
PropBondRep		0.0229	0.00727	-0.000718***	-0.000235***
		(0.76)	(0.42)	(-5.35)	(-5.77)
PropBondRep*CapString		0.0114***	-0.00850***	0.0000316**	0.0000200***
		(3.65)	(-4.67)	(2.20)	(4.43)
Directflights	-0.270***				
	(-3.62)				
Size	5.655***	-0.515***	0.228***	0.00613***	0.00170***
	(10.19)	(-3.81)	(2.91)	(10.06)	(9.44)
GrowthTA	-0.113	0.0241***	-0.00656	-0.0000134	0.0000231*
	(-1.31)	(2.91)	(-1.37)	(-0.32)	(1.97)
EquityTA	0.137	-0.0277	0.0506***	0.000238**	0.0000912***
	(0.53)	(-1.19)	(3.74)	(2.11)	(2.72)
LoanRatio	-0.181***	0.0304***	-0.00771***	-0.000165***	-0.0000251***
	(-4.64)	(6.03)	(-2.63)	(-7.20)	(-3.78)
DepositRatio	-0.248***	0.0210***	-0.00534	-0.000231***	-0.0000277***
	(-4.35)	(2.71)	(-1.19)	(-5.81)	(-2.63)
OperatingRatio	-0.243*	0.0257**	-0.0103	-0.000309***	-0.0000407**
	(-1.93)	(2.00)	(-1.39)	(-5.28)	(-2.41)
BoardSize	0.0133	0.494*	-0.777***	-0.00523***	-0.000963***
	(0.00)	(1.95)	(-5.28)	(-4.03)	(-2.65)
BoardTier	-7.474***	0.822***	-0.434***	-0.00242**	-0.000712**
	(-3.54)	(3.37)	(-3.06)	(-2.30)	(-2.21)
GDP	0.528	0.395**	-0.0559	-0.00299***	-0.000948***
	(0.30)	(2.56)	(-0.62)	(-3.75)	(-4.18)
Inflation	-0.0625	0.124	0.00683	0.000879**	0.000560***
	(-0.07)	(1.64)	(0.16)	(2.43)	(5.25)
Constant	-8.905	2.759***	1.314**	-0.000882	-0.00625***
	(-0.86)	(2.78)	(2.28)	(-0.19)	(-4.26)
Country fixed effect	Yes	Yes	Yes	Yes	Yes
No. of Observations	309	309	309	277	286

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *PropBondRep*CapString*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*PropBondRep*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different level of capital stringency is reported at the end of each column.

Table A19: **Robustness Check (3): Using country fixed effects; role of creditor rights**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(6)
	IV	IV	IV	IV	IV
	1st Stage	2nd Stage	2nd Stage	2nd Stage	2nd Stage
PropBondRep		0.0584**	-0.000602	-0.000516***	-0.000120***
		(2.29)	(-0.05)	(-4.47)	(-3.47)
PropBondRep*.CreditorRights		0.0150***	-0.0211***	-0.0000146	-0.0000
		(3.66)	(-9.93)	(-0.86)	(-0.10)
Directflights	-0.270***				
	(-3.62)				
Size	5.655***	-0.497***	0.225***	0.00630***	0.00177***
	(10.19)	(-3.69)	(3.22)	(10.32)	(9.50)
GrowthTA	-0.113	0.0232***	-0.00770*	-0.0000297	0.0000168
	(-1.31)	(2.81)	(-1.80)	(-0.70)	(1.38)
EquityTA	0.137	-0.0411*	0.0701***	0.000265**	0.0000955***
	(0.53)	(-1.74)	(5.71)	(2.30)	(2.71)
LoanRatio	-0.181***	0.0264***	-0.00413	-0.000176***	-0.0000317***
	(-4.64)	(5.30)	(-1.60)	(-7.82)	(-4.71)
DepositRatio	-0.248***	0.0260***	-0.0114***	-0.000233***	-0.0000241**
	(-4.35)	(3.35)	(-2.82)	(-5.78)	(-2.19)
OperatingRatio	-0.243*	0.0272**	-0.0125*	-0.000310***	-0.0000389**
	(-1.93)	(2.12)	(-1.87)	(-5.24)	(-2.22)
BoardSize	0.0133	0.205	-0.482***	-0.00558***	-0.00123***
	(0.00)	(0.82)	(-3.70)	(-4.29)	(-3.29)
BoardTier	-7.474***	0.735***	-0.370***	-0.00280***	-0.000896***
	(-3.54)	(3.02)	(-2.93)	(-2.68)	(-2.71)
GDP	0.528	0.379**	-0.0285	-0.00287***	-0.000916***
	(0.30)	(2.46)	(-0.36)	(-3.57)	(-3.89)
Inflation	-0.0625	0.132*	-0.00447	0.000878**	0.000570***
	(-0.07)	(1.76)	(-0.11)	(2.41)	(5.15)
Constant	-8.905	3.536***	0.441	-0.000807	-0.00591***
	(-0.86)	(3.55)	(0.85)	(-0.17)	(-3.86)
Country fixed effect	Yes	Yes	Yes	Yes	Yes
No. of Observations	309	309	309	277	286

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *PropBondRep*CreditorRights*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*PropBondRep*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different degree of credit rights is reported at the end of each column.

Table A20: **Robustness Check (3): Using country fixed effects; role of shareholder rights**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(6)
	IV	IV	IV	IV	IV
	1st Stage	2nd Stage	2nd Stage	2nd Stage	2nd Stage
PropBondRep		-0.00272	0.0359**	-0.000497***	-0.000165***
		(-0.10)	(2.31)	(-3.65)	(-4.08)
PropBondRep*ShareholderRights		0.0262***	-0.0223***	-0.0000132	0.0000121*
		(5.72)	(-8.86)	(-0.61)	(1.82)
Directflights	-0.270***				
	(-3.62)				
Size	5.655***	-0.501***	0.220***	0.00629***	0.00176***
	(10.19)	(-3.84)	(3.06)	(10.31)	(9.54)
GrowthTA	-0.113	0.0247***	-0.00752*	-0.0000280	0.0000192
	(-1.31)	(3.10)	(-1.71)	(-0.66)	(1.59)
EquityTA	0.137	-0.0281	0.0511***	0.000250**	0.0000936***
	(0.53)	(-1.25)	(4.11)	(2.20)	(2.71)
LoanRatio	-0.181***	0.0284***	-0.00632**	-0.000177***	-0.0000305***
	(-4.64)	(5.90)	(-2.38)	(-7.86)	(-4.56)
DepositRatio	-0.248***	0.0233***	-0.00718*	-0.000229***	-0.0000233**
	(-4.35)	(3.12)	(-1.74)	(-5.73)	(-2.15)
OperatingRatio	-0.243*	0.0220*	-0.00724	-0.000307***	-0.0000412**
	(-1.93)	(1.77)	(-1.06)	(-5.19)	(-2.36)
BoardSize	0.0133	0.374	-0.692***	-0.00577***	-0.00123***
	(0.00)	(1.55)	(-5.21)	(-4.49)	(-3.33)
BoardTier	-7.474***	0.784***	-0.412***	-0.00282***	-0.000866***
	(-3.54)	(3.33)	(-3.18)	(-2.70)	(-2.63)
GDP	0.528	0.373**	-0.0361	-0.00284***	-0.000939***
	(0.30)	(2.50)	(-0.44)	(-3.52)	(-4.02)
Inflation	-0.0625	0.129*	0.00240	0.000878**	0.000570***
	(-0.07)	(1.77)	(0.06)	(2.41)	(5.19)
Constant	-8.905	3.125***	1.039*	-0.000353	-0.00590***
	(-0.86)	(3.26)	(1.97)	(-0.08)	(-3.90)
Country fixed effect	Yes	Yes	Yes	Yes	Yes
No. of Observations	309	309	309	277	286

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *PropBondRep*ShareholderRights*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*PropBondRep*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different degree of shareholder rights is reported at the end of each column.

Table A21: **Robustness Check (3): Using country fixed effects; role of shareholder rights**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(6)
	IV	IV	IV	IV	IV
	1st Stage	2nd Stage	2nd Stage	2nd Stage	2nd Stage
PropBondRep		0.00101	0.118***	-0.000405**	-0.000183***
		(0.02)	(5.26)	(-2.16)	(-3.19)
PropBondRep*Individualism		0.00116**	-0.00215***	-0.00000187	0.000000830
		(2.46)	(-8.63)	(-0.93)	(1.31)
Directflights	-0.270***				
	(-3.62)				
Size	5.655***	-0.462***	0.167**	0.00625***	0.00178***
	(10.19)	(-3.38)	(2.31)	(10.22)	(9.59)
GrowthTA	-0.113	0.0230***	-0.00860*	-0.0000309	0.0000192
	(-1.31)	(2.75)	(-1.94)	(-0.73)	(1.58)
EquityTA	0.137	-0.0234	0.0435***	0.000244**	0.0000972***
	(0.53)	(-0.99)	(3.48)	(2.15)	(2.80)
LoanRatio	-0.181***	0.0274***	-0.00575**	-0.000178***	-0.0000312***
	(-4.64)	(5.46)	(-2.16)	(-7.90)	(-4.65)
DepositRatio	-0.248***	0.0225***	-0.00646	-0.000228***	-0.0000241**
	(-4.35)	(2.88)	(-1.56)	(-5.71)	(-2.22)
OperatingRatio	-0.243*	0.0251*	-0.00923	-0.000309***	-0.0000394**
	(-1.93)	(1.93)	(-1.34)	(-5.24)	(-2.25)
BoardSize	0.0133	0.289	-0.587***	-0.00565***	-0.00127***
	(0.00)	(1.15)	(-4.39)	(-4.38)	(-3.44)
BoardTier	-7.474***	0.708***	-0.320**	-0.00278***	-0.000918***
	(-3.54)	(2.88)	(-2.46)	(-2.66)	(-2.78)
GDP	0.528	0.383**	-0.0261	-0.00284***	-0.000928***
	(0.30)	(2.45)	(-0.31)	(-3.54)	(-3.96)
Inflation	-0.0625	0.127*	0.00249	0.000882**	0.000569***
	(-0.07)	(1.67)	(0.06)	(2.42)	(5.16)
Constant	-8.905	3.074***	1.101**	-0.000319	-0.00587***
	(-0.86)	(3.07)	(2.07)	(-0.07)	(-3.87)
Country fixed effect	Yes	Yes	Yes	Yes	Yes
No. of Observations	309	309	309	277	286

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *PropBondRep*Individualism*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*PropBondRep*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different degree of individualism/collectivism values is reported at the end of each column.

Table A22: **Robustness Check (3): Using country fixed effects; role of shareholder rights**

		LnZscore	SDROA	MES	DCoVaR
	(1)	(2)	(3)	(4)	(6)
	IV	IV	IV	IV	IV
	1st Stage	2nd Stage	2nd Stage	2nd Stage	2nd Stage
PropBondRep		0.196***	-0.111***	-0.000784***	-0.000169***
		(5.74)	(-5.55)	(-5.14)	(-3.53)
PropBondRep*LongTOrientation		-0.00167***	0.00108***	0.00000386**	0.000000739
		(-4.52)	(5.00)	(2.23)	(1.37)
Directflights	-0.270***				
	(-3.62)				
Size	5.655***	-0.518***	0.227***	0.00630***	0.00178***
	(10.19)	(-3.88)	(2.90)	(10.41)	(9.59)
GrowthTA	-0.113	0.0231***	-0.00560	-0.0000337	0.0000155
	(-1.31)	(2.85)	(-1.18)	(-0.80)	(1.28)
EquityTA	0.137	-0.0238	0.0481***	0.000226**	0.0000927***
	(0.53)	(-1.03)	(3.57)	(2.00)	(2.67)
LoanRatio	-0.181***	0.0280***	-0.00579**	-0.000177***	-0.0000323***
	(-4.64)	(5.69)	(-2.01)	(-7.94)	(-4.82)
DepositRatio	-0.248***	0.0270***	-0.00943**	-0.000237***	-0.0000264**
	(-4.35)	(3.51)	(-2.09)	(-5.96)	(-2.40)
OperatingRatio	-0.243*	0.0258**	-0.0104	-0.000304***	-0.0000387**
	(-1.93)	(2.03)	(-1.41)	(-5.18)	(-2.22)
BoardSize	0.0133	0.431*	-0.719***	-0.00614***	-0.00129***
	(0.00)	(1.75)	(-4.98)	(-4.78)	(-3.46)
BoardTier	-7.474***	0.779***	-0.398***	-0.00274***	-0.000907***
	(-3.54)	(3.24)	(-2.83)	(-2.65)	(-2.75)
GDP	0.528	0.379**	-0.0461	-0.00287***	-0.000902***
	(0.30)	(2.49)	(-0.52)	(-3.61)	(-3.85)
Inflation	-0.0625	0.125*	0.00571	0.000897**	0.000574***
	(-0.07)	(1.68)	(0.13)	(2.48)	(5.21)
Constant	-8.905	2.758***	1.282**	0.00128	-0.00568***
	(-0.86)	(2.81)	(2.24)	(0.27)	(-3.73)
Country fixed effect	Yes	Yes	Yes	Yes	Yes
No. of Observations	309	309	309	277	286

This table presents 2SLS estimations of risk measures *LnZscore*, *SDROA*, *MES*, and *DCoVaR* on the interaction term *PropBondRep*LongTOrientation*. Column (1) reports the results of the first stage IV regression. Columns (2)-(5) report 2nd stage IV regression estimates, where the proportion of bondholder representatives (*PropBondRep*) is instrumented with our IV variable (*Directflights*). All variables are defined in Table 1. The t-statistics are in parentheses, with *, **, and *** denoting significance at 10%, 5%, and 1%. Market discipline exerted by bondholder representatives at different degree of long term orientation values is reported at the end of each column.

Chapter 3

Risk reporting in IRB model: what role of bondholder representatives on bank board?

This paper is co-authored with Carole Haritchabalet and Laetitia Lepetit.

3.1 Introduction

Banks play a vital role in promoting economic growth by facilitating the allocation of capital across the economy. When banks efficiently raise and allocate funds, they lower the cost of capital for firms, thereby boosting investment and stimulating economic growth. A well-functioning banks are essential for the operations of firms and the prosperity of nations (Levine, 1997). In this context, ensuring the stability of the banking sector stands as one of the primary objectives for supervisors and regulators. Following the implementation of Basel II, banks determine their minimum capital requirements through the use of either the standardized approach or the internal ratings-based approach (IRB model) when calculating their Pillar I risk weights. The primary objective of the IRB model is to improve risk sensitivity and prevent bank shareholders from investing in risky assets to capitalize on under-priced government bailout guarantees (BCBS, 2000, 2006).

The implementation of the IRB model has sparked an ongoing debate among scholars and regulatory authorities regarding its effectiveness and reliability. It has come under scrutiny due to its complexity and the significant discretion granted to banks. The intricate nature of the model makes it difficult to compare risk estimates across different banks, as it often requires access to detailed information not publicly available (Haldane, 2011; Arroyo et al., 2012; Ledo, 2011). Empirical studies have reveal that the level of discretion, combined with the potential for capital savings, creates incentives for regulatory arbitrage and manipulation of capital requirements, particularly for capital constraint banks (Mariathasan & Merrouche, 2014; Plosser & Santos, 2018; Berg & Koziol, 2017).

Despite the numerous improvements and revision of the IRB model over the last two decades, capital adequacy rules have failed to ensure that regulatory capital requirements are in line with the riskiness of bank assets. The inadequate capital held by banks has been identified as a major factor contributing to the 2007–2008 financial crisis. One of the reasons banks lacked sufficient capital during the crisis was because regulatory capital requirements did not accurately reflect the risk associated with bank activities (V. V. Acharya & Richardson, 2009; Hellwig, 2010). Discrepancies between capital requirements and bank portfolio risk allow banks to game the system by investing in assets that maximize returns while reducing capital requirements in favor of more levered activities (Jones, 2000; Hellwig, 2010; V. V. Acharya et al., 2013).

The Basel Committee on Banking Supervision (BCBS) highlights the significance of informative risk disclosures in banks to strengthen market discipline. Basel II is built on the idea that banks possess more accurate information about their own assets. Therefore, by employing the IRB model, regulators can obtain a more precise estimate of a bank's risk compared to the crude measures in Basel I. However, because banks know that reporting a high level of risk leads to a higher capital requirement, they have an incentive to understate their true risk. Risk-sensitive capital requirements can promote accurate risk reporting if the regulator is capable of gathering precise information banks' project risk and imposes sanctions on any bank found to have underestimated its true risk. The board of directors play a crucial role in the quality of banks' risk reporting. The board is responsible for setting the bank's strategic direction, capital allocation, and supervising the executive management team. Additionally, the board ensures compliance with regulations and uphold high ethical standards. In the banking industry where regulations are intense, and information can be asymmetrical due to complexity, the board becomes a vital mechanism for maintaining crucial links with regulators (De Haan & Vlahu, 2016; John et al., 2016; Nguyen et al., 2016).

A mechanism for regulators to acquire high-quality information from bank boards is having directors whose interests align with those of the regulator. Among bank stakeholders, debtholders' preferences are most closely aligned with those of regulators when it comes to directly disciplining banks to prevent excessive risk-taking (Flannery & Bliss, 2019). Board positions held by debtholders enhance their oversight capabilities, allowing them to influence management through activities such as shaping compensation structures and approving corporate strategies (Byrd & Mizruchi, 2005; Tirole, 2010). There are evidents that support (Kronenberger & Weiskirchner-Merten, 2022; Distinguin et al., 2023) the hypothesis that debtholders on boards effectively reduce risk.

The paper aims to investigate the impact of debtholders through their representatives on bank boards have upon the incentives to accurately report project risk and credit supply. Specifically, we examine whether debtholder representatives can affect banks' incentives to provide accurate risk reports and the impact of debtholder representatives on credit supply.

The literature on factors that influence the accuracy of banks' risk report is relatively limited. Blum (2008) in an adverse selection model, demonstrating that when supervisors impose a leverage ratio restriction in addition to risk-sensitive capital requirements, all banks are incentivized to report their true portfolio risk. Another aspect of the theoretical literature emphasizes two key factors: the supervisory authority's ability to audit and uncover a bank's true portfolio risk, and the level of sanctions imposed if a bank is found to have misreported its portfolio risk. Firstly, banks are more likely to misreport if they believe regulators have a lower chance of detecting their actual portfolio risk. Secondly, the severity of penalties imposed on banks for misreporting acts as an incentive for truthful reporting (Prescott, 2004; Blum, 2008; Spinassou, 2013).

We contribute to the growing literature on optimal bank board structures by theoretically analyzing the impact of directors related to debtholders on the accuracy of risk reporting under the IRB model. To the best of our knowledge, we are the first to investigate whether directors related to debtholderss can influence the accuracy or truthfulness of risk reporting under the Basel II framework. Additionally, our study adds to the literature on credit growth by examining how the presence of debtholder representatives on a bank's board affects credit supply.

We address our research question by building a framework based Spinassou (2013) model. In an adverse selection model, a representative bank is characterized by a board composition that incorporates a quota of directors affiliated with debtholders.The board is tasked with project selection, risk analysis, and reporting the risk to the regulator. The bank uses the IRB model to estimate its project risk and reports. The regulator imposes a minimum capital requirement based on the bank's risk report. Our result shows that the threshold, that incentivize the bank to truthfully reports its project risk, decreases as the proportion of debtholder representatives on the bank board increases. The result suggests that the bank's incentives to misreport increase with a greater presence of debtholder representatives on the bank board. Our results also indicate that debtholder representatives on banks board is associated with lower credit supply. Additionally, we find that the expected utility of the regulator decreases when bankruptcy costs are not excessively high, as the proportion of debtholder representatives increases.

The remainder of the paper is organized as follows: Section 2 describes the model setup; Section 3 illustrates risk reporting, Section 4 analyze credit supply, Section 5 regulatory preference, and finally Section 6 concludes.

3.2 The model

3.2.1 Setup

The model is built upon the framework of Spinassou (2013). A representative bank is presented with a range of projects, each carrying a different level of risk. To simplify, we classify all available projects into two categories: Project X and Project Y. Project X encompasses all risk-free projects, such as government bonds. In contrast, Project Y involves a loan application from a continuum of risky firms seeking funds for their projects. The bank's total assets are normalized to one, and its funding comes from capital (K) and debt (D) (i.e., $D + K = 1$). For convenience, we assume that the amount of debt is uninsured and normalize it average interest rate to one (equivalent to the risk-free interest rate)[1]. In contrast, capital is assumed to be a more costly form of financing compared to debt. Specifically, the opportunity cost of capital is $\tau > 1$. Project X provides a secure option for the bank with a certain gross rate of return of $1 + x$. Project Y is risky, and its return follows the following distribution:

$$\tilde{Y} = \begin{cases} \text{1+y} & \text{with probability } \lambda \\ \text{1-y} & \text{with probability } 1 - \lambda \end{cases} \tag{1}$$

where $\lambda \in (0, 1)$ represents the probability of success and $0 < \underline{y} \leq y \leq \overline{y}$ is the level of risk associated with a firm's project. The bank's available funds are sufficient to finance one project, but not both (i.e., either project X or Y). If the bank opt for project Y, just before the loan is granted, nature reveals to the bank the true risk y, associated with the firm's project.[2] Upon learning the true risk level associated with Project Y, the bank can choose

[1] The idea of cheaper debt rate is motivated in a run-up to the crisis, due to both relatively accommodative monetary policy Adrian & Shin (2010); Borio & Zhu (2012) and the increasing availability of wholesale funding Brunnermeier (2009); Diamond & Rajan (2009).

[2] We assume the bank conducts a risk assessment to determine the actual level of risk associated with the firm's project.

to either proceed with project Y or invest in risk-free assets (i.e., finance project X). We simplify the analysis by assuming that the probability distribution of risky projects follows a uniform distribution with a cumulative distribution function $H(y)$. Project Y returns $1-y$ with probability $(1-\lambda)$. In that case, the bank defaults and liquidates if the capital it holds is insufficient to cover its losses.

3.2.2 The regulator

We assume that the regulator has a social objective which encompasses maintaining financial stability and promoting credit growth. The regulator considers both the social cost of bankruptcy and benefits associated with credit supply. The failure of a bank leads to social costs γ. These costs include externalities such as contagion effects and disruptions in the payments system. Furthermore, a banking crisis leading to reduced credit availability adversely affects economic growth and results in costs through decreased real output.[3] To achieve prudential bank management, the regulator primarily employs capital regulation. The regulator's capital regulation ensure that the bank's capital requirement aligns with its project risk (i.e., the risk sensitive capital requirement a la Basel II). The implementation of the bank-specific capital requirements aims to impose a level of capital requirement proportional to the bank's project risk; see the MREL (Minimum Requirement for own funds and Eligible Liabilities) in Europe.[4]

The regulator cannot perfectly observe the bank's project risk. To implement the risk-sensitive capital requirement under the Internal Ratings Based (IRB) approach, the bank is required to evaluate its own project risk and report it, denoted as j, to the regulator. Based on this risk report, the regulator sets the bank's required capital : we assume that if the bank reports j, the regulator sets the bank's minimum capital j.

The regulator has the option to conduct an audit, incurring a personal cost denoted as η. It is assumed that, following any audit, the regulator observes the bank's true risk. Following Prescott (2004) and Spinassou (2013), we denote $f(j) \in [0,1]$ as the probability for the bank to be audited. The probability of an audit decreases as the reported risk level

[3] On the costs of banking problems, see Hoggarth et al. (2002) (2001) or Boyd et al. (2005).

[4] MREL is designed to ensure that there are sufficient resources to write down or convert into equity if a bank or other financial institution is in crisis.

j increases. That is, $f'(j) < 0$. We also consider that $f''(j) > 0$, the audit probability is a convex function. If an audit is performed and the bank is found to have misreport its project risk, the regulator imposes a monetary sanction, denoted as S. We model the sanction as a penalty proportional on disparity between the true project risk (y) and the reported risk (j): $S = s(\max\{y - j, 0\})$ where $s \in [0, 1]$ represents the regulator's power or ability to sanction the bank when it misreports. Given the regulator's social objectives, the expected utility of the regulator is defined as

$$E[U_R] = -E[\text{bankruptcy cost}] + E[\text{expected credit supply}] - \eta \tag{2}$$

3.2.3 Role of board of directors

Throughout the model, we assume a banking framework where the composition of the bank's board includes a proportion $\beta \in (0, 1)$ of directors related to bondholders.[5] The bank board has two primary responsibilities. First, the board determines the risk-return characteristics of a project (i.e., chooses project X or project Y). Once a project is chosen, the next responsibility is to assess its risk and report it to the regulator. Shareholders have strong incentives to favor risky projects, especially in highly leveraged firms like banks to exploit the upside benefit of risky projects. In contrast, bondholders prefer a risk level that guarantee full debt repayment upon project completion. Following Hermalin & Weisbach (1998), we make the assumption that the preferences of individual directors can be aggregated into a single collective utility function. As a result, the utility of the board of directors in the presence of both shareholder and bondholder representatives is expressed as follows:

$$E[U_{BoD}] = \beta E[U_B] + (1 - \beta) E[U_S] \tag{3}$$

where $E[U_B]$and $E[U_S]$ represent expected utility of bondholders and shareholders (bank profit) respectively.

3.3 Project risk reporting

In this section, we analyze the influence of bondholder representatives on the project risk report. As shown in Blum (2008) and Spinassou (2013), whenever the bank finances project

[5] Distinguin et al. (2023) have documented the presence of directors affiliated with bondholders in European listed banks.

X, it provides an accurate report of its project risk and holds a minimum capital requirement $j = 0$ because project X is inherently safe and carries no insolvency risk. Therefore, if the bank board opts for project X, bank's profit is

$$[U_S|X] = 1 + x - (1 - j) - f(j)s\left(\max\left\{y - j, 0\right\}\right) - \tau j \tag{4}$$

Since project X posses no risk (i.e., $y = 0$) and the bank always reports $j = 0$ when financing project X, bank profit can be simplify as:

$$[U_S|X] = x$$

The utility of bondholders if the bank finances project X is

$$[U_B|X] = (1)\left(1 - j\right) \tag{5}$$

Since the bank holds no capital (i.e., $j = 0$) when financing project X, Eq (5) can be simplify as:

$$[U_B|X] = 1$$

Therefore, the utility of the board when financing project X is

$$[U_{BoD}|X] = \beta\left(1\right) + \left(1 - \beta\right)x \tag{6}$$

When the bank is financing project Y, the board selects a risk level j to report to the regulator. This choice aims to maximize the utility of the board, taking into account the probability that the bank is being audited $f\left(j\right)$, and the potential sanctions imposed if an audit uncovers any misreporting of risk by the bank. If the bank misreports, it holds a level of capital requirement that is less than its potential losses (i.e., $j < y$). We will use the term "*misreporting bank*" to describe the bank if it reports $j < y$ and "*truth-reporting bank*" if it reports $j = y$. The expected utility of bondholders when the bank is financing project Y is

$$E[U_B|Y] = \lambda\left(1 - j\right) + \left(1 - \lambda\right)\max\left\{\left(1 - j\right), \left(1 - y\right)\right\} \tag{7}$$

and the expected bank profit when the bank finances project Y is

$$E[U_S|Y] = \lambda\left[\left(1 + y\right) - \left(1 - j\right) - f\left(j\right)s\left(y - j\right)\right] + \left(1 - \lambda\right)\left[\max\left\{\left(1 - y\right) - \left(1 - j\right), 0\right\}\right] - \tau j \tag{8}$$

The optimization problem of the board when financing project Y writes as:

$$\max_{j} E[U_{BoD}|Y] = \beta E[U_B|Y] + (1-\beta) E[U_S|Y] \tag{9}$$

subject to

$$j \leq y \tag{10}$$

The solution to the optimization problem leads to the following result.

Proposition 1 *There exist a threshold, denoted $\widehat{y}_\beta$, such that when the bank is financing project Y and observes $y \leq \widehat{y}_\beta$ it truthfully reports the projects risk, (i.e., reports $j = y$), otherwise it misreports (i.e., reports $j < y$)*

$$\widehat{y}_\beta = f^{-1}\left(\frac{\tau - \lambda + \frac{\beta}{1-\beta}\lambda}{\lambda s}\right)$$

Proof: See the appendix.

The threshold distinguishes between a potential truth-reporting bank and a misreporting bank. Its determination depends on several factors, including the cost of capital (τ), the probability of project Y's success (λ), the regulator's willingness to impose sanctions (s) if the bank is found to have misrepresented, the audit function ($f(j)$), and the proportion of bondholder representatives on the bank board. The bank has an incentives to truthfully reports its true project risk if the level of risk associated with the firm's project to such that $y \in \left[\underline{y}, \widehat{y}_\beta\right]$. In contrast, the bank has an incentives to misreport its true risk, when the risk of the firm's project is such that $y \in (\widehat{y}_\beta, \overline{y}]$. Figure 1 illustrates the threshold that distinguishes a potential truth-reporting bank from a misreporting one. As shown by Spinassou (2013),

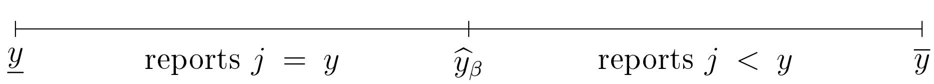

Figure 3.1: Threshold separating truth-reporting from misreporting bank

the threshold separating a truth-reporting bank from a misreporting bank increases as the severity of the sanction impose by the regulator increases or the ability to audit increases. In other words, a strong ability of the regulator to audit and sanction misreporting bank increases the bank's incentives to truthfully reports the project risk. Furthermore, as the cost of capital rises, the bank has stronger incentives to provide an accurate report of its risk. Conversely, when there is a higher probability of project Y being successful, the bank has greater incentives to misrepresent the project risk (i.e., reports $j < y$). Summing up, the value of the threshold increases as τ or s or $f(j)$ increases, while decreases as λ increases.

Lemma 1 *The threshold $\widehat{y}_\beta$, decreases with an increase in the proportion of bondholder representatives on the bank board.*

Proof: The derivative of $\widehat{y}_\beta$ with respect to β is

$$\frac{\partial \widehat{y}_\beta}{\partial \beta} = \frac{\lambda}{f'\left(\frac{\tau-\lambda+\frac{\beta}{1-\beta}\lambda}{\lambda s}\right)(1-\beta)^2} < 0$$

The bank provides an honest project risk report when the firm's project risk is such that $y \in \left[\underline{y}, \widehat{y}_\beta\right]$, otherwise it misreport. Since $\widehat{y}_\beta$ decreases as β increases, it implies that bondholder representatives increases the incentives for the bank to misreport.

3.4 Credit Supply

In this section, we analyze how the presence of bondholder representatives influences the bank's project selection. When the bank fiances project X, its main goal is to protect its assets, and as a result, it does not supply credit to firms. Instead, the bank supplies credit exclusively through the financing of a firm's project(i.e., when it finances project Y). We investigate the actions of the bank's board once the true risk associated with the firm's project has been revealed to by nature.

3.4.1 Project choice of a truth-reporting bank

A potential truth-reporting bank is the one that has an incentive to provide an accurate report (thus, if the bank observes $y < \widehat{y}_\beta$). From Eq (9), the utility of a potential truth-reporting bank board can be expressed as follows:

$$[U_{BoD}|Y]^T = \beta(1-y) + (1-\beta)(2\lambda - \tau)\,y \tag{11}$$

Comparing Eq (6) and Eq (11), leads to the following threshold.

Lemma 2 *There exist a threshold denoted as $\widehat{y}_{\beta T}$, such that if the bank selects project Y and observes a level of risk such that $y < \widehat{y}_{\beta}$, the bank will proceed with project Y only if $\widehat{y}_{\beta T} < y < \widehat{y}_{\beta}$, otherwise the bank will choose project X.*

$$\widehat{y}_{\beta T} = \frac{x}{(2\lambda - \tau) - \frac{\beta}{1-\beta}} \tag{12}$$

The threshold $\widehat{y}_{\beta T}$ serves as the boundary that determines the project choice of a potential truth-reporting bank's board, indicating whether it will finance project Y or opt for project X. More specifically, a truth-reporting bank will finance project Y if the firm's project risk is within the interval $(\widehat{y}_{\beta T}, \widehat{y}_{\beta})$. For a level of risk $y \in \left(\underline{y}, \widehat{y}_{\beta T}\right]$, the bank will opt for project X. A truth-reporting bank board's preference for project Y is influenced by not only the proportion of directors affiliated with bondholders (β) but also by additional factors, including the probability of project Y's success (λ), the cost of capital (τ), and the return from project X (x).

Lemma 3 *The threshold $\widehat{y}_{\beta T}$, which determines whether a truth-reporting bank proceeds with project Y (i.e., financing a firm's project) decreases with an increase in the proportion of bondholder representatives β or the cost of capital τ or the return from project X x while it decreases with an increase in the probability of project Y's success λ.*

Proof: See the appendix.

The value of the threshold $\widehat{y}_{\beta T}$ increases with an increase in the proportion of bondholder representatives on the bank board β, or the return from project X x, or the cost of capital τ, while it decreases as the probability of project Y's success λ. This implies that the incentives for the bank to finance project Y decreases as β, x, τ or λ increases, but it increases as λ increases. The proportion of bondholder representatives on the board of a truth-reporting bank leads to the following result.

Proposition 2 *The incentives for a truth-reporting bank to choose project Y decrease with a higher proportion of bondholder representatives on the bank board.*

A potential truth-reporting bank will finance project Y when the firm's risk level falls within the interval $(\widehat{y}_{\beta T}, \widehat{y}_{\beta})$. From lemma 3, as the proportion bondholder representatives increases, the threshold value $\widehat{y}_{\beta T}$ also increases. This suggests that the range of values of y for which a truth-reporting bank selects project Y decreases, while the range of values of y for the bank to opt for project X increases. In other words, the presence of bondholder representatives increases the board's preference to finance project X, even when the bank has incentives to truthfully its risk when it finances project Y.

In summary, the presence of bondholder representatives leads the bank's board to favor safer projects, even when the bank has the incentives to truthfully reports project risk when financing project Y. Bondholder representatives on the board prioritize the protection of bondholders' interests. As a result, advocate for stricter lending standards thereby reducing credit supply to mitigate potential losses. On the credit supply side, the literature identifies some determinants of bank credit supply. Kashyap & Stein (2000) emphasize the importance of bank capital adequacy in shaping lending decisions. Their study underscores that banks with higher capital are more likely to extend credit. Berger & Udell (2006) in a study analyzing SME credit availability issues, find that information asymmetry between banks and borrowers significantly impacts credit supply.

3.4.2 Project choice of a misreporting bank

A potential misreporting bank is one that has an incentive to misrepresent its true risk. If the bank misreports (i.e., reports $j < y$), it holds a minimum capital requirement j less than the project's potential losses y. The expected utility of a misreporting bank board writes:

$$E[U_{BoD}|Y]^M = \beta\left[\lambda\left(1-j\right)+\left(1-\lambda\right)\left(1-y\right)\right]+\left(1-\beta\right)\left[\lambda\left[y+j-f\left(j\right)s\left(y-j\right)\right]-\tau j\right] \quad (13)$$

Comparing Eq (6) and Eq (13) leads to the following threshold.

Lemma 4 *There exist a threshold denoted as $\widehat{y}_{\beta M}$, such that if the bank chooses project Y and observes a level of risk such that $y > \widehat{y}_{\beta}$, the bank will proceed with project Y only if $\widehat{y}_{\beta M} < y < \overline{y}$, otherwise, the bank finances project X.*

$$\widehat{y}_{\beta M} = \frac{x + j\left[\tau - \lambda\left(1+f\left(j\right)s\right)\right] + \frac{\beta}{1-\beta}\lambda j}{\lambda - \frac{\beta}{1-\beta}\left(1-\lambda\right) - \lambda f\left(j\right)s} \quad (14)$$

This threshold $\widehat{y}_{\beta M}$, determines whether the bank will finance project Y or opt for project X after observing a project risk $y > \widehat{y}_{\beta}$. As shown in Figure 3, a misreporting bank will finance project Y when the risk of the firm's project is such that $y \in (\widehat{y}_{\beta M}, \overline{y}]$. Otherwise, the bank finances project X. Note that, the value of the threshold $\widehat{y}_{\beta M}$ is influenced not only by the proportion of bondholder representatives on the bank board (β) but also by other factors, including the probability of project Y's success (λ), the cost of capital (τ), the return from project X (x), the probability that the bank will be audited $f(j)$, the sanction s, and the reported risk j.

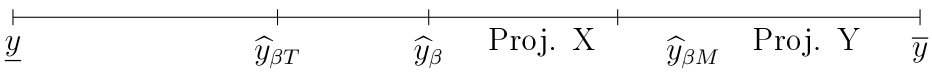

Figure 3.2: Project selection of a misreporting bank

Lemma 5 *The value of threshold $\widehat{y}_{\beta M}$, that determines whether the bank will finance project Y or opt for project X after observing a level of risk $y > \widehat{y}_{\beta}$ increases as the proportion of bondholder representatives on the board increases*

Proof: The derivative of $\widehat{y}_{\beta M}$ with respect to β gives

$$\frac{\partial \widehat{y}_{\beta M}}{\partial \beta} = \frac{x(1-\lambda) + j\left[(2\lambda+\tau)(1-\lambda) - \lambda f(j)\, s\right]}{\left[\lambda(1-f(j)\, s) - \beta(1-\lambda f(j)\, s)\right]^2} > 0$$

Bondholder representatives on the bank board influence the project selection of the board after nature has reveal the true risk associated with the firm's project. That observes $y > \widehat{y}_{\beta}$. As the proportion of bondholder representatives increases, value of the threshold $\widehat{y}_{\beta T}$ also increases. In other words, a higher proportion of bondholder representatives decreases the range of value of y that incentivize a misreporting bank to finance project Y. Bondholder representatives on the board of a misreporting bank leads to the following result.

Proposition 3 *The incentives for a misreporting bank to choose project X increases as the proportion of bondholder representatives on the bank board increases.*

Form lemma 5, the presence of bondholder representatives on the bank board increases the values of the threshold $\widehat{y}_{\beta M}$ which increases the range of values of y for the bank to choose the safer project (i.e., finances project X). Thus, a misreporting bank will finance project Y if the level of risk associated with the firm's project is within the interval $(\widehat{y}_{\beta M}, \overline{y}]$. Since as β increases, the value of the threshold $\widehat{y}_{\beta M}$ also increases, indicating that a higher representation of bondholder representatives reduces the bank's incentives to finance project Y. Summing up, bondholder representatives on a misreporting bank is associated with a decrease in credit supply.

3.5 Regulator's preference

Given the regulator's multifaceted objectives of enhancing financial stability and fostering credit growth, we analyze the overall impact of bondholder representatives its expected utility. The regulator internalize the benefit of credit supply and the bankruptcy costs γ. For β - the proportion of bondholder representatives on the bank board, the bank finances project Y when the level of risk associated with the firm's project is such that $y \in (\widehat{y}_{\beta T}, \widehat{y}_{\beta})$ or $y \in (\widehat{y}_{\beta M}, \overline{y}]$. Thus, credit is supply when a truth-reporting finances project Y or a misreporting finances project Y. From lemma 2 and 3 the probability of a truth-reporting bank and a misreporting bank financing project Y are $\left(\frac{\widehat{y}_{\beta}-\widehat{y}_{\beta T}}{\overline{y}-\underline{y}}\right)$ and $\left(\frac{\overline{y}-\widehat{y}_{\beta M}}{\overline{y}-\underline{y}}\right)$ respectively.

Proposition 4 *Expected credit supply decreases as the proportion of bondholder representatives on the bank board increases.*

Proof: See the appendix.

From proposition 2, the preference of a truth-reporting bank for project Y decreases as the bondholder representatives on the board increases. This suggests that a truth-reporting bank is more likely to keep it assets safe as β increases. Also, from proposition 3, the preference of a misreporting bank for project Y decreases as the proportion of bondholder representatives increases. Therefore, the overall impact of bondholder representatives on the bank board is associated with lower credit supply. Unlike shareholders, who participate in the company's profits, bondholders are entitled to a fixed payment at the project's conclusion. This fixed payment steers bondholders toward projects or investments that offer a high level of certainty in generating sufficient cash flow to meet these fixed payment obligations. Their preference for certainty and security leads bondholder representatives to favor project X over granting loans to firms.

The bank possess insolvency risk only when if finances project Y and misreports. From lemma 4, the probability that the bank will misreport its risk when financing project Y is $\left(\frac{\overline{y}-\widehat{y}_{\beta M}}{\overline{y}-\underline{y}}\right)$. Then the expected utility of the regulator can be written as

$$E\left[U_R\right] = \underbrace{-(1-\lambda)\left(\frac{\overline{y}-\widehat{y}_{\beta M}}{\overline{y}-\underline{y}}\right)\gamma}_{\text{expected social cost}} + \underbrace{\left(\frac{\widehat{y}_{\beta}-\widehat{y}_{\beta T}}{\overline{y}-\underline{y}}\right)+\left(\frac{\overline{y}-\widehat{y}_{\beta M}}{\overline{y}-\underline{y}}\right)}_{\text{expected credit supply}} - \underbrace{\eta}_{\text{cost of audit}} \tag{15}$$

The derivative of Eq (15) with respect to β leads to the following result

Proposition 5 *When the cost of bankruptcy is small* $\left(\gamma < \frac{1}{1-\lambda}\right)$, *the expected utility of the regulator decreases with* β. *When the cost of bankruptcy increases, there may exist a strictly positive optimal number of bondholders.*

Proof: See the appendix

When cost of bankruptcy is not large (i.e., $\gamma < \frac{1}{1-\lambda}$) the entire expression is always negative, and as the proportion of debt-holder representatives (β) increases, the expected utility of the regulator decreases. However, when the bankruptcy cost γ increases, the first term becomes positive, and we may find that there is an optimal value for β that maximizes the expected utility of the regulator.In other words, when bankruptcy costs are significantly high, having a certain level of debt-holder representation on the bank boards may actually be beneficial for the regulator, potentially striking a balance between financial stability and credit supply

3.6 Conclusion

The introduction of risk-sensitive capital a la Basel II and the utilization of internal ratings (IRB) models by banks to determine risk weights represent significant innovations in banking prudential regulation. However, there have been ongoing discussions among scholars and regulatory authorities about the effectiveness and reliability of the IRB approach.

The literature examining the factors affecting the accuracy of banks' risk reporting is somewhat limited. This study's primary goal is to investigate the influence of debtholder representatives on a bank's board on risk reporting and its impact on credit supply. Specifically, we explore whether directors affiliated with debtholders can affect banks' incentives to report project risk accurately and how this influences credit supply.

To answer our research question, we construct a framework based on Spinassou (2013) model. In this adverse selection model, a representative bank has a board composition that includes a quota of directors affiliated with debtholders. The board is responsible for project selection, risk analysis, and reporting to the regulator. The bank employs the IRB model to estimate its portfolio risk, and the regulator sets a minimum capital requirement based on the bank's risk report. Our findings indicate that the threshold encouraging the bank to accurately report project risk decreases as the proportion of debtholder representatives on the bank board increases. This suggests that the bank's incentives to misreport rise with a greater presence of debtholder representatives on the board, leading to an increased manipulation of risk-weighted measures in the IRB model.

Our analysis sheds light on the impact of debtholder representatives on the accuracy of a bank's risk report and its effect on credit supply. In particular, our results show that debtholder representatives on bank boards are associated with reduced credit supply, and the expected utility of regulation decreases as the proportion of debtholder representatives increases.

In summary, our findings contribute to the ongoing discourse surrounding the reliability of the IRB model and the broader literature on optimal bank board structures. Additionally, our study adds valuable insights to the literature on credit growth by examining how the presence of debtholder representatives on a bank's board influences credit supply.

Appendix

Proof of proposition 1: The board selects a risk level to report to the regulator that maximize the utility function of the board in Eq (9).

$$\max_{j} E\left[U_{BoD}|Y\right] = \beta\left[\lambda\left(1-j\right)+\left(1-\lambda\right)\left(1-y\right)\right]+\left(1-\beta\right)\left[\lambda\left[\left(1+y\right)-\left(1-j\right)-f\left(j\right)s\left(\max\left\{y-j\right\},0\right)\right]+\left(1-\lambda\right)\left[\max\left\{\left(1-y\right)-\left(1-j\right),0\right\}\right]-\tau j\right] \tag{16}$$

subject to

$$j \leq y \tag{17}$$

The Lagrangian function can be written as:

$$L\left(j,\mu\right) = \beta\left[\lambda\left(1-j\right)+\left(1-\lambda\right)\left(1-y\right)\right]+\left(1-\beta\right)\left[\lambda\left[\left(1+y\right)-\left(1-j\right)-f\left(j\right)s\left(y-j\right)\right]-\tau j\right]-\mu\left(j-y\right) \tag{18}$$

where, the derivative with respect to j gives:

$$\frac{\partial L\left(j,\mu\right)}{j} = -\beta\lambda+\left(1-\beta\right)\left[\lambda-\lambda f'\left(j\right)s\left(y-j\right)+\lambda f\left(j\right)s-\tau\right]-\mu=0 \tag{19}$$

and

$$\mu\left(j-y\right)=0 \tag{20}$$

There are two possible solutions (1) where $j=y$ and $\mu>0$ and (2) where $j<y$ and $\mu=0$. In the first case, the bank truthfully reports the project risk, hence holds a level of capital equal y. From Eq (19), we obtain:

$$f\left(y\right)=\frac{\mu+\tau-\lambda+\frac{\beta}{1-\beta}\lambda}{\lambda s} \tag{21}$$

In the second case, the bank misreports, that is reports $j<y$. By reporting $j<y$, the bank holds a level of capital equals j. Hence, from Eq (19), we obtain:

$$f\left(j\right)-f'\left(j\right)s\left(y-j\right)=\frac{\tau-\lambda+\frac{\beta}{1-\beta}\lambda}{\lambda s} \tag{22}$$

We know that $f'\left(j\right)<0$ and $f\left(j\right)>f\left(y\right)$ when $j<y$. It follows that

$$f\left(j\right)-f'\left(j\right)s\left(y-j\right)>f\left(y\right) \qquad \forall j<y \tag{23}$$

Since $f'\left(j\right)<0$, from Eq (23) the bank has incentive to reports its true risk when

$$f(y) > \frac{\tau - \lambda + \frac{\beta}{1-\beta}\lambda}{\lambda s} \tag{24}$$

This leads to the threshold separating the incentive to misreport and truth-reporting

$$f(\widehat{y}_{\beta}) = \frac{\tau - \lambda + \frac{\beta}{1-\beta}\lambda}{\lambda s} \tag{25}$$

Proof of lemma 3: The derivative of Eq (12) with respect to β, τ, x, and λ gives

$$\frac{\partial \widehat{y}_{\beta T}}{\partial \beta} = \frac{x}{(1-\beta)^2\left[2\lambda - \tau - \frac{\beta}{1-\beta}\right]^2} > 0 \tag{26}$$

$$\frac{\partial \widehat{y}_{\beta T}}{\partial \tau} = \frac{x}{\left[2\lambda - \tau - \frac{\beta}{1-\beta}\right]^2} > 0 \tag{27}$$

$$\frac{\partial \widehat{y}_{\beta T}}{\partial x} = \frac{1}{(2\lambda - \tau) - \frac{\beta}{1-\beta}} > 0 \tag{28}$$

$$\frac{\partial \widehat{y}_{\beta T}}{\partial \lambda} = -\frac{2x}{\left[2\lambda - \tau - \frac{\beta}{1-\beta}\right]^2} < 0 \tag{29}$$

Proof of Proposition 4: The expected credit supply of the bank from proposition 2 and 3 is

$$\left(\frac{\widehat{y}_{\beta} - \widehat{y}_{\beta T}}{\overline{y} - \underline{y}}\right) + \left(\frac{\overline{y} - \widehat{y}_{\beta M}}{\overline{y} - \underline{y}}\right) \tag{30}$$

The derivative with respect to β gives

$$\underbrace{-\frac{1}{(\overline{y} - \underline{y})}\left[\frac{x}{\left[(2\lambda - \tau)(1-\beta) - \beta\right]^2} + \frac{x(1-\lambda) + j\left[2\lambda^2 + \tau - \lambda(1 + f(j)s + \tau)\right]}{\left[\lambda - \lambda f(j)s - \beta(1 - f(j)s)\right]^2}\right]}_{<0} + \underbrace{\frac{\lambda}{f'\left(\frac{\tau - \lambda + \frac{\beta}{1-\beta}\lambda}{\lambda s}\right)(1-\beta)^2(\overline{y} - \underline{y})}}_{<0} < 0 \tag{31}$$

Proof of proportion 5: The expected utility of the regulation is in Eq (15) is rewritten as

$$E\left[U_R\right] = \left(\frac{\overline{y} - \widehat{y}_{\beta M}}{\overline{y} - \underline{y}}\right)\left[1 - (1-\lambda)\gamma\right] + \left(\frac{\widehat{y}_{\beta} - \widehat{y}_{\beta T}}{\overline{y} - \underline{y}}\right) - \eta \tag{32}$$

The first derivative with respect to β gives:

$$\frac{\partial E[U_R]}{\partial \beta} = \underbrace{-\frac{\left[1-(1-\lambda)\gamma\right]}{\left(\overline{y}-\underline{y}\right)}\left[\frac{x\,(1-\lambda) + j\left[2\lambda^2 + \tau - \lambda\left(1 + f\,(j)\,s + \tau\right)\right]}{\left[\lambda - \lambda f\,(j)\,s - \beta\left(1 - f\,(j)\,s\right)\right]^2}\right]}_{<0 \text{ for } \gamma < \frac{1}{1-\lambda}} - \underbrace{\frac{1}{\left(\overline{y}-\underline{y}\right)}\left[\frac{x}{\left[(2\lambda-\tau)(1-\beta)-\beta\right]^2}\right]}_{<0} + \underbrace{\frac{\lambda}{f'\left(\frac{\tau-\lambda+\frac{\beta}{1-\beta}\lambda}{\lambda s}\right)(1-\beta)^2\left(\overline{y}-\underline{y}\right)}}_{<0} < 0 \tag{33}$$

The second derivative with respect to β is

$$\underbrace{-\frac{\left[1-(1-\lambda)\gamma\right]}{\left(\overline{y}-\underline{y}\right)}\left[\frac{\left(1-f\,(j)\,s\right)\left[x\,(1-\lambda) + j\left[2\lambda^2 + \tau - \lambda\left(1 + f\,(j)\,s + \tau\right)\right]\right]}{\left[\lambda - \lambda f\,(j)\,s - \beta\left(1 - f\,(j)\,s\right)\right]^3}\right]}_{<0} - \frac{1}{\left(\overline{y}-\underline{y}\right)}\left[\frac{\left[2(2\lambda-\tau)+2\right]x}{\left[(2\lambda-\tau)(1-\beta)-\beta\right]^3}\right] + \frac{\lambda\left[2(1-\beta)f'\left(\frac{\tau-\lambda+\frac{\beta}{1-\beta}\lambda}{\lambda s}\right) - (1-\beta)^2 f''\left(\frac{\tau-\lambda+\frac{\beta}{1-\beta}\lambda}{\lambda s}\right)\right]}{\left(\overline{y}-\underline{y}\right)\left[(1-\beta)^2 f'\left(\frac{\tau-\lambda+\frac{\beta}{1-\beta}\lambda}{\lambda s}\right)\right]^2} < 0 \tag{34}$$

GENERAL CONCLUSION

Given the far-reaching consequences of the 2007-2008 financial crisis and its lasting impact on the economy, several countries have implemented various reforms to enhance corporate governance. This action has been taken in response to the recognition that the failure of several internal corporate governance mechanisms is attributed as one of the major causes of the crisis. This thesis aims to achieve three primary objectives: first, to conduct a theoretical analysis of whether the discipline imposed by bondholders through their representatives can act as a complement or substitute for prudential capital regulation; second, to explore how the operational environment affects the monitoring and influence of banking risk by debtholder representatives; and third, to theoretically investigate how the presence of bondholder representatives on bank boards influences their behavior concerning risk reporting and its potential impact on credit supply.

In chapter one, we investigate theoretically whether banking regulators can use the discipline exerted by debtholders, represented on bank boards, as a complement or substitute for traditional banking regulation. We investigate this through a one-period discrete model in which the regulator selects between two regulatory frameworks: one based solely on a minimum capital requirement and another that includes an additional quota mandating a minimum number of bondholder representatives on the bank's board. Our analysis reveals that when bankruptcy costs are relatively high, the regulator uses the bondholder representative quota as a complement to capital regulation to reinforce financial stability. Conversely, in scenarios with lower bankruptcy costs, the regulator leverages the bondholder representative quota to ease the capital constraint, thereby enhancing bank profits, albeit at the expense of financial stability.

Chapter two analyzes whether the discipline exerted by bondholders through their representatives on bank boards is contingent on the regulatory, legal environment, and cultural environments of a country. We identify three factors that could influence the risk-reducing effect of bondholder representatives. The factors include regulatory factors (supervisory power and capital regulation), legal factors (creditor rights and shareholder rights), and national cultural values (individualism/collectivism and long-term orientation/short-term orientation). Leveraging a unique dataset that tracks board relationships between European-listed financial institutions and their bondholders following the implementation of the BRRD in 2016,

120

our results demonstrate that bondholder representatives on bank boards significantly reduce risk, regardless of these factors. However, the degree of this impact varies. It is more pronounced in countries with stricter capital requirements, stronger creditor and shareholder rights, and a culture emphasizing individualism, while it is weaker in regions with greater supervisory power and a focus on long-term orientation.

Finally, chapter three theoretically examines how the presence of bondholder representatives on bank boards influences bank behavior in relation to risk reporting and credit supply. In an adverse selection model, the board is entrusted with project selection and project risk reporting. Our results demonstrate that the presence of bondholder representatives on bank boards increases banks' incentives to misreport. Furthermore, our findings indicate that the presence of bondholder representatives on bank boards is associated with reduced credit supply.

Based on the findings above, this research provides essential policy implications. Firstly, in situations where bankruptcy costs are relatively high, the influence of bondholder representatives on bank boards in reducing risk emerges as a complementary element to regulatory capital, further strengthening financial stability. The 2007-2008 financial crisis vividly illustrated the steep costs associated with bank failures. In this context, our results underscore the significance of Pillar 3 within the Basel II and III agreements, which emphasize the critical role of market discipline in conjunction with supervisory measures.

Our study makes a substantial contribution to the ongoing policy discussions regarding effective forms of corporate governance in banks to secure financial stability. Traditional corporate governance, primarily based on shareholder interests, frequently overlooks the distinct characteristics of banks. Our result that bondholder representatives significantly reduce reduce risk, irrespective of the environment emphasize the importance of structuring bank boards to better reflect bondholders' interests, ultimately enhancing alignment with regulators' objectives. Analyzing the regulatory and legal environment is crucial for a comprehensive understanding of the effectiveness of a bondholder representative quota in mitigating excessive risks. Our finding that regulatory supervision can be substituted by the risk-reducing effect of bondholder representatives is pivotal in understanding how to fully harness the benefits of having bondholder representatives on bank boards.

121

Finally, our research also highlights a crucial policy implication regarding bondholder representatives. While they can serve as an additional layer of oversight, potentially reducing the need for resource-intensive on-site and in-site controls, their presence may inadvertently intensify incentives for banks to misreport their project risk as well as compromising the credit supply from banks – an essential component for a country's economic financing, growth, and employment. These findings provide regulators with the pros and cons of having bondholder representatives on bank boards.

122

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