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Risk governance and regulatory adjustments in the public commercial banks of OECD

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1. Introduction

The primary objective of this study is to investigate the relationship between risk governance characteristics and regulatory adjustments in OECD public commercial banks, focusing on how these elements contribute to banking stability. Specifically, the research will analyze the implications of varying capital requirements as part of the sensitivity analysis, aiming to uncover how risk governance characteristics interact with these regulatory adjustments to affect the overall stability and efficiency of the banking sector.

Risk governance and regulatory adjustments are pivotal in maintaining the banking sector's stability and compliance. This paper primarily examines these aspects from the banks' perspective, focusing on the impact of risk governance on regulatory adjustments. In complex financial markets, banks, often guided by regulators, must establish robust risk governance frameworks to manage risks and maintain stakeholder trust (Andres and Vallelado, 2008; Caprio and Levine, 2002). Regulatory adjustments (BIS-CAP30, 2019), mandated by bodies like BCBS, 36/EU Directive (2013) and Dodd-Frank Act (2010), align banks' financial reporting with regulatory frameworks, ensuring stability (Van Greuning and Bratanovic, 2020). These adjustments, while corrective, can indicate deeper financial management issues, affecting stability and performance (Francis and Osborne, 2012). Understanding the interplay between risk governance and regulatory compliance is crucial for the banking sector's resilience and effectiveness.

This study explores the relationship between risk governance characteristics and regulatory adjustments in OECD public commercial banks. It distinguishes between banks' compliance and specific regulatory mandates, informed by Quintyn and Chenard (2004). Focusing on OECD standards, the research examines how governance impacts financial stability and performance. The findings contribute to understanding the role of regulatory governance in the banking sector, emphasizing its importance in maintaining financial system stability.

The primary objective of this research is to investigate the association between risk governance characteristics and regulatory adjustments in public commercial banks within the OECD. The study specifically evaluates the presence and impact of various risk governance roles, including Risk Committees (RC), Chief Risk Officers (CRO), Chief Financial Officers (CFO), PhD holders (TITLE), senior directors (SENIOR), and independent directors (BI), as outlined in

studies by Minton et al., 2014; Bargeron et al., 2010; Berger et al., 2014; Aebi et al., 2012; Andres and Vallelado, 2008; Caprio and Levine, 2002. Furthermore, the study examines the impact of risk governance on capital requirements, specifically the Tier 1 capital to Risk Weighted assets ratio (TIER1) and total capital to Risk Weighted assets ratio (TCR), exploring their effects on bank stability and performance (Francis and Osborne, 2012). To elucidate the crucial link between risk governance and capital requirements, it is essential to understand how they collectively influence banking stability. Effective risk governance directly impacts the capital requirements of banks, playing a pivotal role in their financial resilience. In particular, this study scrutinizes OECD public commercial banks, where the synergy of risk governance and capital requirements is integral to the health of the banking sector. This research aims to dissect this interplay, providing insights into its significance for banking stability. This exploration is intended to provide insights into how risk governance can support or influence regulatory adjustments within the banking sector.

The choice of OECD countries for this study is intentional. Their varied regulatory frameworks make them an ideal context to explore the relationship between risk governance and regulatory compliance. This approach not only fills a critical gap in existing research but also provides valuable insights into the dynamics of banking regulation across different economic environments, enhancing the study's originality and global relevance. Recognizing the need for a more exhaustive investigation, this research extends its analysis to explore the nuanced effects of risk governance roles, such as CRO and CFO, on regulatory adjustments and bank stability. Employing methodologies like principal component analysis and regression models, the study draws on a theory from corporate governance and financial regulation literature to analyze how specific risk governance characteristics within OECD public commercial banks relate to regulatory adjustments and their overall implications for banking stability and performance.

This study not only investigates the association between risk governance characteristics and regulatory adjustments in OECD public commercial banks but also delves into how these factors interact with various elements of banks' capital structure, such as TIER1 and TCR. The nuanced findings, especially the differential impacts observed in the sensitivity analysis, underscore a novel contribution to the literature. By exploring these complex relationships, the study offers fresh insights into the dynamics of risk governance

and its implications on financial stability, a topic less explored in existing research within the context of OECD countries.

To achieve the outlined research objectives, a comprehensive research design has been implemented, analyzing data from 14,596 bank-director years spanning 2001 to 2020. This approach allows for a detailed examination of individual director experiences within banks, offering a nuanced understanding of the interplay between risk governance characteristics and regulatory adjustments. It includes information such as the country, bank-specific International Securities Identification Number (ISIN), unique director identifier, risk governance characteristics, regulatory adjustments, and the financial data of the banks. The dataset was derived from merging the BankFocus and BoardEx databases, ensuring a robust and reliable source of information for analysis and findings (Van Greuning and Bratanovic, 2020).

The research methodology incorporates a three-pronged statistical approach. Firstly, I analyzed descriptive statistics to provide a comprehensive overview of the dataset, presenting fundamental statistical values for each variable. Secondly, correlation analysis was conducted to explore the associations between risk governance characteristics and regulatory adjustments, providing insights into their relationships. Lastly, Principal Component Analysis (PCA) was employed to identify the underlying structure of risk governance characteristics, reducing data dimensionality and aiding in the identification of critical risk governance factors (Quintyn and Chenard, 2004; Chao and Wu, 2017).

To directly address the research objectives, regression analysis was performed, incorporating fixed effects and accounting for potential confounding factors by including control variables (Stock and Watson, 2008; Streukens and Leroi-Werelds, 2016). This analysis aimed to test the hypothesis that improved or stronger risk governance characteristics are associated with fewer regulatory adjustments in public commercial banks within the OECD (Andres and Vallelado, 2008). Findings from this research indicate a significant negative relationship between risk governance characteristics and regulatory adjustments in public commercial banks within the OECD. Specifically, the presence of a CRO is significantly associated with regulatory adjustments, as indicated by a correlation coefficient of -0.06 at $p<0.05$. However, the presence of a CFO and SENIOR does not show a significant correlation with regulatory adjustments, emphasizing the importance of efficient risk governance practices (Srivastav and Hagendorff, 2016).

Regulatory oversight is one of the measures for developing, or improving, coherent risk governance policies (Drake et al., 2006). Theoretical frameworks propose that risk governance has a significant impact on supervising risk and managing risks. (Nguyen and Dang, 2022; Caprio and Levine, 2002). Based on the findings, one perspective to consider is that, instead of focusing exclusively on controlling bank risk, shareholders might benefit from exploring the restructuring of risk governance as a means to enhance the effectiveness of risk management (Nguyen and Dang, 2022; Srivastav and Hagendorff, 2016). Based on the findings, one perspective to consider is that, instead of focusing exclusively on controlling bank risk, shareholders might benefit from exploring the restructuring of risk governance as a means to enhance the effectiveness of risk management (Nguyen and Dang, 2022; Quintyn and Chenard, 2004). Additional research could expand upon this study by exploring a broader range of risk governance characteristics and analyzing their influence on regulatory adaptations within the banking sector (Nguyen and Dang, 2022).

In conclusion, this study reveals a significant relationship between specific risk governance characteristics and the frequency of regulatory adjustments in public commercial banks within the OECD. It highlights the importance of roles such as the CRO and CFO, along with the presence of highly qualified directors, in mitigating risks and enhancing risk management practices (Andres and Vallelado, 2008; Srivastav and Hagendorff, 2016). Policymakers, regulators, and bank management can leverage these findings to refine their risk governance strategies and methodologies. By focusing on structured approaches that encompass guidelines, best practices, and effective oversight mechanisms, they can contribute to a more stable and compliant banking sector. Further analysis and robust testing of the research hypotheses will deepen the understanding of the link between risk governance characteristics, regulatory adjustments, and bank stability (Francis and Osborne, 2012). Future research, incorporating additional variables and advanced statistical techniques, has the potential to expand upon the current findings and provide more nuanced insights into the dynamics of risk governance in the banking sector (Quintyn and Chenard, 2004; Birindelli and Ferretti, 2008;2013).

2. Theory, Literature Review, and Hypothesis Development

Effective risk governance and regulatory compliance are crucial for the stability and reputation of public commercial banks in the OECD (Quintyn and Chenard, 2004; Srivastav and Hagendorff, 2016). This section provides an overview of the theoretical underpinnings and relevant literature on risk governance, regulatory compliance, and their relationship with regulatory adjustments.

Risk governance involves the identification, communication, application, and supervision of risk within banks (Karyani et al., 2020). This research delves deeply into regulatory compliance theory as a key theoretical underpinning. Regulatory compliance theory, which focuses on the adherence of institutions to laws and regulations, is critical in understanding how banks manage and mitigate risk. This theory sheds light on the mechanisms through which banks align their risk governance strategies with regulatory demands, a process that is vital for maintaining stability and credibility in the banking sector. By exploring how regulatory compliance shapes risk management practices, this study highlights the intricacies of navigating the complex regulatory landscapes that banks operate within. Recent research emphasizes the collective efforts of directors in contributing to risk governance. Directors, regardless of their specific roles, add value to risk management by incorporating their expertise and perspectives (Erin et al., 2018).

Fiene's (2016) "Theory of Regulatory Compliance" examines why banks follow rules, highlighting factors like culture and stakeholder influence. It posits that compliance goes beyond legal requirements, ensuring financial system stability and integrity. This adherence is crucial for protecting banks and their clients (Birindelli and Ferretti, 2008; Francis and Osborne, 2012). Yao et al. (2023) provide a comparative analysis of the American and Chinese banking systems, offering insights into the impact of different regulatory environments on banking stability and compliance. Compliance with regulatory requirements, such as those related to Common Equity Capital, is vital for maintaining financial stability and protecting stakeholders' interests (Rachdi and Bouheni, 2016; Stolz et al., 2003). Furthermore, the interplay between capital requirements and risk governance forms a crucial aspect of banking stability. This research expands the discussion by exploring how capital requirements, as a key element of regulatory frameworks, influence and are influenced by risk governance practices. For instance, higher capital requirements may prompt banks to adopt more

stringent risk governance policies, while effective risk governance can lead to a more efficient capital structure, thus meeting regulatory standards without excessive capital allocation. This bidirectional relationship emphasizes the need for an integrated approach in bank management, where both capital requirements and risk governance are aligned to achieve financial stability. These requirements can be subject to regulatory adjustments, which are changes or modifications made to address evolving financial landscapes or new insights. Penalties imposed by regulators for non-compliance further emphasize the importance of meeting regulatory capital requirements (BCBS; Dodd-Frank Act, 2010; 36/EU Directive, 2013; Ekawati et al., 2021). Recent studies, such as Lubberink and Willett (2023), further illuminate how regulatory capital adjustments impact bank market values, offering a nuanced understanding of the consequences of regulatory non-compliance.

The relationship between risk governance characteristics and regulatory adjustments has gained attention in the literature. Strong risk governance practices (Minton et al., 2014; Gontarek and Belghitar, 2018; Lingel and Sheedy, 2012; and Aebi et al., 2012) including the presence of a CRO, CFO, and senior directors are expected to be associated with reduced regulatory adjustments. These characteristics, when effectively implemented, enhance risk management practices and improve regulatory compliance, thereby reducing the likelihood of regulatory adjustments (Srivastav and Hagendorff, 2016). Abou-El-Sood and Shahin (2023) extend this understanding by presenting international evidence on the interplay between bank competition, regulatory capital, and risk-taking. To more explicitly connect the reviewed literature with the hypothesis of this study, it is essential to emphasize how the key studies inform and support the hypothesis development. Drawing on the insights from Fiene (2016), Minton et al. (2014), and others, the hypothesis that 'Risk governance characteristics are negatively associated with regulatory adjustments in public commercial banks within the OECD' is based on the understanding that effective risk governance mechanisms, as evidenced in these studies, lead to improved regulatory compliance and stability. This hypothesis is a direct reflection of the theoretical and empirical insights gained from the literature, highlighting the crucial role of risk governance characteristics in shaping regulatory outcomes in banks.

Based on the above discussions, the following research hypothesis is formulated: "Risk governance characteristics are negatively associated with regulatory adjustments in public commercial banks within the OECD." This hypothesis posits that stronger risk governance

practices within banks lead to lower levels of regulatory adjustments. The research aims to empirically test this hypothesis by examining the relationship between risk governance characteristics and regulatory adjustments in public commercial banks within the OECD.

The existing literature offers valuable insights into risk governance, regulatory compliance, and their impact on regulatory adjustments in the banking sector. Studies (Minton et al., 2014; Bargeron et al., 2010; Berger et al., 2014; Aebi et al., 2012; Andres and Vallelado, 2008; Caprio and Levine, 2002) highlight the importance of risk governance characteristics, such as the presence of a CRO, CFO, and SENIOR, in reducing regulatory adjustments (Drake et al., 2006; Srivastav and Hagendorff, 2016). These studies emphasize the role of risk governance in enhancing risk management practices and regulatory compliance (Karyani et al., 2020).

Further research explores the causes of the financial crisis and emphasizes the need for effective risk governance to prevent such crises (Aebi et al., 2012; Francis and Osborne, 2012). Studies analyze the relationship between corporate governance and firm performance, highlighting the importance of governance structures in mitigating risks and improving outcomes (Ekawati et al., 2021). Additionally, investigations are conducted to explore the relationship between risk governance and bank stability, providing evidence of the positive impact of strong risk governance practices on bank performance and stability (Erin et al., 2018). In addition, Abdel-Wanis (2021) investigates how regulatory capital and bank characteristics affect risk-taking, offering valuable insights into the regulatory dynamics within the banking sector.

The Basel Committee on Banking Supervision (BCBS) outlines the Basel III framework, which emphasizes the importance of risk governance and regulatory compliance in ensuring the stability of banks and banking systems (Francis and Osborne, 2012). Gropp et al. (2021) further examine the influence of supranational rules, such as Basel III, on national banking systems, highlighting the complexity of implementing international standards. Studies examine the compliance with international accounting standards, emphasizing the role of institutional factors in shaping compliance behavior (Stolz et al., 2003). The regulation of the shadow banking system is investigated, highlighting the importance of effective regulatory frameworks to address systemic risks (Quintyn and Chenard, 2004).

Explorations into the relationship between bank governance, regulation, and risk-taking provide evidence of the impact of governance structures on bank behavior (Srivastav

and Hagendorff, 2016). Studies analyze the relationship between imperfect competition, risk-taking, and regulation in banking, shedding light on the complex interplay between market structure, risk governance, and regulatory oversight (Drake et al., 2006).

Additional perspectives include frameworks for managing risks, critically examining regulatory measures and their implications for corporate governance and providing a survey of corporate governance mechanisms and their impact on firm performance (Ekawati et al., 2021). Discussions also cover risk governance, democratic participation, and accountability in the European banking union, exploring the historical perspective of corporate governance and finance in colonial America, and examining the use of market information in prudential bank supervision (Karyani et al., 2020).

In summary, the literature highlights the significance of risk governance characteristics, such as the presence of specific roles and advanced degrees, in reducing regulatory adjustments and enhancing risk management practices (Erin et al., 2018). It also acknowledges the importance of regulatory compliance in ensuring financial stability and protecting stakeholders' interests (Francis and Osborne, 2012). Effective risk governance practices play a crucial role in facilitating regulatory compliance and contributing to the overall stability and performance of banks (Quintyn and Chenard, 2004).

The next section will discuss the research methodology, including the data collection process, statistical analyses, and regression modeling techniques employed to test the hypothesis and examine the relationship between risk governance characteristics and regulatory adjustments.

This section has provided a comprehensive theoretical framework and literature review focusing on risk governance, regulatory compliance, and their relationship with regulatory adjustments in public commercial banks within the OECD. The research hypothesis states that risk governance characteristics are negatively associated with regulatory adjustments, aligning with previous research emphasizing the importance of risk governance in reducing regulatory adjustments (Srivastav and Hagendorff, 2016). The literature review highlights the significance of risk governance and regulatory compliance in maintaining financial stability and minimizing the need for regulatory adjustments (Stolz et al., 2003).

3. Research Design

3.1. Data collection and description

The dataset for this study provides a comprehensive overview of banks and their directors from 2001 to 2020. It encompasses 14,596 instances, each representing the presence of a specific director in a particular bank for a given year. For instance, if Director A was present in Bank X for three consecutive years, it would be recorded as three separate instances. Over the study period, the dataset captures information from 1,125 unique banks. Additionally, there are 14,404 individual records detailing the presence of directors, reflecting their association with various banks across different years.

It consists of 17 variables related to banks, their directors, and financial information. The dataset includes information on the country, bank-specific ISIN, and a unique identifier for each director. The dependent variable, Regulatory Adjustments (RA), as defined by the Bank for International Settlement (BIS) in CAP30, is essential for transparently representing a bank's financial position, including items like intangible assets and deferred tax assets. RA's role in providing a clearer view of a bank's core capital is underlined by its importance in financial stability assessments, as discussed in the context of the Basel Committee guidelines. The independent variable, RGI (Risk Governance Index), is an aggregated measure derived from a Principal Component Analysis (PCA) of risk governance elements. The presence of a Risk Committee (RC) is included based on the findings of Gontarek and Belghitar (2018) and McNulty et al. (2013), who emphasize its impact on risk-taking and governance effectiveness. The roles of Chief Risk Officers (CRO) and Chief Financial Officers (CFO) are included following the insights from Mongiardino and Plath (2010), and Brancato et al. (2006), who discuss the significance of these positions in enhancing risk governance. The inclusion of PhD holders (TITLE) as a variable is supported by the study of Berger et al. (2014), highlighting their influence on risk management. The factor of senior directors (SENIOR) is incorporated following the findings of Agarwal et al. (2009) and Berger et al. (2014), who note the relationship between director age and risk-taking behaviors. Lastly, the variable of independent directors (BI) is based on the works of Adams and Ferreira (2009), Aebi et al. (2012), and Erkens et al. (2012), which link board independence to improved governance and performance. Control variables like CEO's additional position (CEOAD), the total number of

directors (BS), bank size (SIZE), and its logarithm (LNSIZE) are included due to their recognized impact on corporate governance and risk management, as suggested by Srivastav and Hagendorff (2016). Each variable is meticulously chosen based on its relevance to the study's objectives and its established significance in risk governance and regulatory compliance literature. The financial information was collected from the BankFocus database, while the directors' information was obtained from the BoardEx database.

Frequencies from the dataset reveal that 81 banks have a RC, 15 banks have a CRO, 54 banks have a CFO, 91 banks have directors with a TITLE, 117 directors are in the senior age bracket (SENIOR), and 118 banks have Board Independence (BI). These frequencies provide a detailed insight into the distribution and prevalence of risk governance characteristics in the sampled banks.

The dataset for this study was curated by including banks that are currently operational (active) and publicly traded (listed). The focus was on banks with C1 financial statements, which present a consolidated view of a bank's financial activities by integrating the statements of its controlled subsidiaries or branches. Additionally, C* Additional Consolidated statements, which offer supplementary financial details, were also considered. To compile this dataset, data from the BankFocus database, which provides detailed financial data for banks, was merged with the BoardEx database, which offers insights into board members and senior executives. Only observations that were consistent across both databases were retained to ensure the dataset's accuracy and relevance.

While it's recognized that the dataset, given its extensive coverage, might contain data points that appear as outliers, the decision to retain these outliers is grounded in the research's theoretical framework. The comprehensive nature of this study, aiming to capture the entirety of risk governance practices across diverse banking landscapes, necessitates the inclusion of these data points. While winsorizing is a common technique, its application in this context would not align with the research objectives and could potentially diminish the depth of the analysis.

In the selection of variables for this study, each was chosen based on its relevance to assessing the impact of risk governance on regulatory adjustments. The primary variable, RA , directly reflects the regulatory changes impacting banks, critical for evaluating governance effectiveness. RGI aggregates key governance features, providing a holistic measure of governance structure. Control variables such as CEOAD, BS, SIZE, and LNSIZE were included

to account for factors that might influence or confound the relationship between risk governance and regulatory adjustments. For instance, CEOAD offers insights into leadership concentration, which can affect decision-making processes, while SIZE and LNSIZE help account for the scale of the bank's operations, which can influence governance dynamics and regulatory interactions. This careful selection of variables ensures a comprehensive analysis that aligns with the study's objectives and provides a robust examination of the relationship between governance and regulatory compliance.

3.2. Research Methodology

Building on the detailed data description provided earlier, this section delves into the methodological approach adopted for this research. The study leverages a comprehensive dataset to empirically investigate the relationship between risk governance characteristics and regulatory adjustments. Various statistical techniques and models are employed to ensure robustness in the findings and to account for potential confounding factors. The subsequent sections will detail the specific models used, the rationale behind their selection, and the results derived from them.

The selection of variables from the database was driven by the need to evaluate risk governance factors. This includes aspects such as the number of board members, their presence on the board, and their professional qualifications, among other relevant factors. Acknowledging the concerns about the relevance of public profiles of board members for risk governance characteristics, it was clarified that the choice of BoardEx was dictated by the availability of this information.

Variables of interest were standardized to reconcile differences in scale and ensure comparability. A PCA was then conducted on these standardized variables with an aim to identify the principal components that would explain the greatest variance in the data.

Subsequently, the data was transitioned into a panel setup, arranged based on unique combinations of bank and director identifiers and the corresponding year. The research employed a fixed-effects modeling approach, aligning closely with the theoretical underpinnings of the study, especially given the span across OECD countries and over a 20-year period. Additionally, the fixed-effects model is particularly advantageous in mitigating

potential endogeneity issues arising from unobserved heterogeneity. By controlling for both bank-specific and time-specific effects, the model accounts for the possibility that unobserved factors, which could be correlated with both the independent and dependent variables, might bias the results. This approach effectively isolates the impact of risk governance characteristics on regulatory adjustments, providing more reliable and accurate estimates of their relationships. The model was estimated using the "xtreg" command in Stata, which is specifically designed for panel data regressions, allowing for the estimation of both fixed-effects and random-effects models.

An econometric model was designed to encapsulate the regulatory adjustments occurring in different countries.

Model 1: $RA_{bt} = \beta_0 + \beta_1 * RGI_{bt} + \beta_2 * CEOAD_{bt} + \beta_3 * BS_{bt} + \beta_4 * SIZE_{bt} + \alpha_b + \delta_t + \varepsilon_{bt}$

In this research, a primary focus is placed on the dependent variable, RA (Regulatory Adjustments). Regulatory adjustments, as defined by the Bank for International Settlement (BIS) in CAP30, are crucial for banks. They encompass various elements such as intangible assets, deferred tax assets, cash flow hedge reserve, and cumulative gains and losses due to changes in own credit risk on fair valued liabilities. Primarily applied to Common Equity Tier 1, these adjustments aim to provide a transparent view of the Common Equity Tier 1 to all stakeholders. Institutions are mandated to apply these requirements to all their assets measured at fair value when calculating their own funds. Furthermore, any additional value adjustments deemed necessary are deducted from the Common Equity Tier 1 capital. The model, therefore, examines the relationship between RA and the independent variables, including the Risk Governance Index (RGI), which has been renamed from Comp1 following a PCA, CEOAD, BS, and SIZE. In the model, RA_{bt}, RA_{bt} represents the Regulatory Adjustment for bank $_b$ in year $_t$. Here, b denotes the bank and t represents time in years. The model controls for bank and time fixed effects denoted by α_b and δ_t, respectively for unobserved heterogeneity across banks and time. The error term, ε_{bt}, represents the unobserved factors influencing the dependent variable. Clustered standard errors at the bank level are employed to account for potential correlation within banks. These adjustments mirror the diverse national regulatory environments, economic conditions, and governance structures. Distinctions were made between regulatory adjustments as changes mandated by regulators,

and governance and controls as the bank's internal mechanisms. The 'beta', or the slope intercept, is the baseline level of Regulatory Adjustment in the absence of other control variables.

The main regression analysis utilized the reghdfe command. This command is an extension of Stata's standard regression command, specifically tailored for high-dimensional fixed effects models. It efficiently estimates linear regressions with multiple levels of fixed effects by absorbing these effects. In this research, the reghdfe command was employed to estimate the fixed effects model, absorbing both year and bank fixed effects. Additionally, standard errors were clustered at the bank level to account for potential correlations within banks and to provide robust standard errors. To assess the robustness of the main regression analysis, a bootstrap procedure with 100 repetitions was conducted (Karyani et al., 2020). To assess the robustness of Model 1, a bootstrap technique is employed with 100 replications to assess the robustness of the results from Model 1 in Model 1a. The bootstrap resampling method generates multiple replicated datasets by sampling with replacement from the original dataset. This approach allows for the estimation of coefficients' stability and provides robust standard errors. The estimated coefficients and their significance levels are evaluated using the bootstrap results.

A sensitivity analysis was conducted using alternative dependent variables, "TIER1" (Tier 1 capital / Risk Weighted assets) and "TCR" (Total capital / Risk Weighted assets), to test the robustness of the results obtained with the primary dependent variable, RA (Regulatory Adjustments). Both TIER1 and TCR are critical indicators of a bank's financial health and stability. Given that regulatory adjustments primarily influence Common Equity Tier 1, which is a component of TIER1, there's an inherent relationship between these variables. By examining the results across RA, TIER1, and TCR, the analysis aims to ascertain the consistency and robustness of the findings. The models were estimated with fixed effects, clustering the standard errors at the bank level, and employing a bootstrap with 100 repetitions to further assess robustness.

Sensitivity models:

$$\textit{Model 2: } TIER1_{bt} = \gamma_0 + \gamma_1 * RGI_{bt} + \gamma_2 * CEOAD_{bt} + \gamma_3 * BS_{bt} + \gamma_4 * SIZE_{bt} + \alpha_b + \gamma_t + \varepsilon_{bt}$$

$$\textit{Model 3: } TCR_{bt} = \delta_0 + \delta_1 * RGI_{bt} + \delta_2 * CEOAD_{bt} + \delta_3 * BS_{bt} + \delta_4 * SIZE_{bt} + \alpha_b + \gamma_t + \varepsilon_{bt}$$

In Model 2, $TIER1_{bt}$ represents the dependent variable, for bank b in time period t. The independent variables are RGI, CEOAD, BS, and SIZE for the corresponding bank and time period. The fixed effects, α_b and γ_t capture bank and time heterogeneity, respectively, while the error term, ε_{bt}, accounts for unobserved factors influencing the TIER1.

To assess the robustness of Model 2, a bootstrap technique is employed in Model 2a same as in Model 1. Similarly, in Model 3, TCR_{bt} represents the dependent variable, TCR for bank b in time period t. The independent variables and other definitions of fixed effects and error term are same as in Model 1 and 2 along with the application of bootstrap technique for robustness of Model 3 in Model 3a.

In conclusion, the methodology, underpinned by data on OECD banks spanning 20 years, seeks to elucidate the relationship between regulatory adjustments and risk governance. While the paper does not directly study variations across national contexts or provide a baseline understanding in the absence of governance and control variables, the comprehensive dataset inherently captures the nuances and variations over time and across different banking environments. This approach offers valuable insights into the dynamics of regulatory adjustments in relation to risk governance.

[Insert Table I here]

4. Results

4.1. Descriptive Statistics

This section presents a detailed overview of the descriptive statistics for key variables in the dataset. The dataset encompasses 14,596 bank-director years from 2001 to 2020, providing a comprehensive view of the banking landscape within this period.

Each variable is selected for its relevance to the study's focus on regulatory compliance and risk governance. The RA variable, with a mean value of 548,608 € and a standard deviation of 4,100,070 €, is central to understanding the scope and frequency of adjustments made by banks in response to regulatory changes. TIER1 and TCR offer insights into banks' capital adequacy, while variables like RC, CRO, CFO, TITLE, SENIOR, and BI provide a nuanced view of the composition and characteristics of bank boards. This section not only presents these statistics but also contextualizes them within the broader framework of regulatory compliance and risk governance, crucial for accurately interpreting the data and understanding its larger research implications.

Table 2 presents the descriptive statistics for the variables in the dataset. The variable RA, with a mean value of 548,607.9 and a standard deviation of 4,100,070. The variable TIER1, with a mean value of 13.24027 and a standard deviation of 3.202067. The variable TCR, with a mean value of 15.23164 and a standard deviation of 3.44537. Other variables such as RC, CRO, CFO, SENIOR, and BI are also included in the table. These descriptive statistics provide an overview of the distribution and variation of the variables in the dataset. The descriptive statistics in this study, particularly in relation to RA, TIER1, and TCR, resonate with trends observed in the seminal work of Francis and Osborne (2012). Their investigation into the impact of capital requirements on bank behavior provides essential context for understanding how regulatory frameworks influence banking operations. The variable RA, characterized by a significant mean and standard deviation, indicates substantial variability in banks' responses to regulatory changes. This aspect of the findings can be contrasted with the research by Francis and Osborne (2012), who explored the impact of capital requirements on bank behavior. While their study provides a broad overview of the regulatory impacts, the current analysis extends these insights by highlighting specific variances in key variables, thereby

contributing to a more nuanced understanding of banks' behaviors under different regulatory environments. This study extends these insights by showcasing the specific variances in key variables within the dataset, thereby contributing to a more nuanced understanding of bank behaviors under different regulatory environments.

[insert table II here]

4.2. Correlation

In this section, the correlation matrix is used to explore the relationships between different variables, particularly focusing on risk governance characteristics and their influence on regulatory adjustments. This matrix is a crucial statistical tool that helps in understanding how variables are interrelated within the dataset. The correlations provide insights into potential associations but do not imply causation. For instance, a negative correlation between RA and TIER1 suggests an inverse relationship, but it's important to consider other factors that might be influencing these variables.

To address concerns about multicollinearity, which arises when independent variables in a regression model are highly correlated, this study has conducted careful variable selection and analysis. While some degree of correlation is expected due to the nature of the variables studied, the impact on the regression models is mitigated through the use of advanced statistical techniques and the interpretation of results in the context of existing literature. This approach helps ensure that the findings are robust and reliable.

The correlation matrix presents the relationships among the variables in the study, focusing on risk governance characteristics and their association with regulatory adjustments. Among these characteristics, only the CRO shows a small negative correlation with regulatory adjustments, while the CFO and TITLE do not exhibit significant negative correlations with regulatory adjustments. Conversely, the presence of a RC shows a positive correlation, and BI exhibits a significant positive correlation with RA. These findings suggest that while certain risk governance characteristics may influence regulatory adjustments, their impact varies. The observed correlations in this study, particularly those related to risk governance characteristics such as the presence of a CRO and their impact on regulatory adjustments, offer noteworthy insights. These findings are in line with the research conducted by Erin et al.

(2018) on the Nigerian banking sector, which also underscored the influence of risk governance on bank performance. Furthermore, the relationship between risk governance characteristics and regulatory adjustments resonates with the findings of Srivastav and Hagendorff (2016), who emphasized the significance of these factors in the banking sector. The current analysis enriches this discourse by providing empirical evidence from the OECD public commercial banks, thereby contributing to a more comprehensive understanding of risk governance within diverse regulatory contexts. This study's findings, particularly the correlation between risk governance characteristics and regulatory adjustments, align with Erin et al. (2018). Their research on the Nigerian banking sector similarly highlighted the influence of risk governance on bank performance, underscoring the relevance of these correlations in understanding bank behavior within regulatory frameworks. The correlation matrix provides clear evidence of specific relationships between risk governance characteristics and regulatory adjustments, underscoring the need for careful interpretation and consideration of broader research implications, as discussed in Srivastav and Hagendorff (2016). Further analysis is needed to assess the statistical significance and strength of these associations.

[insert table III here]

4.3. Principal Component Analysis

Building on the foundational understanding of risk governance practices highlighted in the previous work such as Karyani et al. (2020), this study conducts a PCA to explore the underlying structure and dimensionality of specific risk governance characteristics. The variables of interest, namely RC, CRO, CFO, TITLE, SENIOR, and BI, were included in the analysis to further investigate their interrelationships and potential impact on regulatory adjustments. The PCA analysis identified six principal components based on the variance in the dataset. The first component, labeled as Comp1, captured the most variance with an eigenvalue of 1.33838. Comp1 explained 22.31% of the total variance, indicating its significance in capturing the variability in the risk governance characteristics. The subsequent components, Comp2 to Comp6, accounted for decreasing proportions of the variance.

The loadings of the variables on the principal components provide insights into their contribution to the overall structure. Comp1 has a negative loading for CRO, CFO, and SENIOR.

Specifically, SENIOR has a pronounced negative loading of -0.4137 on Comp1, suggesting a significant inverse relationship. CRO also has a negative relationship with Comp1, indicated by its loading of -0.2171. However, CFO's contribution to Comp1 is minimal, as evidenced by its loading of -0.0288. This makes Comp1 a suitable representative of the risk governance characteristics in the subsequent regression analysis. The PCA findings in this study, particularly regarding the significant variance captured by Comp1 and its loadings on CRO, CFO, and SENIOR, align with the methodologies employed by Karyani et al. (2020) in their study on the ASEAN-5 banking sector. They also utilized PCA to dissect risk governance characteristics, finding key components that influence bank operations. The similarity in the use of PCA and the identification of influential risk governance factors in both studies not only validates the methodology but also reinforces the importance of these characteristics in risk governance analysis within the banking sector.

Including Comp1 as an explanatory variable in the regression analysis facilitates the examination of its relationship with RA, offering insights into the potential association between risk governance characteristics and regulatory adjustments (Drake et al., 2006). By utilizing Comp1, which emerged from the PCA as a comprehensive measure of risk governance characteristics, the study can effectively capture the collective impact of CRO, CFO, and SENIOR on regulatory adjustments. This approach, grounded in the PCA findings, enhances the interpretability and efficiency of the regression model. It provides a nuanced evaluation of the role played by risk governance characteristics in potentially influencing regulatory adjustments, aligning with the broader research context highlighted by Srivastav and Hagendorff (2016).

The PCA methodology in this study not only aligns with the approach taken by Karyani et al. (2020) but also extends it by offering unique insights into the role of senior directors in risk governance. While Karyani et al. (2020) laid the groundwork for understanding risk governance in the ASEAN-5 banking sector, this study further explores how specific components like senior director roles uniquely contribute to the dynamics of risk governance in OECD public commercial banks. This distinction highlights the study's contribution to the broader discourse on risk governance, enhancing the understanding of its multifaceted nature in different banking contexts.

[insert tables IV-a, IV-b, and IV-c here]

4.4. Main Regression Analysis

The main regression analysis results provide important insights into the relationship between the Risk Governance Index (RGI), represented by Comp1, and regulatory adjustments. The regression model incorporated the RGI, capturing the collective influence of risk governance characteristics, along with control variables such as CEOAD, BS, and SIZE. The coefficient for RGI was statistically significant and negative (-18,760.77, $p < 0.05$), indicating that a higher score on RGI, reflecting stronger risk governance practices associated with CRO, CFO, and SENIOR, is linked to lower levels of regulatory adjustments. This association remains robust even when controlling for CEOAD, BS, and SIZE, suggesting that risk governance characteristics, as represented by RGI, are associated with lower levels of regulatory adjustments, even after accounting for other control variables (Srivastav and Hagendorff, 2016). The negative relationship between the RGI and regulatory adjustments, as indicated by the significant coefficient in the regression analysis, resonates with the findings of Srivastav and Hagendorff (2016). They explored similar dynamics in the context of bank risk-taking behaviors and governance. The alignment of these results with their study provides a broader validation of the hypothesis that stronger risk governance practices, particularly those characterized by CRO, CFO, and SENIOR roles, are instrumental in reducing the need for regulatory adjustments. This study extends these insights by demonstrating how such governance characteristics specifically impact regulatory adjustments in the context of OECD public commercial banks, thereby contributing to the ongoing discourse on effective risk governance and regulatory compliance.

These findings offer empirical evidence supporting the hypothesis that risk governance characteristics, as represented by the RGI, are associated with regulatory adjustments. This study carefully considers the fixed-effects modeling approach to address potential endogeneity. This method controls for unobserved heterogeneity that could bias estimates. Incorporating fixed effects for banks and time, the model accounts for unobserved, bank-specific factors and time-related effects that could influence the dependent variable, enhancing the credibility of the findings. Such methodological consideration ensures the robustness of results and mitigates the risk of endogeneity. The negative coefficient for RGI suggests that strong risk governance practices, particularly those characterized by the presence of a CRO, CFO, and SENIOR, are linked with fewer regulatory adjustments. This

association underscores the importance of effective risk governance in aligning financial statements with regulatory standards and potentially reducing the frequency of adjustments required by regulatory bodies like the Bank for International Settlements (BIS). The specific mention of CRO, CFO, and SENIOR is due to their significant loadings in the PCA, indicating their pivotal role in the overall risk governance framework and its impact on regulatory compliance.

[insert table V here]

4.5. Sensitivity Analysis

The results of the sensitivity analysis, robust to heteroskedasticity using bootstrap replication, provide additional insights into the relationship between risk governance characteristics and regulatory adjustments. The analysis focused on TIER1 as the dependent variable. The coefficient for RGI remains positive (0.0074) in the sensitivity analysis, but it does not achieve statistical significance at the conventional level ($p < 0.05$). However, the coefficient is marginally significant at a 10% significance level ($p < 0.10$). While the bootstrap results do not strongly confirm the main regression findings, they suggest a consistent positive association between RGI and TIER1. The statistical significance of this association is not firmly established based on the available data, but the consistent direction of the coefficient across the bootstrap replications suggests a tendency towards a positive relationship. These findings indicate an association between risk governance characteristics, as represented by RGI, and the TIER1 for banks. However, it's important to note that this does not imply a direct causal relationship. In the sensitivity analysis, the positive coefficient for Comp1 suggests a potential association between TIER1 and the risk governance characteristics. Specifically, while the RC shows a positive influence on TIER1, the roles of CRO, CFO, and Senior Directors might have inverse effects. However, given the nature of sensitivity analyses, these findings should be interpreted with caution, as they are meant to test the robustness of our main regression results rather than establish definitive relationships. Caution is exercised in interpreting these results, as the statistical significance of the association is not firmly established. Further research with a larger sample size may be necessary to obtain more conclusive evidence on the relationship between risk governance

characteristics and the regulatory capital ratio. It's pertinent to note that while this study delves into the relationship between risk governance characteristics and regulatory adjustments,

The sensitivity analysis, robust to heteroskedasticity using bootstrap replication, provides additional insights into the relationship between risk governance characteristics and the TCR. The coefficient for RGI in the main regression analysis remains statistically significant and negative (-0.0585, $p < 0.05$) even after accounting for potential variations in the estimation.

The negative association between RGI and TCR suggests that there's a correlation between risk governance characteristics, as captured by RGI, and the overall capital adequacy of banks, as reflected by the total capital ratio. This indicates that while risk governance characteristics may be associated with higher tier 1 capital, which primarily consists of a bank's core capital, they may not necessarily correlate with tier 2 capital, which includes supplementary capital like subordinated debt and loan-loss reserves, or other components of the total capital.

The bootstrap results further support the main regression findings, confirming the stability of the negative coefficient for RGI across the bootstrap replications. This consistency strengthens the evidence that risk governance characteristics have a limited influence on the TCR of banks.

These findings suggest that risk governance characteristics may play a more significant role in enhancing the core capital component (tier 1 capital) of banks, while their impact on other components, such as tier 2 capital, may be limited. It is essential to consider additional factors that influence the TCR beyond risk governance characteristics, as they may contribute to a more comprehensive understanding of the bank's overall capital structure.

In the sensitivity analysis, the exploration of the relationship between risk governance characteristics and regulatory capital ratios, as seen through the lens of RGI's impact on TIER1 and TCR, offers a nuanced perspective on governance practices. This aligns with and extends the findings of Karyani et al. (2020), who examined the influence of risk governance and market competition on banks' operational risk disclosure quality in the ASEAN-5 banking sector. Their study underscores the broad significance of risk governance in banking and the interplay between governance and market factors, a theme that resonates with the current study's focus on regulatory capital ratios.

[insert table VI here]

4.6. Discussion

The results of the main regression analysis and sensitivity analysis provide valuable insights into the relationship between risk governance characteristics and regulatory adjustments in public commercial banks within the OECD. The findings suggest that risk governance characteristics, particularly those represented by CRO, CFO, and SENIOR, play a crucial role in mitigating regulatory adjustments and ensuring regulatory compliance. The negative associations observed in the correlation analysis (Section 4.2, Table III) and regression analysis indicate that a stronger presence of these risk governance characteristics is associated with lower levels of regulatory adjustments. This supports the hypothesis that effective risk governance practices contribute to the stability and reputation of public commercial banks within the OECD. While the direct impact on stability and reputation is beyond the scope of this study, it's evident that effective risk governance practices can influence regulatory adjustments in public commercial banks within the OECD. As highlighted by Srivastav and Hagendorff (2016), governance mechanisms play a crucial role in shaping bank risk-taking behaviors, emphasizing the need for internal governance mechanisms that reflect the needs of various stakeholders to ensure financial stability.

These findings are consistent with the earlier discussion emphasizing the significance of risk governance roles, particularly the roles of CRO, CFO, and SENIOR, in influencing regulatory adjustments. This alignment with previous research, such as that by Stolz et al. (2003), further underscores the importance of these roles in enhancing risk management practices within public commercial banks. The results also align with the principles set out in regulatory frameworks that emphasize risk governance and regulatory compliance. Specifically, the Basel III framework, introduced by the Basel Committee on Banking Supervision, focuses on strengthening bank capital requirements and introducing new regulatory requirements on bank liquidity and bank leverage. These measures are designed to enhance the resilience of the banking sector and reduce the risk of systemic failures. While this study does not directly address the concept of "stability," the findings do shed light on

the relationship between risk governance characteristics and regulatory adjustments in public commercial banks.

The sensitivity analysis, as presented in Table VI, was conducted to assess how the main results with the RA variable might change if the dependent variable is altered to TIER1 or TCR. For the models with TIER1 as the dependent variable, there's a positive association with the RGI variable, indicating that an enhancement in risk governance correlates with an increase in TIER1. However, this association is significant at the 10% level in Model 1. Additionally, the SIZE variable shows a negative relationship with TIER1, significant at the 1% level, suggesting that larger banks might have a lower TIER1. The CEOAD and BS variables do not exhibit statistical significance in these models. It's essential to interpret these findings in the context of the broader research and consider the implications for risk governance practices in public commercial banks within the OECD. Future research, especially studies like that of Ekawati et al. (2021) which delve into the interplay between risk management, capital structure, and corporate governance, can offer deeper insights into the influence of risk governance characteristics on banks' financial performance and capital structure.

While the main regression results, as presented in Table V, indicate a negative association between RGI and RA, the sensitivity analysis for TCR, robust to heteroskedasticity using bootstrap replication, also reveals a negative association between RGI and TCR. This contrast with the positive association observed for TIER1 underscores the nuanced impact of risk governance on different components of banks' capital structure and regulatory adjustments. This suggests that risk governance characteristics, as represented by RGI, may have a differential impact on different components of the bank's capital structure. Further research is necessary to explore the specific reasons behind this negative association and its implications for bank risk management and capital adequacy.

Overall, the results of this study contribute to the existing literature on risk governance, regulatory compliance, and their relationship with regulatory adjustments in public commercial banks within the OECD. The findings highlight the importance of effective risk governance practices in mitigating regulatory adjustments and maintaining financial stability. In line with the insights from Francis and Osborne (2012), who examined the effects of regulatory capital requirements on bank behavior in the UK, policymakers and bank regulators can use these findings to inform their efforts in strengthening risk governance frameworks and promoting regulatory compliance in the banking sector. This is especially

pertinent given the ongoing debates surrounding the design and calibration of international capital standards.

5. Conclusion

Findings from the analysis support the hypothesis that the presence of specific roles, namely a CRO, CFO, and SENIOR, have a significant negative association with regulatory adjustments. As clarified in section 4.6, along with the overall risk governance characteristics, these three roles in particular stand out as significant based on their loadings in the PCA. This implies that stronger risk governance, represented by these characteristics, can reduce the level of regulatory adjustments in banks. While the study does not directly address financial stability, the observed reduction in regulatory adjustments suggests a more compliant and, by implication, a potentially more stable banking environment. This conclusion provides valuable insights for policymakers and bank regulators, as they can focus their efforts on enhancing these specific risk governance practices to promote regulatory compliance and indirectly contribute to the stability of the banking sector.

However, while the findings are consistent and hold true across various tests and conditions, it is crucial to acknowledge the limitations of the study. The sample size and dataset used in this study might limit the generalizability of the findings. A larger sample size, a more diverse set of data, or focusing on a specific group of banks, might yield different results. It is also important to remember that correlation does not imply causation, and while the study found associations, more research is required to establish causal relationships.

This study enriches the literature on risk governance and regulatory compliance in OECD public commercial banks. It reveals the impact of roles like CRO, CFO, and SENIOR on regulatory adjustments, offering insights for future research and policy-making. While not directly addressing financial stability, the findings suggest effective risk governance may enhance regulatory compliance and indirectly indicate a more stable banking environment.

In terms of future research, it would be valuable to delve deeper into the specific mechanisms through which risk governance characteristics influence different components of a bank's capital structure. This could provide more granular insights into the dynamics of risk governance and its implications for bank performance. The study's conclusions underscore the significance of specific risk governance roles in reducing regulatory adjustments, suggesting a more compliant and potentially stable banking environment. These

insights offer practical implications for policymakers and bank regulators, highlighting the importance of enhancing risk governance practices, particularly focusing on roles like CRO, CFO, and SENIOR, to promote regulatory compliance and indirectly support banking sector stability. The limitations of the study, such as sample size and dataset scope, point towards the need for further research to generalize these findings and establish causal relationships. Future research should explore the mechanisms through which risk governance characteristics influence bank capital structure and performance, as well as the collective impact of various governance elements on regulatory adjustments and stability. This study contributes to the literature on risk governance and regulatory compliance, particularly in OECD public commercial banks, and provides a foundation for future policy-making and research initiatives. By suggesting directions for further investigation, it bridges the gap between theory and practice, offering a path for applying these insights in real-world banking and regulatory scenarios. Additionally, considering other risk governance characteristics not covered in this study could offer a more comprehensive view of the landscape. Exploring the interaction and synergy effects between different risk governance characteristics might also shed light on how these elements collectively impact regulatory adjustments and overall bank stability. We encourage researchers to take these suggestions into account as they continue to expand the knowledge base in this domain.

References

Abdel-Wanis, E. (2021), *"The impact of regulatory capital and bank characteristics on the relationship between bank competition and risk taking in the banking system",* Journal of Accounting, Business and Management (JABM), Vol. 28 No. 1, pp. 87-100.

Abou-El-Sood, H. and Shahin, R. (2023), *"Bank competition, regulatory capital, and risk taking: international evidence",* Managerial Finance, Vol. 49 No. 10, pp. 1614-1640. https://doi.org/10.1108/MF-06-2022-0277

Adams, R., and Ferreira, D. (2009), *"Women in the boardroom and their impact on governance and performance",* Journal of Financial Economics, Vol. 94, pp. 291–309.

Aebi, V., Sabato, G. and Schmid, M. (2012), *"Risk management, corporate governance, and bank performance in the financial crisis",* Journal of Banking & Finance, Vol. 36, pp. 3213–3226.

Agarwal, S., and Wang, F.H. (2009), *"Perverse incentives at the banks? Evidence from a natural experiment",* Working Paper 2009–08. Federal Reserve Bank of Chicago.

Andres, P. de. and Vallelado, E. (2008), *"Corporate governance in banking: The role of the board of directors",* Journal of Banking and Finance, Vol. 32 No. 12, pp.2570–2580. https://doi.org/10.1016/j.jbankfin.2008.05.008

Bargeron, L.L. Lehn, K.M. and Zutter, C.J. (2010), *"Sarbanes-Oxley and corporate risk-taking",* Journal of Accounting and Economics, Vol. 49 No. 1-2, pp. 34-52.

Basel Committee on Banking Supervision. (2011), *"Basel III: A global regulatory framework for more resilient banks and banking systems",* Bank for International Settlements.

BCBS (2015), *"Corporate Governance Principles for Banks, Bank for International Settlements",* available at: https://www.bis.org/bcbs/publ/d328.pdf (accessed 21 June 2023).

Berger, A. N., Kick, T., and Schaeck, K. (2014), *"Executive board composition and bank risk taking",* Journal of Corporate Finance, Vol. 28, pp. 48-65.

Birindelli, G. and Ferretti, P. (2013), *"Compliance function in Italian banks: organizational issues",* Journal of Financial Regulation and Compliance, Vol. 21 No. 3, pp. 217–240.

Birindelli, G. andFerretti, P. (2008), *"Compliance risk in Italian banks: the results of a survey",* Journal of Financial Regulation and Compliance, Vol. 16 No. 4, pp. 335–351.

BIS (2019), *"CAP30, Regulatory Adjustments",* available at: https://www.bis.org/basel_framework/chapter/CAP/30.htm

Brancato, C., Tonello, M., Hexter, E., and Newman, K. R. (2006), *"The role of US corporate boards in enterprise risk management",* The Conference Board Research Report, No. R-1390-06-RR.

Caprio, G. and Levine, R. (2002), *"Corporate governance in finance: Concepts and international observations",* in Financial Sector Governance: The Roles of the Public and Private Sectors, pp.17-50.

Chao, Y.-S. and Wu, C.-J. (2017), *"Principal component-based weighted indices and a framework to evaluate indices: Results from the Medical Expenditure Panel Survey 1996 to 2011",* PLoS One, Vol. 12 No. 9, e0183997–e0183997.

DIRECTIVE 2013/36/EU of the European Parliament and of the Council of 26 June 2013, available at: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32013L0036 (accessed 21 June 2023).

Dodd-Frank Wall Street Reform and Consumer Protection Act, Public Law 203, U.S. Statutes at Large 124 (2010): pp. 1376-2223.

Drake, L., Hall, M.J. and Simper, R. (2006), *"The impact of macroeconomic and regulatory factors on bank efficiency: A non-parametric analysis of Hong Kong's banking system",* Journal of Banking and Finance, Vol. 30 No. 5, pp.1443-1466.

Ekawati, N., Purwohedi, U. and Warokka, A. (2021), *"The Influence of Risk Management, Third-Party Funds and Capital Structure on Banking Sector Financial Performance in Indonesia and Thailand with Corporate Governance as Moderating Variable in 2015-2019",* Oblik i Finansi, No. 94, pp.71-80.

Erin, O., Asiriuwa, O., Olojede, P., Ajetunmobi, O. and Usman, T. (2018), *"Does risk governance impact bank performance? Evidence from the Nigerian banking sector",* Academy of Accounting and Financial Studies Journal, Vol. 22 No. 4, pp.1-14.

Erkens, D. H., Hung, M., and Matos, P. (2012), *"Corporate governance in the 2007–2008 financial crisis: Evidence from financial institutions worldwide",* Journal of Corporate Finance, Vol. 18, pp. 389–411.

Fiene, R. (2016), *"A Treatise on the Theory of Regulatory Compliance",* Journal of Regulatory Science, Vol. 7 No. 1-3.

Francis, B. B., and Osborne, M. (2012), *"Capital requirements and bank behavior in the UK: Are there lessons for international capital standards?",* Journal of Banking and Finance, Vol. 36 No. 3, pp. 803-816.

Gontarek, W., and Belghitar, Y. (2018), *"Risk governance: Examining its impact upon bank performance and risk-taking",* Financial Markets, Institutions and Instruments, Vol. 27 No. 5, pp. 187-224.

Gropp, R., Mosk, T., Ongena, S., Simac, I., and Wix, C. (2021), *"Supranational rules, national discretion: Increasing versus inflating regulatory bank capital? ",* Journal of Financial and Quantitative Analysis, pp. 1-58.

Karyani, E., Kolade, O. and Dewo, S.A. (2020), *"Risk governance, market competition and operational risk disclosure quality: a study of the ASEAN-5 banking sector",* Journal of Operational Risk, Vol. 16 No. 2.

Kirkpatrick, G. (2009), *"The corporate governance lessons from the financial crisis",* OECD Journal: Financial Market Trends, Vol. 2009 No. 1, pp.61-87.

Lingel, A. and Sheedy, E. A. (2012), *"The Influence of Risk Governance on Risk Outcomes – International Evidence",* Macquarie Applied Finance Centre Research Paper 37, available at SSRN: https://ssrn.com/abstract=2187116 (accessed 21 June 2023).

Lubberink, M. J. P., and Willett, R. J. (2023), *"How sensitive are bank market values to regulatory adjustments of capital? ",* Available at SSRN 4172870.

McNulty, T., Florackis, C., and Ormrod, P. (2013), *"Boards of directors and financial risk during the credit crisis",* Corporate Governance: An International Review, Vol. 21 No. 1, pp. 58–78.

Minton, B. A., Taillard, J. P., and Williamson, R. (2014), *"Financial Expertise of the Board, Risk Taking, and Performance: Evidence from Bank Holding Companies",* Journal of Financial and Quantitative Analysis, Vol. 49 No. 2, pp. 351–380.

Mongiardino, A., and Plath, C. (2010), *"Risk governance at large banks: have any lessons been learned? ",* Journal of Risk Management in Financial Institutions, Vol. 3, pp. 116–123.

Nguyen, Q. K. and Dang, V. C. (2022), *"The impact of risk governance structure on bank risk management effectiveness: evidence from ASEAN countries",* Heliyon, Vol. 8 No. 10, e11192–e11192. https://doi.org/10.1016/j.heliyon.2022.e11192.

Quintyn, M. and Chenard, K. (2004), *"Does Regulatory Governance Matter for Financial System Stability? An Empirical Analysis",* IMF Working Paper No. 04/89, available at SSRN: https://ssrn.com/abstract=878912 (accessed 21 June 2023).

Rachdi, H., and Ben Bouheni, F. (2016), *"Revisiting the effect of regulation, supervision, and risk on banking performance: Evidence from European banks based on PSTR model",* Journal of Financial Regulation and Compliance, Vol. 24 No. 1, pp. 24–40.

Srivastav, A. and Hagendorff, J. (2016), *"Corporate governance and bank risk-taking",* Corporate Governance: An International Review, Vol. 24 No. 3, pp.334-345.

Stock, J.H., and Watson, M.W. (2008), *"Heteroskedasticity-Robust Standard Errors for Fixed Effects Panel Data Regression",* Econometrica, Vol. 76 No. 1, pp. 155–174. https://doi.org/10.1111/j.0012-9682.2008.00821.x.

Stolz, S., Heid, F., and Porath, D. (2003), *"Does capital regulation matter for bank behavior? Evidence for German savings banks",* Kiel Working Paper, No. 1192, Kiel Institute for the World Economy (IfW), Kiel.

Streukens, S., and Leroi-Werelds, S. (2016), *"Bootstrapping and PLS-SEM: A step-by-step guide to get more out of your bootstrap results",* European Management Journal, Vol. 34 No. 6, pp. 618-632.

Van Greuning, H. and Bratanovic, S.B. (2020), *"Analyzing Banking Risk: A Framework for Assessing Corporate Governance and Risk Management",* World Bank Publications.

Yao, J., Hisham Noori Hussain, A. H., Waleed Noori, H., and Haider Noori, H. (2023), *"Comparative Analysis of the Global Banking System A Study of the American and Chinese Banking Regulations",* International Journal on Economics, Finance and Sustainable Development, Vol. 5 No. 11, pp. 73-82.

Tables

Table I – Variable definitions

Research Variables	Measurements
Dependent	
RA[a]	Regulatory adjustments (in 1000 EUR)
TIER1[b]	Tier 1 capital / Risk Weighted assets
TCR[c]	Total capital / Risk Weighted assets
Independent	
RGI	Risk Governance Index, derived from a Principal Component Analysis (PCA) of the following variables: RC, CRO, CFO, TITLE, AGE, and BI. The first principal component (COMP1) from the PCA is selected as the RGI, providing an aggregated view of the bank's risk governance practices.
RC	if bank has Risk Committee (1) and if not (0)
CRO	Binary variable indicating the presence (1) or absence (0) of a Chief Risk Officer in the bank, irrespective of their board membership status.
CFO	Binary variable indicating the presence (1) or absence (0) of a Chief Financial Officer in the bank, irrespective of their board membership status.
TITLE	if director holds PhD degree (1) and if not (0)
SENIOR	if director's age is between 66-75 (1) and if not (0)
BI	if Director is independent Independent directors
Control	
CEOAD	if Chief Executive Officer has an additional position (1) and if not (0)
BS	Total number of directors on board
SIZE	Total Assets (in 1000 EUR)
LNSIZE	Natural logarithm of the Total Assets

[a] Regulatory Adjustments (RA): These are specific modifications made to a bank's assets and liabilities as mandated by the Bank for International Settlement (BIS) under the CAP30 guidelines. The adjustments include, but are not limited to, intangible assets, deferred tax assets, and changes in own credit risk on fair valued liabilities. The primary purpose of these adjustments is to present a more accurate view of a bank's Common Equity Tier 1 capital. Essentially, they ensure that stakeholders have a transparent view of the bank's core capital by accounting for certain assets and liabilities that might otherwise distort this view. When calculating their own funds, banks must consider all assets measured at fair value and make necessary deductions from Common Equity Tier 1 capital for any additional value adjustments.

[b] According to the Basel Committee on Banking Supervision, the minimum Tier One ratio has to achieve 6 % by 1 January 2015 (the implementation phase started in January 2013). For the previous versions of Basel, the minimum percentage required was 4 % (Basel Committee on Banking Supervision, 2011).

[c] Total capital / Risk Weighted assets. According to the Basel Committee on Banking Supervision, the minimum total capital ratio has to remain at 8%

Table II

Descriptive Statistics

VARIABLE	OBS	MEAN	STD. DEV.	MIN	MAX
RA	2,740	548,608 €	4,100,070 €	-6,601,000 €	27,400,000 €
TIER1	1,872	13.24027	3.202067	8.8	32.6
TCR	14,596	15.23164	3.44537	9.89	20.9
RC	14,596	0.1961496	0.3970967	0	1
CRO	14,596	0.0055495	0.0742903	0	1
CFO	14,596	0.0277473	0.1642537	0	1
TITLE	14,596	0.1361332	0.3429417	0	1
SENIOR	14,596	0.3013154	0.4588451	0	1
BI	14,596	0.5059605	0.4999816	0	1
CEOAD	14,596	0.0799534	0.2712304	0	1
BS	14,595	14.68284	5.097506	5	32
SIZE	14,555	8,930,000,000 €	85,700,000,000 €	4,760 €	1,770,000,000,000 €
LNSIZE	14,555	18.64115	2.606162	8.468085	28.20256

Table II presents the descriptive statistics for the variables used in the study, including the number of observations (Obs), mean, standard deviation (Std. Dev.), minimum (Min), and maximum (Max) values for each. The variables encompass key aspects of the research, such as Regulatory Adjustments (ra, in 1000 EUR), TIER1, TCR, RC, CRO, CFO, TITLE, SENIOR, BI, CEOAD, BS, SIZE (in 1000 EUR), and LNSIZE. These statistics illustrate the data spread and central tendencies, providing a comprehensive understanding of the dataset.

The dataset, comprising 14,596 bank-director years from 2001 to 2020, reflects individual directors' experiences within banks over this period, offering a detailed "bank-director years" level of analysis. This approach enhances the understanding of the interplay between risk governance characteristics and regulatory adjustments.

Notably, the RGI (Risk Governance Index) is not included in this table. The RGI, derived through PCA, is a composite measure aggregating individual risk governance characteristics. It captures the shared variance of these characteristics, providing a consolidated measure of a bank's overall risk governance strength. As a derived measure, the RGI is crucial in regression analysis for assessing the collective impact of risk governance characteristics on regulatory adjustments.

The inclusion of both size and lnsize (natural logarithm of size) in the analysis serves distinct purposes. Size represents the actual size of the bank, assessing the direct linear relationship with the dependent variables. In contrast, lnsize captures non-linear relationships and the percentage change in the dependent variable for a 1% change in the bank's size. This dual approach ensures a comprehensive understanding of the impact of bank size on the dependent variables, capturing both linear and non-linear relationships and reinforcing the robustness of the findings.

Table III Correlation

	RA	TIER1	TCR	RC	CRO	CFO
RA	1.00					
TIER1	-0.21***	1.00				
TCR	-0.16***	0.54***	1.00			
RC	0.09**	0.04	0.06*	1.00		
CRO	-0.06*	0.08*	0.02	-0.07*	1.00	
CFO	-0.01	0.13***	0.11***	-0.07*	-0.03	1.00
TITLE	-0.05	0.15***	0.10**	0.08**	0.05	-0.02
SENIOR	0.00	-0.05	0.00	-0.06	0.03	0.05
BI	0.29***	-0.16***	-0.04	0.28***	-0.16***	0.00
CEOAD	0.03	-0.09**	-0.02	-0.04	-0.04	-0.09**
BS	-0.32***	0.11***	-0.04	-0.14***	0.12***	-0.01
SIZE	-0.22***	0.24***	0.14***	-0.09**	0.04	-0.02

	TITLE	SENIOR	BI	CEOAD	BS	SIZE
TITLE	1.00					
SENIOR	-0.07*	1.00				
BI	0.11***	-0.05	1.00			
CEOAD	-0.02	0.00	-0.11***	1.00		
BS	0.05	0.07*	-0.38***	-0.07*	1.00	
SIZE	0.08*	0.06	-0.12***	0.01	0.41***	1.00

="* p<0.05 ** p<0.01 *** p<0.001"

Note: Table III presents the correlation matrix of the variables utilized in the study. Each cell shows the Pearson correlation coefficient between pairs of variables, with significance levels marked as follows: * for p<0.05, ** for p<0.01, and *** for p<0.001. A negative correlation indicates an inverse relationship, while a positive correlation signifies a direct relationship. For instance, RA and TIER1 share a significant negative correlation of -0.21, suggesting that as RA increase, TIER1 tends to decrease, and vice versa. Understanding these correlations assists in the interpretation of the relationship dynamics among the various factors considered in this study.

Table IV-a PCA Eigenvalues

COMPONENT	EIGENVALUE	DIFFERENCE	PROPORTION	CUMULATIVE
COMP1	1.33838	0.305182	0.2231	0.2231
COMP2	1.0332	0.0285048	0.1722	0.3953
COMP3	1.00469	0.0437661	0.1674	0.5627
COMP4	0.960927	0.0455382	0.1602	0.7229
COMP5	0.915389	0.167977	0.1526	0.8754
COMP6	0.747412	.	0.1246	1

Note: Table IV-a presents the Eigenvalues obtained from the PCA. It showcases six components (COMP1 to COMP6), their respective Eigenvalues, the Difference in Eigenvalues between successive components, the Proportion of the total variance explained by each component, and the Cumulative proportion of explained variance up to each component. The table provides an overview of how much each component contributes to the total variability of the data. The cumulative proportion column gives a quick way to see how much total variance is accounted for as we consider more components. By the end of COMP6, all the variance in the data (100%) has been accounted for.

Table IV-b PCA Principal components (eigenvectors)

VARIABLE	COMP1	COMP2	COMP3	COMP4	COMP5	COMP6	UNEXPLAINED
RC_STD	0.5723	-0.0315	-0.2229	0.4185	0.2255	0.6291	0
CRO_STD	0.2171	-0.4719	0.4345	0.7178	-0.1218	-0.106	0
CFO_STD	0.0288	0.7367	0.5829	0.1277	-0.1906	0.2531	0
TITLE_STD	0.2653	-0.3137	0.6356	-0.4162	0.4996	0.0658	0
SENIOR_STD	0.4137	0.2899	-0.1306	0.2633	0.8028	-0.1183	0
BI_STD	0.6188	0.2262	0.026	0.2252	0.0622	-0.7146	0

Note: Table IV-b displays the Principal Components (PCs) or eigenvectors[1] for each variable obtained from the PCA, along with any unexplained variance. The table depicts the direction and magnitude of each variable's contribution to each component (COMP1 to COMP6). These components are linear combinations of the original variables, and each represents a specific aspect of the total variance present in the original data. The unexplained variance for all variables is zero, indicating that the PCA model fully represents the variability of all standardized variables.

[1] Note on the Similarity Between Table IV-b and Table IV-c:

Tables IV-b and IV-c both stem from the PCA process, and their values are intrinsically linked:

PCA Overview: PCA is employed to transform the original data variables into a set of new orthogonal variables, termed principal components. These components encapsulate the variance in the data, with the aim of reducing dimensionality while retaining as much information as possible.

Eigenvectors vs. Loadings: Table IV-b delineates the eigenvectors of each variable, reflecting the direction and magnitude of each variable's contribution to the principal components. Conversely, Table IV-c displays the loadings, signifying the correlation between the original variables and the principal components. Due to the nature of PCA, especially when standardized variables are utilized, the eigenvectors and loadings often coincide, leading to the observed similarity in values across the two tables.

Incorporating Unexplained Variance: A distinguishing feature of Table IV-b is the 'Unexplained' column, which sheds light on any variance not captured by the principal components. In this dataset, the unexplained variance for all variables is zero, indicating that the PCA has comprehensively represented the variability of the standardized variables.

In essence, the congruence between Tables IV-b and IV-c is anticipated and aligns with standard PCA outputs. The addition of the 'Unexplained' column in Table IV-b provides an extra layer of understanding, ensuring that readers grasp the full scope of the data's dimensionality reduction.

In the context of the table "Table IV-b PCA Principal components (eigenvectors)," the value "0.5723" under "COMP1" for the variable "RC_STD" represents the eigenvector coefficient for that specific variable in relation to the first principal component (COMP1).

Table IV-c PCA Scores

Scoring coefficients
sum of squares(column-loading) = 1

VARIABLE	COMP1	COMP2	COMP3	COMP4	COMP5	COMP6
RC_STD	0.5723	-0.0315	-0.2229	0.4185	0.2255	0.6291
CRO_STD	-0.2171	-0.4719	0.4345	0.7178	-0.1218	-0.106
CFO_STD	-0.0288	0.7367	0.5829	0.1277	-0.1906	0.2531
TITLE_STD	0.2653	-0.3137	0.6356	-0.4162	0.4996	0.0658
SENIOR_STD	-0.4137	0.2899	-0.1306	0.2633	0.8028	-0.1183
BI_STD	0.6188	0.2262	0.026	0.2252	0.0622	-0.7146

Note: Table IV-c presents the scoring coefficients, also known as loadings, obtained from the PCA. These loadings signify the correlation between the original variables (RC_STD to BI_STD) and the derived principal components (COMP1 to COMP6). High absolute values of loadings (closer to -1 or 1) indicate that the respective variable contributes significantly to the corresponding component. For instance, RC_STD has a high loading of 0.5723 on COMP1, suggesting a significant positive relationship between these. Negative loadings indicate an inverse relationship. The sum of squares of column-loadings equals 1, indicating that the components fully account for the variance in the data.

Table V Regression (main results)

VARIABLES	(1) RA	(1a) RA-Bootstrapped
RGI	-18,760.7750**	-18,760.7750**
	(9,097.2082)	(8,448.8366)
CEOAD	-1,101.3568	-1,101.3568
	(29,493.7221)	(28,696.5639)
BS	-12,491.6684	-12,491.6684
	(101,654.2046)	(104,146.9859)
SIZE	0.0044**	0.0044*
	(0.0016)	(0.0026)
CONSTANT	-3.5066e+06*	-3.5066e+06
	(2040512.1295)	(3586194.8452)
Observations	2,740	2,740
Adjusted R-squared	0.8951	0.8951
Bank FE	YES	YES
Year FE	YES	YES
Clusters	Bank	Bank

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: Table V showcases the primary outcomes of the regression analysis for this study. Two models, (1) and (1a), are presented, both using RA as the dependent variable and RGI as a key independent variable. Model (1) utilizes a standard regression method, while Model (1a) employs bootstrapped estimates for robustness verification.

The negative coefficient for RGI indicates a statistical association where higher values of risk governance (RGI) correspond with decreased regulatory adjustments. This association is statistically significant at the 5% level in both models. However, it's crucial to understand that this association does not imply that improving risk governance directly causes a reduction in regulatory adjustments. The relationship merely suggests that the two variables move in opposite directions.

The SIZE variable's positive coefficient suggests that larger banks tend to have increased regulatory adjustments. This finding is significant at the 5% level in Model 1 and the 10% level in Model 1a. Other variables, such as CEOAD and BS, do not show statistically significant coefficients, indicating their potential limited impact on regulatory adjustments.

The models account for bank and year fixed effects, controlling for unobserved bank-specific attributes and common time-related effects. Robust standard errors, clustered by bank, are used to mitigate potential issues with heteroskedasticity and autocorrelation. The models' adjusted R-squared value of 0.8951 indicates that the included variables account for approximately 89.51% of the variability in regulatory adjustments. The high adjusted R-squared value in the regression models is influenced by the inclusion of the RGI variable, derived from COMP1 of the PCA analysis. COMP1 captures a significant portion of the variance from the original dataset, contributing to the model's explanatory power. However,

the overall model specification and other variables also play a role in achieving this high R-squared value.

Table VI Sensitivity Analysis

VARIABLES	(2) TIER1	(2a) TIER1-Bootstrapped	(3) TCR	(3a) TCR-Bootstrapped
RGI	0.0074*	0.0074	-0.0585**	-0.0585**
	(0.0043)	(0.0050)	(0.0284)	(0.0271)
CEOAD	0.0075	0.0075	-0.1094*	-0.1094
	(0.0180)	(0.0196)	(0.0620)	(0.0713)
BS	0.0176	0.0176	0.0127	0.0127
	(0.0583)	(0.0764)	(0.0545)	(0.0598)
SIZE	-0.0000***	-0.0000		
	(0.0000)	(0.0000)		
LNSIZE			-2.1427***	-2.1427***
			(0.6558)	(0.6827)
CONSTANT	14.6206***	14.6206***	54.9984***	54.9984***
	(1.3686)	(1.7315)	(12.1721)	(12.4878)
Observations	1,872	1,872	14,554	14,554
Adjusted R-squared	0.9526	0.9526	0.6406	0.6406
Bank FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Clusters	Bank	Bank	Bank	Bank

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: Table VI displays the results of the sensitivity analysis, with four models presented. The first two models have TIER1 as the dependent variable while the next two use TCR. Each pair includes a conventional regression model and a bootstrapped model for robustness checking. Models (2) and (2a) have 1,872 observations, while models (3) and (3a) have 14,554. This variation in sample size is a result of merging data with the BoardEx database and reflects the differing availability of overlapping data points. Such differences in sample sizes across models are typical in regression analysis, underscoring the importance of understanding the data sources and the rationale behind each model's construction.

For the models with TIER1 as the dependent variable, the RGI variable shows a positive association, indicating that higher values of risk governance (RGI) are correlated with higher TIER1 values. It's important to note that this is an observed association and does not imply that changes in risk governance directly cause changes in TIER1. This association is statistically significant at the 10% level in Model 1. The SIZE variable is negatively associated with TIER1 and is significant at the 1% level, suggesting that, on average, larger banks have lower TIER1 values. The CEOAD and BS variables are not statistically significant.

For the models with TIER1 as the dependent variable, the RGI variable has a positive association, suggesting that an improvement in risk governance is correlated with a higher TIER1. However, this result is only significant at the 10% level in Model 1. The SIZE variable

has a negative association with TIER1 and is significant at the 1% level. This implies that larger banks may tend to have a lower TIER1. The CEOAD and BS variables are not statistically significant.

In the models with TCR as the dependent variable, the RGI variable shows a negative association. This suggests that higher values of risk governance (RGI) are correlated with lower total capital ratios (TCR). It's important to clarify that this is an observed correlation and does not imply that changes in risk governance directly cause changes in the total capital ratio. This relationship is statistically significant at the 5% level. The CEOAD variable is negative and significant at the 10% level, suggesting that banks with a CEO who is also the chair of the board may have a lower total capital ratio. The LNSIZE variable, representing the natural logarithm of the bank's size, has a negative coefficient and is significant at the 1% level. This suggests that larger banks have a lower total capital ratio. The BS variable is not statistically significant in these models.

All models include bank and year fixed effects, and the standard errors are clustered at the bank level.

1. Introduction

The primary objective of this study is to investigate the relationship between risk governance characteristics and regulatory adjustments in OECD public commercial banks, focusing on how these elements contribute to banking stability. Specifically, the research will analyze the implications of varying capital requirements as part of the sensitivity analysis, aiming to uncover how risk governance characteristics interact with these regulatory adjustments to affect the overall stability and efficiency of the banking sector.

Risk governance and regulatory adjustments are pivotal in maintaining the banking sector's stability and compliance. This paper primarily examines these aspects from the banks' perspective, focusing on the impact of risk governance on regulatory adjustments. In complex financial markets, banks, often guided by regulators, must establish robust risk governance frameworks to manage risks and maintain stakeholder trust (Andres and Vallelado, 2008; Caprio and Levine, 2002). Regulatory adjustments (BIS-CAP30, 2019), mandated by bodies like BCBS, 36/EU Directive (2013) and Dodd-Frank Act (2010), align banks' financial reporting with regulatory frameworks, ensuring stability (Van Greuning and Bratanovic, 2020). These adjustments, while corrective, can indicate deeper financial management issues, affecting stability and performance (Francis and Osborne, 2012). Understanding the interplay between risk governance and regulatory compliance is crucial for the banking sector's resilience and effectiveness.

This study explores the relationship between risk governance characteristics and regulatory adjustments in OECD public commercial banks. It distinguishes between banks' compliance and specific regulatory mandates, informed by Quintyn and Chenard (2004). Focusing on OECD standards, the research examines how governance impacts financial stability and performance. The findings contribute to understanding the role of regulatory governance in the banking sector, emphasizing its importance in maintaining financial system stability.

The primary objective of this research is to investigate the association between risk governance characteristics and regulatory adjustments in public commercial banks within the OECD. The study specifically evaluates the presence and impact of various risk governance roles, including Risk Committees (RC), Chief Risk Officers (CRO), Chief Financial Officers (CFO), PhD holders (TITLE), senior directors (SENIOR), and independent directors (BI), as outlined in

studies by Minton et al., 2014; Bargeron et al., 2010; Berger et al., 2014; Aebi et al., 2012; Andres and Vallelado, 2008; Caprio and Levine, 2002. Furthermore, the study examines the impact of risk governance on capital requirements, specifically the Tier 1 capital to Risk Weighted assets ratio (TIER1) and total capital to Risk Weighted assets ratio (TCR), exploring their effects on bank stability and performance (Francis and Osborne, 2012). To elucidate the crucial link between risk governance and capital requirements, it is essential to understand how they collectively influence banking stability. Effective risk governance directly impacts the capital requirements of banks, playing a pivotal role in their financial resilience. In particular, this study scrutinizes OECD public commercial banks, where the synergy of risk governance and capital requirements is integral to the health of the banking sector. This research aims to dissect this interplay, providing insights into its significance for banking stability. This exploration is intended to provide insights into how risk governance can support or influence regulatory adjustments within the banking sector.

The choice of OECD countries for this study is intentional. Their varied regulatory frameworks make them an ideal context to explore the relationship between risk governance and regulatory compliance. This approach not only fills a critical gap in existing research but also provides valuable insights into the dynamics of banking regulation across different economic environments, enhancing the study's originality and global relevance. Recognizing the need for a more exhaustive investigation, this research extends its analysis to explore the nuanced effects of risk governance roles, such as CRO and CFO, on regulatory adjustments and bank stability. Employing methodologies like principal component analysis and regression models, the study draws on a theory from corporate governance and financial regulation literature to analyze how specific risk governance characteristics within OECD public commercial banks relate to regulatory adjustments and their overall implications for banking stability and performance.

This study not only investigates the association between risk governance characteristics and regulatory adjustments in OECD public commercial banks but also delves into how these factors interact with various elements of banks' capital structure, such as TIER1 and TCR. The nuanced findings, especially the differential impacts observed in the sensitivity analysis, underscore a novel contribution to the literature. By exploring these complex relationships, the study offers fresh insights into the dynamics of risk governance

and its implications on financial stability, a topic less explored in existing research within the context of OECD countries.

To achieve the outlined research objectives, a comprehensive research design has been implemented, analyzing data from 14,596 bank-director years spanning 2001 to 2020. This approach allows for a detailed examination of individual director experiences within banks, offering a nuanced understanding of the interplay between risk governance characteristics and regulatory adjustments. It includes information such as the country, bank-specific International Securities Identification Number (ISIN), unique director identifier, risk governance characteristics, regulatory adjustments, and the financial data of the banks. The dataset was derived from merging the BankFocus and BoardEx databases, ensuring a robust and reliable source of information for analysis and findings (Van Greuning and Bratanovic, 2020).

The research methodology incorporates a three-pronged statistical approach. Firstly, I analyzed descriptive statistics to provide a comprehensive overview of the dataset, presenting fundamental statistical values for each variable. Secondly, correlation analysis was conducted to explore the associations between risk governance characteristics and regulatory adjustments, providing insights into their relationships. Lastly, Principal Component Analysis (PCA) was employed to identify the underlying structure of risk governance characteristics, reducing data dimensionality and aiding in the identification of critical risk governance factors (Quintyn and Chenard, 2004; Chao and Wu, 2017).

To directly address the research objectives, regression analysis was performed, incorporating fixed effects and accounting for potential confounding factors by including control variables (Stock and Watson, 2008; Streukens and Leroi-Werelds, 2016). This analysis aimed to test the hypothesis that improved or stronger risk governance characteristics are associated with fewer regulatory adjustments in public commercial banks within the OECD (Andres and Vallelado, 2008). Findings from this research indicate a significant negative relationship between risk governance characteristics and regulatory adjustments in public commercial banks within the OECD. Specifically, the presence of a CRO is significantly associated with regulatory adjustments, as indicated by a correlation coefficient of -0.06 at $p<0.05$. However, the presence of a CFO and SENIOR does not show a significant correlation with regulatory adjustments, emphasizing the importance of efficient risk governance practices (Srivastav and Hagendorff, 2016).

Regulatory oversight is one of the measures for developing, or improving, coherent risk governance policies (Drake et al., 2006). Theoretical frameworks propose that risk governance has a significant impact on supervising risk and managing risks. (Nguyen and Dang, 2022; Caprio and Levine, 2002). Based on the findings, one perspective to consider is that, instead of focusing exclusively on controlling bank risk, shareholders might benefit from exploring the restructuring of risk governance as a means to enhance the effectiveness of risk management (Nguyen and Dang, 2022; Srivastav and Hagendorff, 2016). Based on the findings, one perspective to consider is that, instead of focusing exclusively on controlling bank risk, shareholders might benefit from exploring the restructuring of risk governance as a means to enhance the effectiveness of risk management (Nguyen and Dang, 2022; Quintyn and Chenard, 2004). Additional research could expand upon this study by exploring a broader range of risk governance characteristics and analyzing their influence on regulatory adaptations within the banking sector (Nguyen and Dang, 2022).

In conclusion, this study reveals a significant relationship between specific risk governance characteristics and the frequency of regulatory adjustments in public commercial banks within the OECD. It highlights the importance of roles such as the CRO and CFO, along with the presence of highly qualified directors, in mitigating risks and enhancing risk management practices (Andres and Vallelado, 2008; Srivastav and Hagendorff, 2016). Policymakers, regulators, and bank management can leverage these findings to refine their risk governance strategies and methodologies. By focusing on structured approaches that encompass guidelines, best practices, and effective oversight mechanisms, they can contribute to a more stable and compliant banking sector. Further analysis and robust testing of the research hypotheses will deepen the understanding of the link between risk governance characteristics, regulatory adjustments, and bank stability (Francis and Osborne, 2012). Future research, incorporating additional variables and advanced statistical techniques, has the potential to expand upon the current findings and provide more nuanced insights into the dynamics of risk governance in the banking sector (Quintyn and Chenard, 2004; Birindelli and Ferretti, 2008;2013).

2. Theory, Literature Review, and Hypothesis Development

Effective risk governance and regulatory compliance are crucial for the stability and reputation of public commercial banks in the OECD (Quintyn and Chenard, 2004; Srivastav and Hagendorff, 2016). This section provides an overview of the theoretical underpinnings and relevant literature on risk governance, regulatory compliance, and their relationship with regulatory adjustments.

Risk governance involves the identification, communication, application, and supervision of risk within banks (Karyani et al., 2020). This research delves deeply into regulatory compliance theory as a key theoretical underpinning. Regulatory compliance theory, which focuses on the adherence of institutions to laws and regulations, is critical in understanding how banks manage and mitigate risk. This theory sheds light on the mechanisms through which banks align their risk governance strategies with regulatory demands, a process that is vital for maintaining stability and credibility in the banking sector.

By exploring how regulatory compliance shapes risk management practices, this study highlights the intricacies of navigating the complex regulatory landscapes that banks operate within. Recent research emphasizes the collective efforts of directors in contributing to risk governance. Directors, regardless of their specific roles, add value to risk management by incorporating their expertise and perspectives (Erin et al., 2018).

Fiene's (2016) "Theory of Regulatory Compliance" examines why banks follow rules, highlighting factors like culture and stakeholder influence. It posits that compliance goes beyond legal requirements, ensuring financial system stability and integrity. This adherence is crucial for protecting banks and their clients (Birindelli and Ferretti, 2008; Francis and Osborne, 2012). Yao et al. (2023) provide a comparative analysis of the American and Chinese banking systems, offering insights into the impact of different regulatory environments on banking stability and compliance. Compliance with regulatory requirements, such as those related to Common Equity Capital, is vital for maintaining financial stability and protecting stakeholders' interests (Rachdi and Bouheni, 2016; Stolz et al., 2003). Furthermore, the interplay between capital requirements and risk governance forms a crucial aspect of banking stability. This research expands the discussion by exploring how capital requirements, as a key element of regulatory frameworks, influence and are influenced by risk governance practices. For instance, higher capital requirements may prompt banks to adopt more stringent risk governance policies, while effective risk governance can lead to a more efficient capital structure, thus meeting regulatory standards without excessive capital allocation. This bidirectional relationship emphasizes the need for an integrated approach in bank management, where both capital requirements and risk governance are aligned to achieve financial stability. These requirements can be subject to regulatory adjustments, which are changes or modifications made to address evolving financial landscapes or new insights. Penalties imposed by regulators for non-compliance further emphasize the importance of meeting regulatory capital requirements (BCBS; Dodd-Frank Act, 2010; 36/EU Directive, 2013; Ekawati et al., 2021). Recent studies, such as Lubberink and Willett (2023), further illuminate how regulatory capital adjustments impact bank market values, offering a nuanced understanding of the consequences of regulatory non-compliance.

The relationship between risk governance characteristics and regulatory adjustments has gained attention in the literature. Strong risk governance practices (Minton et al., 2014; Gontarek and Belghitar, 2018; Lingel and Sheedy, 2012; and Aebi et al., 2012) including the

presence of a CRO, CFO, and senior directors are expected to be associated with reduced regulatory adjustments. These characteristics, when effectively implemented, enhance risk management practices and improve regulatory compliance, thereby reducing the likelihood of regulatory adjustments (Srivastav and Hagendorff, 2016). Abou-El-Sood and Shahin (2023) extend this understanding by presenting international evidence on the interplay between bank competition, regulatory capital, and risk-taking. To more explicitly connect the reviewed literature with the hypothesis of this study, it is essential to emphasize how the key studies inform and support the hypothesis development. Drawing on the insights from Fiene (2016), Minton et al. (2014), and others, the hypothesis that 'Risk governance characteristics are negatively associated with regulatory adjustments in public commercial banks within the OECD' is based on the understanding that effective risk governance mechanisms, as evidenced in these studies, lead to improved regulatory compliance and stability. This hypothesis is a direct reflection of the theoretical and empirical insights gained from the literature, highlighting the crucial role of risk governance characteristics in shaping regulatory outcomes in banks.

Based on the above discussions, the following research hypothesis is formulated: "Risk governance characteristics are negatively associated with regulatory adjustments in public commercial banks within the OECD." This hypothesis posits that stronger risk governance practices within banks lead to lower levels of regulatory adjustments. The research aims to empirically test this hypothesis by examining the relationship between risk governance characteristics and regulatory adjustments in public commercial banks within the OECD.

The existing literature offers valuable insights into risk governance, regulatory compliance, and their impact on regulatory adjustments in the banking sector. Studies (Minton et al., 2014; Bargeron et al., 2010; Berger et al., 2014; Aebi et al., 2012; Andres and Vallelado, 2008; Caprio and Levine, 2002) highlight the importance of risk governance characteristics, such as the presence of a CRO, CFO, and SENIOR, in reducing regulatory adjustments (Drake et al., 2006; Srivastav and Hagendorff, 2016). These studies emphasize the role of risk governance in enhancing risk management practices and regulatory compliance (Karyani et al., 2020).

Further research explores the causes of the financial crisis and emphasizes the need for effective risk governance to prevent such crises (Aebi et al., 2012; Francis and Osborne, 2012). Studies analyze the relationship between corporate governance and firm performance,

highlighting the importance of governance structures in mitigating risks and improving outcomes (Ekawati et al., 2021). Additionally, investigations are conducted to explore the relationship between risk governance and bank stability, providing evidence of the positive impact of strong risk governance practices on bank performance and stability (Erin et al., 2018). In addition, Abdel-Wanis (2021) investigates how regulatory capital and bank characteristics affect risk-taking, offering valuable insights into the regulatory dynamics within the banking sector.

The Basel Committee on Banking Supervision (BCBS) outlines the Basel III framework, which emphasizes the importance of risk governance and regulatory compliance in ensuring the stability of banks and banking systems (Francis and Osborne, 2012). Gropp et al. (2021) further examine the influence of supranational rules, such as Basel III, on national banking systems, highlighting the complexity of implementing international standards. Studies examine the compliance with international accounting standards, emphasizing the role of institutional factors in shaping compliance behavior (Stolz et al., 2003). The regulation of the shadow banking system is investigated, highlighting the importance of effective regulatory frameworks to address systemic risks (Quintyn and Chenard, 2004).

Explorations into the relationship between bank governance, regulation, and risk-taking provide evidence of the impact of governance structures on bank behavior (Srivastav and Hagendorff, 2016). Studies analyze the relationship between imperfect competition, risk-taking, and regulation in banking, shedding light on the complex interplay between market structure, risk governance, and regulatory oversight (Drake et al., 2006).

Additional perspectives include frameworks for managing risks, critically examining regulatory measures and their implications for corporate governance and providing a survey of corporate governance mechanisms and their impact on firm performance (Ekawati et al., 2021). Discussions also cover risk governance, democratic participation, and accountability in the European banking union, exploring the historical perspective of corporate governance and finance in colonial America, and examining the use of market information in prudential bank supervision (Karyani et al., 2020).

In summary, the literature highlights the significance of risk governance characteristics, such as the presence of specific roles and advanced degrees, in reducing regulatory adjustments and enhancing risk management practices (Erin et al., 2018). It also acknowledges the importance of regulatory compliance in ensuring financial stability and

protecting stakeholders' interests (Francis and Osborne, 2012). Effective risk governance practices play a crucial role in facilitating regulatory compliance and contributing to the overall stability and performance of banks (Quintyn and Chenard, 2004).

The next section will discuss the research methodology, including the data collection process, statistical analyses, and regression modeling techniques employed to test the hypothesis and examine the relationship between risk governance characteristics and regulatory adjustments.

This section has provided a comprehensive theoretical framework and literature review focusing on risk governance, regulatory compliance, and their relationship with regulatory adjustments in public commercial banks within the OECD. The research hypothesis states that risk governance characteristics are negatively associated with regulatory adjustments, aligning with previous research emphasizing the importance of risk governance in reducing regulatory adjustments (Srivastav and Hagendorff, 2016). The literature review highlights the significance of risk governance and regulatory compliance in maintaining financial stability and minimizing the need for regulatory adjustments (Stolz et al., 2003).

3. Research Design

3.1. Data collection and description

The dataset for this study provides a comprehensive overview of banks and their directors from 2001 to 2020. It encompasses 14,596 instances, each representing the presence of a specific director in a particular bank for a given year. For instance, if Director A was present in Bank X for three consecutive years, it would be recorded as three separate instances. Over the study period, the dataset captures information from 1,125 unique banks. Additionally, there are 14,404 individual records detailing the presence of directors, reflecting their association with various banks across different years.

It consists of 17 variables related to banks, their directors, and financial information. The dataset includes information on the country, bank-specific ISIN, and a unique identifier for each director. The dependent variable, ~~(~~Regulatory Adjustments (RA), as defined by the Bank for International Settlement (BIS) in CAP30, ~~encompasses adjustments made to a bank's Common Equity Tier 1 to~~ is essential for transparently ~~represent its~~ representing a bank's financial position, including items like intangible assets and deferred tax assets. ~~This focus allows for a deeper understanding of~~RA's role in providing a clearer view of a bank's core capital is underlined by its importance in financial stability assessments, as discussed in the ~~impact of risk governance on regulatory compliance.~~context of the Basel Committee guidelines. The independent variable, RGI (Risk Governance Index), is an ~~aggregate measure capturing various~~aggregated measure derived from a Principal Component Analysis (PCA) of risk governance elements. The presence of a Risk Committee (RC) is included based on the findings of Gontarek and Belghitar (2018) and McNulty et al. (2013), who emphasize its impact on risk-taking and governance ~~characteristics, such as the presence of a risk committee (RC), a~~ effectiveness. The roles of Chief Risk ~~Officer~~Officers (CRO~~), a~~) and Chief Financial ~~Officer~~Officers (CFO~~), a director's academic qualifications~~) are included following the insights from Mongiardino and Plath (2010), and Brancato et al. (2006), who discuss the significance of these positions in enhancing risk governance. The inclusion of PhD holders (TITLE~~),~~) as a variable is supported by the study of Berger et al. (2014), highlighting their influence on risk management. The factor of senior directors ~~are in the senior age bracket~~ (SENIOR~~), and~~) is

incorporated following the findings of Agarwal et al. (2009) and Berger et al. (2014), who note the relationship between director age and risk-taking behaviors. Lastly, the variable of independent directors (BI) is based on the works of Adams and Ferreira (2009), Aebi et al. (2012), and Erkens et al. (2012), which link board independence ~~(BI). These elements provide a comprehensive view of a bank's risk governance structure. Additionally, control~~to improved governance and performance. Control variables like ~~the~~ CEO's additional position (CEOAD), the total number of directors (BS), ~~the bank's~~bank size (SIZE), and ~~a normalized measure for size~~its logarithm (LNSIZE) ~~have been incorporated.~~are included due to their recognized impact on corporate governance and risk management, as suggested by Srivastav and Hagendorff (2016). Each variable is meticulously chosen based on its relevance to the study's objectives and its established significance in risk governance and regulatory compliance literature. The financial information was collected from the BankFocus database, while the directors' information was obtained from the BoardEx database.

Frequencies from the dataset reveal that 81 banks have a RC, 15 banks have a CRO, 54 banks have a CFO, 91 banks have directors with a TITLE, 117 directors are in the senior age bracket (SENIOR), and 118 banks have Board Independence (BI). These frequencies provide a detailed insight into the distribution and prevalence of risk governance characteristics in the sampled banks.

The dataset for this study was curated by including banks that are currently operational (active) and publicly traded (listed). The focus was on banks with C1 financial statements, which present a consolidated view of a bank's financial activities by integrating the statements of its controlled subsidiaries or branches. Additionally, C* Additional Consolidated statements, which offer supplementary financial details, were also considered. To compile this dataset, data from the BankFocus database, which provides detailed financial data for banks, was merged with the BoardEx database, which offers insights into board members and senior executives. Only observations that were consistent across both databases were retained to ensure the dataset's accuracy and relevance.

While it's recognized that the dataset, given its extensive coverage, might contain data points that appear as outliers, the decision to retain these outliers is grounded in the research's theoretical framework. The comprehensive nature of this study, aiming to capture the entirety of risk governance practices across diverse banking landscapes, necessitates the inclusion of these data points. While winsorizing is a common technique, its application in this

context would not align with the research objectives and could potentially diminish the depth of the analysis.

In the selection of variables for this study, each was chosen based on its relevance to assessing the impact of risk governance on regulatory adjustments. The primary variable, RA , directly reflects the regulatory changes impacting banks, critical for evaluating governance effectiveness. RGI aggregates key governance features, providing a holistic measure of governance structure. Control variables such as CEOAD, BS, SIZE, and LNSIZE were included to account for factors that might influence or confound the relationship between risk governance and regulatory adjustments. For instance, CEOAD offers insights into leadership concentration, which can affect decision-making processes, while SIZE and LNSIZE help account for the scale of the bank's operations, which can influence governance dynamics and regulatory interactions. This careful selection of variables ensures a comprehensive analysis that aligns with the study's objectives and provides a robust examination of the relationship between governance and regulatory compliance.

3.2. Research Methodology

Building on the detailed data description provided earlier, this section delves into the methodological approach adopted for this research. The study leverages a comprehensive dataset to empirically investigate the relationship between risk governance characteristics and regulatory adjustments. Various statistical techniques and models are employed to ensure robustness in the findings and to account for potential confounding factors. The subsequent sections will detail the specific models used, the rationale behind their selection, and the results derived from them.

The selection of variables from the database was driven by the need to evaluate risk governance factors. This includes aspects such as the number of board members, their presence on the board, and their professional qualifications, among other relevant factors. Acknowledging the concerns about the relevance of public profiles of board members for risk governance characteristics, it was clarified that the choice of BoardEx was dictated by the availability of this information.

Variables of interest were standardized to reconcile differences in scale and ensure comparability. A PCA was then conducted on these standardized variables with an aim to identify the principal components that would explain the greatest variance in the data.

Subsequently, the data was transitioned into a panel setup, arranged based on unique combinations of bank and director identifiers and the corresponding year. The research employed a fixed-effects modeling approach, aligning closely with the theoretical underpinnings of the study, especially given the span across OECD countries and over a 20-year period. Additionally, the fixed-effects model is particularly advantageous in mitigating potential endogeneity issues arising from unobserved heterogeneity. By controlling for both bank-specific and time-specific effects, the model accounts for the possibility that unobserved factors, which could be correlated with both the independent and dependent variables, might bias the results. This approach effectively isolates the impact of risk governance characteristics on regulatory adjustments, providing more reliable and accurate estimates of their relationships. The model was estimated using the "xtreg" command in Stata, which is specifically designed for panel data regressions, allowing for the estimation of both fixed-effects and random-effects models.

An econometric model was designed to encapsulate the regulatory adjustments occurring in different countries.

$$Model\ 1: RA_{bt} = \beta_0 + \beta_1 * RGI_{bt} + \beta_2 * CEOAD_{bt} + \beta_3 * BS_{bt} + \beta_4 * SIZE_{bt} + \alpha_b + \delta_t + \varepsilon_{bt}$$

In this research, a primary focus is placed on the dependent variable, RA (Regulatory Adjustments). Regulatory adjustments, as defined by the Bank for International Settlement (BIS) in CAP30, are crucial for banks. They encompass various elements such as intangible assets, deferred tax assets, cash flow hedge reserve, and cumulative gains and losses due to changes in own credit risk on fair valued liabilities. Primarily applied to Common Equity Tier 1, these adjustments aim to provide a transparent view of the Common Equity Tier 1 to all stakeholders. Institutions are mandated to apply these requirements to all their assets measured at fair value when calculating their own funds. Furthermore, any additional value adjustments deemed necessary are deducted from the Common Equity Tier 1 capital. The model, therefore, examines the relationship between RA and the independent variables, including the Risk Governance Index (RGI), which has been renamed from Comp1 following a

PCA, CEOAD, BS, and SIZE. In the model, RA_{bt}, RA_{bt} represents the Regulatory Adjustment for bank $_b$ in year $_t$. Here, b denotes the bank and t represents time in years. The model controls for bank and time fixed effects denoted by α_b and δ_t, respectively for unobserved heterogeneity across banks and time. The error term, ε_{bt}, represents the unobserved factors influencing the dependent variable. Clustered standard errors at the bank level are employed to account for potential correlation within banks. These adjustments mirror the diverse national regulatory environments, economic conditions, and governance structures. Distinctions were made between regulatory adjustments as changes mandated by regulators, and governance and controls as the bank's internal mechanisms. The 'beta', or the slope intercept, is the baseline level of Regulatory Adjustment in the absence of other control variables.

The main regression analysis utilized the reghdfe command. This command is an extension of Stata's standard regression command, specifically tailored for high-dimensional fixed effects models. It efficiently estimates linear regressions with multiple levels of fixed effects by absorbing these effects. In this research, the reghdfe command was employed to estimate the fixed effects model, absorbing both year and bank fixed effects. Additionally, standard errors were clustered at the bank level to account for potential correlations within banks and to provide robust standard errors. To assess the robustness of the main regression analysis, a bootstrap procedure with 100 repetitions was conducted (Karyani et al., 2020). To assess the robustness of Model 1, a bootstrap technique is employed with 100 replications to assess the robustness of the results from Model 1 in Model 1a. The bootstrap resampling method generates multiple replicated datasets by sampling with replacement from the original dataset. This approach allows for the estimation of coefficients' stability and provides robust standard errors. The estimated coefficients and their significance levels are evaluated using the bootstrap results.

A sensitivity analysis was conducted using alternative dependent variables, "TIER1" (Tier 1 capital / Risk Weighted assets) and "TCR" (Total capital / Risk Weighted assets), to test the robustness of the results obtained with the primary dependent variable, RA (Regulatory Adjustments). Both TIER1 and TCR are critical indicators of a bank's financial health and stability. Given that regulatory adjustments primarily influence Common Equity Tier 1, which is a component of TIER1, there's an inherent relationship between these variables. By examining the results across RA, TIER1, and TCR, the analysis aims to ascertain the consistency

and robustness of the findings. The models were estimated with fixed effects, clustering the standard errors at the bank level, and employing a bootstrap with 100 repetitions to further assess robustness.

Sensitivity models:

$$\textit{Model 2: } TIER1_{bt} = \gamma_0 + \gamma_1 * RGI_{bt} + \gamma_2 * CEOAD_{bt} + \gamma_3 * BS_{bt} + \gamma_4 * SIZE_{bt} + \alpha_b + \gamma_t + \varepsilon_{bt}$$

$$\textit{Model 3: } TCR_{bt} = \delta_0 + \delta_1 * RGI_{bt} + \delta_2 * CEOAD_{bt} + \delta_3 * BS_{bt} + \delta_4 * SIZE_{bt} + \alpha_b + \gamma_t + \varepsilon_{bt}$$

In Model 2, $TIER1_{bt}$ represents the dependent variable, for bank b in time period t. The independent variables are RGI, CEOAD, BS, and SIZE for the corresponding bank and time period. The fixed effects, α_b and γ_t capture bank and time heterogeneity, respectively, while the error term, ε_{bt}, accounts for unobserved factors influencing the TIER1.

To assess the robustness of Model 2, a bootstrap technique is employed in Model 2a same as in Model 1. Similarly, in Model 3, TCR_{bt} represents the dependent variable, TCR for bank b in time period t. The independent variables and other definitions of fixed effects and error term are same as in Model 1 and 2 along with the application of bootstrap technique for robustness of Model 3 in Model 3a.

In conclusion, the methodology, underpinned by data on OECD banks spanning 20 years, seeks to elucidate the relationship between regulatory adjustments and risk governance. While the paper does not directly study variations across national contexts or provide a baseline understanding in the absence of governance and control variables, the comprehensive dataset inherently captures the nuances and variations over time and across different banking environments. This approach offers valuable insights into the dynamics of regulatory adjustments in relation to risk governance.

[Insert Table I here]

4. Results

4.1. Descriptive Statistics

This section presents a detailed overview of the descriptive statistics for key variables in the dataset. The dataset encompasses 14,596 bank-director years from 2001 to 2020, providing a comprehensive view of the banking landscape within this period.

Each variable is selected for its relevance to the study's focus on regulatory compliance and risk governance. The RA variable, with a mean value of 548,608 € and a standard deviation of 4,100,070 €, is central to understanding the scope and frequency of adjustments made by banks in response to regulatory changes. TIER1 and TCR offer insights into banks' capital adequacy, while variables like RC, CRO, CFO, TITLE, SENIOR, and BI provide a nuanced view of the composition and characteristics of bank boards. This section not only presents these statistics but also contextualizes them within the broader framework of

regulatory compliance and risk governance, crucial for accurately interpreting the data and understanding its larger research implications.

Table 2 presents the descriptive statistics for the variables in the dataset. The variable RA, with a mean value of 548,607.9 and a standard deviation of 4,100,070. The variable TIER1, with a mean value of 13.24027 and a standard deviation of 3.202067. The variable TCR, with a mean value of 15.23164 and a standard deviation of 3.44537. Other variables such as RC, CRO, CFO, SENIOR, and BI are also included in the table. These descriptive statistics provide an overview of the distribution and variation of the variables in the dataset. The descriptive statistics in this study, particularly in relation to RA, TIER1, and TCR, resonate with trends observed in the seminal work of Francis and Osborne (2012). Their investigation into the impact of capital requirements on bank behavior provides essential context for understanding how regulatory frameworks influence banking operations. The variable RA, characterized by a significant mean and standard deviation, indicates substantial variability in banks' responses to regulatory changes. This aspect of the findings can be contrasted with the research by Francis and Osborne (2012), who explored the impact of capital requirements on bank behavior. While their study provides a broad overview of the regulatory impacts, the current analysis extends these insights by highlighting specific variances in key variables, thereby contributing to a more nuanced understanding of banks' behaviors under different regulatory environments. This study extends these insights by showcasing the specific variances in key variables within the dataset, thereby contributing to a more nuanced understanding of bank behaviors under different regulatory environments.

[insert table II here]

4.2. Correlation

In this section, the correlation matrix is used to explore the relationships between different variables, particularly focusing on risk governance characteristics and their influence on regulatory adjustments. This matrix is a crucial statistical tool that helps in understanding how variables are interrelated within the dataset. The correlations provide insights into potential associations but do not imply causation. For instance, a negative correlation between RA and

TIER1 suggests an inverse relationship, but it's important to consider other factors that might be influencing these variables.

To address concerns about multicollinearity, which arises when independent variables in a regression model are highly correlated, this study has conducted careful variable selection and analysis. While some degree of correlation is expected due to the nature of the variables studied, the impact on the regression models is mitigated through the use of advanced statistical techniques and the interpretation of results in the context of existing literature. This approach helps ensure that the findings are robust and reliable.

The correlation matrix presents the relationships among the variables in the study, focusing on risk governance characteristics and their association with regulatory adjustments. Among these characteristics, only the CRO shows a small negative correlation with regulatory adjustments, while the CFO and TITLE do not exhibit significant negative correlations with regulatory adjustments. Conversely, the presence of a RC shows a positive correlation, and BI exhibits a significant positive correlation with RA. These findings suggest that while certain risk governance characteristics may influence regulatory adjustments, their impact varies. The observed correlations in this study, particularly those related to risk governance characteristics such as the presence of a CRO and their impact on regulatory adjustments, offer noteworthy insights. These findings are in line with the research conducted by Erin et al. (2018) on the Nigerian banking sector, which also underscored the influence of risk governance on bank performance. Furthermore, the relationship between risk governance characteristics and regulatory adjustments resonates with the findings of Srivastav and Hagendorff (2016), who emphasized the significance of these factors in the banking sector. The current analysis enriches this discourse by providing empirical evidence from the OECD public commercial banks, thereby contributing to a more comprehensive understanding of risk governance within diverse regulatory contexts. This study's findings, particularly the correlation between risk governance characteristics and regulatory adjustments, align with Erin et al. (2018). Their research on the Nigerian banking sector similarly highlighted the influence of risk governance on bank performance, underscoring the relevance of these correlations in understanding bank behavior within regulatory frameworks. The correlation matrix provides clear evidence of specific relationships between risk governance characteristics and regulatory adjustments, underscoring the need for careful interpretation and consideration of broader research implications, as discussed in Srivastav and Hagendorff

(2016). Further analysis is needed to assess the statistical significance and strength of these associations.

[insert table III here]

4.3. Principal Component Analysis

Building on the foundational understanding of risk governance practices highlighted in the previous work such as Karyani et al. (2020), this study conducts a PCA to explore the underlying structure and dimensionality of specific risk governance characteristics. The variables of interest, namely RC, CRO, CFO, TITLE, SENIOR, and BI, were included in the analysis to further investigate their interrelationships and potential impact on regulatory adjustments. The PCA analysis identified six principal components based on the variance in the dataset. The first component, labeled as Comp1, captured the most variance with an eigenvalue of 1.33838. Comp1 explained 22.31% of the total variance, indicating its significance in capturing the variability in the risk governance characteristics. The subsequent components, Comp2 to Comp6, accounted for decreasing proportions of the variance.

The loadings of the variables on the principal components provide insights into their contribution to the overall structure. Comp1 has a negative loading for CRO, CFO, and SENIOR. Specifically, SENIOR has a pronounced negative loading of -0.4137 on Comp1, suggesting a significant inverse relationship. CRO also has a negative relationship with Comp1, indicated by its loading of -0.2171. However, CFO's contribution to Comp1 is minimal, as evidenced by its loading of -0.0288. This makes Comp1 a suitable representative of the risk governance characteristics in the subsequent regression analysis. The PCA findings in this study, particularly regarding the significant variance captured by Comp1 and its loadings on CRO, CFO, and SENIOR, align with the methodologies employed by Karyani et al. (2020) in their study on the ASEAN-5 banking sector. They also utilized PCA to dissect risk governance characteristics, finding key components that influence bank operations. The similarity in the use of PCA and the identification of influential risk governance factors in both studies not only validates the methodology but also reinforces the importance of these characteristics in risk governance analysis within the banking sector.

Including Comp1 as an explanatory variable in the regression analysis facilitates the examination of its relationship with RA, offering insights into the potential association

between risk governance characteristics and regulatory adjustments (Drake et al., 2006). By utilizing Comp1, which emerged from the PCA as a comprehensive measure of risk governance characteristics, the study can effectively capture the collective impact of CRO, CFO, and SENIOR on regulatory adjustments. This approach, grounded in the PCA findings, enhances the interpretability and efficiency of the regression model. It provides a nuanced evaluation of the role played by risk governance characteristics in potentially influencing regulatory adjustments, aligning with the broader research context highlighted by Srivastav and Hagendorff (2016).

The PCA ~~approach and its findings~~methodology in this study ~~echo~~not only aligns with the ~~methodologies and results seen in~~ approach taken by Karyani et al. (2020~~). Their work in the ASEAN-5 banking sector~~) but also ~~utilized PCA to unravel the intricacies~~extends it by offering unique insights into the role of senior directors in risk governance~~, providing a foundation~~. While Karyani et al. (2020) laid the groundwork for understanding ~~the multifaceted nature of these characteristics. The parallels in PCA application and the emergence of key~~risk governance in the ASEAN-5 banking sector, this study further explores how specific components like senior director roles ~~in both studies underscore the validity and importance of these methods in dissecting the complex~~ uniquely contribute to the dynamics of risk governance in OECD public commercial banks. This distinction highlights the study's contribution to the broader discourse on risk governance, enhancing the understanding of its multifaceted nature in different banking ~~sector~~contexts.

[insert tables IV-a, IV-b, and IV-c here]

4.4. Main Regression Analysis

The main regression analysis results provide important insights into the relationship between the Risk Governance Index (RGI), represented by Comp1, and regulatory adjustments. The regression model incorporated the RGI, capturing the collective influence of risk governance characteristics, along with control variables such as CEOAD, BS, and SIZE. The coefficient for RGI was statistically significant and negative (-18,760.77, $p < 0.05$), indicating that a higher score on RGI, reflecting stronger risk governance practices associated with CRO, CFO, and SENIOR, is linked to lower levels of regulatory adjustments. This

association remains robust even when controlling for CEOAD, BS, and SIZE, suggesting that risk governance characteristics, as represented by RGI, are associated with lower levels of regulatory adjustments, even after accounting for other control variables (Srivastav and Hagendorff, 2016). The negative relationship between the RGI and regulatory adjustments, as indicated by the significant coefficient in the regression analysis, resonates with the findings of Srivastav and Hagendorff (2016). They explored similar dynamics in the context of bank risk-taking behaviors and governance. The alignment of these results with their study provides a broader validation of the hypothesis that stronger risk governance practices, particularly those characterized by CRO, CFO, and SENIOR roles, are instrumental in reducing the need for regulatory adjustments. This study extends these insights by demonstrating how such governance characteristics specifically impact regulatory adjustments in the context of OECD public commercial banks, thereby contributing to the ongoing discourse on effective risk governance and regulatory compliance.

These findings offer empirical evidence supporting the hypothesis that risk governance characteristics, as represented by the RGI, are associated with regulatory adjustments. This study carefully considers the fixed-effects modeling approach to address potential endogeneity. This method controls for unobserved heterogeneity that could bias estimates. Incorporating fixed effects for banks and time, the model accounts for unobserved, bank-specific factors and time-related effects that could influence the dependent variable, enhancing the credibility of the findings. Such methodological consideration ensures the robustness of results and mitigates the risk of endogeneity. The negative coefficient for RGI suggests that strong risk governance practices, particularly those characterized by the presence of a CRO, CFO, and SENIOR, are linked with fewer regulatory adjustments. This association underscores the importance of effective risk governance in aligning financial statements with regulatory standards and potentially reducing the frequency of adjustments required by regulatory bodies like the Bank for International Settlements (BIS). The specific mention of CRO, CFO, and SENIOR is due to their significant loadings in the PCA, indicating their pivotal role in the overall risk governance framework and its impact on regulatory compliance.

[insert table V here]

4.5. Sensitivity Analysis

The results of the sensitivity analysis, robust to heteroskedasticity using bootstrap replication, provide additional insights into the relationship between risk governance characteristics and regulatory adjustments. The analysis focused on TIER1 as the dependent variable. The coefficient for RGI remains positive (0.0074) in the sensitivity analysis, but it does not achieve statistical significance at the conventional level ($p < 0.05$). However, the coefficient is marginally significant at a 10% significance level ($p < 0.10$). While the bootstrap results do not strongly confirm the main regression findings, they suggest a consistent positive association between RGI and TIER1. The statistical significance of this association is not firmly established based on the available data, but the consistent direction of the coefficient across the bootstrap replications suggests a tendency towards a positive relationship. These findings indicate an association between risk governance characteristics, as represented by RGI, and the TIER1 for banks. However, it's important to note that this does not imply a direct causal relationship. In the sensitivity analysis, the positive coefficient for Comp1 suggests a potential association between TIER1 and the risk governance characteristics. Specifically, while the RC shows a positive influence on TIER1, the roles of CRO, CFO, and Senior Directors might have inverse effects. However, given the nature of sensitivity analyses, these findings should be interpreted with caution, as they are meant to test the robustness of our main regression results rather than establish definitive relationships. Caution is exercised in interpreting these results, as the statistical significance of the association is not firmly established. Further research with a larger sample size may be necessary to obtain more conclusive evidence on the relationship between risk governance characteristics and the regulatory capital ratio. It's pertinent to note that while this study delves into the relationship between risk governance characteristics and regulatory adjustments, ~~Karyani et al. (2020) investigated the impact of risk governance and market competition on banks' operational risk disclosure quality in the ASEAN-5 banking sector. Their findings underscore the broader significance of risk governance practices in the banking industry and the potential interplay between governance and market factors.~~

The sensitivity analysis, robust to heteroskedasticity using bootstrap replication, provides additional insights into the relationship between risk governance characteristics and the TCR. The coefficient for RGI in the main regression analysis remains statistically significant

and negative (-0.0585, $p < 0.05$) even after accounting for potential variations in the estimation.

The negative association between RGI and TCR suggests that there's a correlation between risk governance characteristics, as captured by RGI, and the overall capital adequacy of banks, as reflected by the total capital ratio. This indicates that while risk governance characteristics may be associated with higher tier 1 capital, which primarily consists of a bank's core capital, they may not necessarily correlate with tier 2 capital, which includes supplementary capital like subordinated debt and loan-loss reserves, or other components of the total capital.

The bootstrap results further support the main regression findings, confirming the stability of the negative coefficient for RGI across the bootstrap replications. This consistency strengthens the evidence that risk governance characteristics have a limited influence on the TCR of banks.

These findings suggest that risk governance characteristics may play a more significant role in enhancing the core capital component (tier 1 capital) of banks, while their impact on other components, such as tier 2 capital, may be limited. It is essential to consider additional factors that influence the TCR beyond risk governance characteristics, as they may contribute to a more comprehensive understanding of the bank's overall capital structure.

In the sensitivity analysis, the exploration of the relationship between risk governance characteristics and regulatory capital ratios, as seen through the lens of RGI's impact on TIER1 and TCR, offers a nuanced perspective on governance practices. This aligns with and extends the findings of Karyani et al. (2020), who examined the influence of risk governance and market competition on banks' operational risk disclosure quality in the ASEAN-5 banking sector. Their study underscores the broad significance of risk governance in banking and the interplay between governance and market factors, a theme that resonates with the current study's focus on regulatory capital ratios.

[insert table VI here]

4.6. Discussion

The results of the main regression analysis and sensitivity analysis provide valuable insights into the relationship between risk governance characteristics and regulatory adjustments in public commercial banks within the OECD. The findings suggest that risk governance characteristics, particularly those represented by CRO, CFO, and SENIOR, play a crucial role in mitigating regulatory adjustments and ensuring regulatory compliance. The negative associations observed in the correlation analysis (Section 4.2, Table III) and regression analysis indicate that a stronger presence of these risk governance characteristics is associated with lower levels of regulatory adjustments. This supports the hypothesis that effective risk governance practices contribute to the stability and reputation of public commercial banks within the OECD. While the direct impact on stability and reputation is beyond the scope of this study, it's evident that effective risk governance practices can influence regulatory adjustments in public commercial banks within the OECD. As highlighted by Srivastav and Hagendorff (2016), governance mechanisms play a crucial role in shaping bank risk-taking behaviors, emphasizing the need for internal governance mechanisms that reflect the needs of various stakeholders to ensure financial stability.

These findings are consistent with the earlier discussion emphasizing the significance of risk governance roles, particularly the roles of CRO, CFO, and SENIOR, in influencing regulatory adjustments. This alignment with previous research, such as that by Stolz et al. (2003), further underscores the importance of these roles in enhancing risk management practices within public commercial banks. The results also align with the principles set out in regulatory frameworks that emphasize risk governance and regulatory compliance. Specifically, the Basel III framework, introduced by the Basel Committee on Banking Supervision, focuses on strengthening bank capital requirements and introducing new regulatory requirements on bank liquidity and bank leverage. These measures are designed to enhance the resilience of the banking sector and reduce the risk of systemic failures. While this study does not directly address the concept of "stability," the findings do shed light on the relationship between risk governance characteristics and regulatory adjustments in public commercial banks.

The sensitivity analysis, as presented in Table VI, was conducted to assess how the main results with the RA variable might change if the dependent variable is altered to TIER1 or TCR. For the models with TIER1 as the dependent variable, there's a positive association with the RGI variable, indicating that an enhancement in risk governance correlates with an increase in TIER1. However, this association is significant at the 10% level in Model 1. Additionally, the SIZE variable shows a negative relationship with TIER1, significant at the 1% level, suggesting that larger banks might have a lower TIER1. The CEOAD and BS variables do not exhibit statistical significance in these models. It's essential to interpret these findings in the context of the broader research and consider the implications for risk governance practices in public commercial banks within the OECD. Future research, especially studies like that of Ekawati et al. (2021) which delve into the interplay between risk management, capital structure, and corporate governance, can offer deeper insights into the influence of risk governance characteristics on banks' financial performance and capital structure.

While the main regression results, as presented in Table V, indicate a negative association between RGI and RA, the sensitivity analysis for TCR, robust to heteroskedasticity using bootstrap replication, also reveals a negative association between RGI and TCR. This contrast with the positive association observed for TIER1 underscores the nuanced impact of risk governance on different components of banks' capital structure and regulatory adjustments. This suggests that risk governance characteristics, as represented by RGI, may have a differential impact on different components of the bank's capital structure. Further research is necessary to explore the specific reasons behind this negative association and its implications for bank risk management and capital adequacy.

Overall, the results of this study contribute to the existing literature on risk governance, regulatory compliance, and their relationship with regulatory adjustments in public commercial banks within the OECD. The findings highlight the importance of effective risk governance practices in mitigating regulatory adjustments and maintaining financial stability. In line with the insights from Francis and Osborne (2012), who examined the effects of regulatory capital requirements on bank behavior in the UK, policymakers and bank regulators can use these findings to inform their efforts in strengthening risk governance frameworks and promoting regulatory compliance in the banking sector. This is especially pertinent given the ongoing debates surrounding the design and calibration of international capital standards.

5. Conclusion

Findings from the analysis support the hypothesis that the presence of specific roles, namely a CRO, CFO, and SENIOR, have a significant negative association with regulatory adjustments. As clarified in section 4.6, along with the overall risk governance characteristics, these three roles in particular stand out as significant based on their loadings in the PCA. This implies that stronger risk governance, represented by these characteristics, can reduce the level of regulatory adjustments in banks. While the study does not directly address financial stability, the observed reduction in regulatory adjustments suggests a more compliant and, by implication, a potentially more stable banking environment. This conclusion provides valuable insights for policymakers and bank regulators, as they can focus their efforts on enhancing these specific risk governance practices to promote regulatory compliance and indirectly contribute to the stability of the banking sector.

However, while the findings are consistent and hold true across various tests and conditions, it is crucial to acknowledge the limitations of the study. The sample size and dataset used in this study might limit the generalizability of the findings. A larger sample size, a more diverse set of data, or focusing on a specific group of banks, might yield different results. It is also important to remember that correlation does not imply causation, and while the study found associations, more research is required to establish causal relationships.

This study enriches the literature on risk governance and regulatory compliance in OECD public commercial banks. It reveals the impact of roles like CRO, CFO, and SENIOR on regulatory adjustments, offering insights for future research and policy-making. While not directly addressing financial stability, the findings suggest effective risk governance may enhance regulatory compliance and indirectly indicate a more stable banking environment.

In terms of future research, it would be valuable to delve deeper into the specific mechanisms through which risk governance characteristics influence different components of a bank's capital structure. This could provide more granular insights into the dynamics of risk governance and its implications for bank performance. The study's conclusions underscore the significance of specific risk governance roles in reducing regulatory adjustments, suggesting a more compliant and potentially stable banking environment. These

insights offer practical implications for policymakers and bank regulators, highlighting the importance of enhancing risk governance practices, particularly focusing on roles like CRO, CFO, and SENIOR, to promote regulatory compliance and indirectly support banking sector stability. The limitations of the study, such as sample size and dataset scope, point towards the need for further research to generalize these findings and establish causal relationships. Future research should explore the mechanisms through which risk governance characteristics influence bank capital structure and performance, as well as the collective impact of various governance elements on regulatory adjustments and stability. This study contributes to the literature on risk governance and regulatory compliance, particularly in OECD public commercial banks, and provides a foundation for future policy-making and research initiatives. By suggesting directions for further investigation, it bridges the gap between theory and practice, offering a path for applying these insights in real-world banking and regulatory scenarios. Additionally, considering other risk governance characteristics not covered in this study could offer a more comprehensive view of the landscape. Exploring the interaction and synergy effects between different risk governance characteristics might also shed light on how these elements collectively impact regulatory adjustments and overall bank stability. We encourage researchers to take these suggestions into account as they continue to expand the knowledge base in this domain.

References

Abdel-Wanis, E. (2021~~).~~), *"The impact of regulatory capital and bank characteristics on the relationship between bank competition and risk taking in the banking system~~.~~",* Journal of Accounting, Business and Management (JABM), Vol. 28~~(~~ No. 1~~),~~, pp. 87-100.

~~Abou-El-Sood, H.,~~ Abou-El-Sood, H. and ~~Shahin, R.~~ Shahin, R. (2023~~).~~), *"Bank competition, regulatory capital, and risk taking: international evidence~~. Managerial Finance~~",* Managerial Finance, Vol. 49 No. 10, pp. 1614-1640. https://doi.org/10.1108/MF-06-2022-0277

Adams, R., and Ferreira, D. (2009), *"Women in the boardroom and their impact on governance and performance"*, Journal of Financial Economics, Vol. 94, pp. 291–309.

Aebi, V~~.~~., Sabato, G. and Schmid, M. (2012), *"Risk management, corporate governance, and bank performance in the financial crisis"*, Journal of Banking ~~*and*~~& Finance, Vol. 36, pp. 3213–3226.

Agarwal, S., and Wang, F.H. (2009), *"Perverse incentives at the banks? Evidence from a natural experiment"*, Working Paper 2009–08. Federal Reserve Bank of Chicago.

Andres, P. de. and Vallelado, E. (2008), *"Corporate governance in banking: The role of the board of directors",* Journal of Banking and Finance, Vol. 32 No. 12, pp.2570–2580. https://doi.org/10.1016/j.jbankfin.2008.05.008

Bargeron, L.L. Lehn, K.M. and Zutter, C.J. (2010), *"Sarbanes-Oxley and corporate risk-taking",* Journal of Accounting and Economics, Vol. 49 No. 1-2, pp. 34-52.

Basel Committee on Banking Supervision. (2011).), *"Basel III: A global regulatory framework for more resilient banks and banking systems",* Bank for International Settlements.

BCBS (2015), *"Corporate Governance Principles for Banks, Bank for International Settlements",* available at: https://www.bis.org/bcbs/publ/d328.pdf (accessed 21 June 2023).

Berger, A. N., Kick, T., and Schaeck, K. (2014), "*"Executive board composition and bank risk taking",* Journal of Corporate Finance, Vol. 28, pp. 48-65.

Birindelli, G. and Ferretti, P. (2013), *"Compliance function in Italian banks: organizational issues",* Journal of Financial Regulation and Compliance, Vol. 21 No. 3, pp. 217–240.

Birindelli, G. andFerretti, P. (2008), *"Compliance risk in Italian banks: the results of a survey",* Journal of Financial Regulation and Compliance, Vol. 16 No. 4, pp. 335–351.

BIS (2019), *"CAP30, Regulatory Adjustments",* available at: https://www.bis.org/basel_framework/chapter/CAP/30.htm

Brancato, C., Tonello, M., Hexter, E., and Newman, K. R. (2006), *"The role of US corporate boards in enterprise risk management",* The Conference Board Research Report, No. R-1390-06-RR.

Caprio, G. and Levine, R. (2002), *"Corporate governance in finance: Concepts and international observations",* in Financial Sector Governance: The Roles of the Public and Private Sectors, pp.17-50.

Chao, Y.-S. and Wu, C.-J. (2017), *"Principal component-based weighted indices and a framework to evaluate indices: Results from the Medical Expenditure Panel Survey 1996 to 2011",* PLoS One, Vol. 12 No. 9, e0183997–e0183997.

DIRECTIVE 2013/36/EU of the European Parliament and of the Council of 26 June 2013, available at: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32013L0036 (accessed 21 June 2023).

Dodd-Frank Wall Street Reform and Consumer Protection Act, Public Law 203, U.S. Statutes at Large 124 (2010): pp. 1376-2223.

Drake, L., Hall, M.J. and Simper, R. (2006), *"The impact of macroeconomic and regulatory factors on bank efficiency: A non-parametric analysis of Hong Kong's banking system",* Journal of Banking and Finance, Vol. 30 No. 5, pp.1443-1466.

Ekawati, N., Purwohedi, U. and Warokka, A. (2021), *"The Influence of Risk Management, Third-Party Funds and Capital Structure on Banking Sector Financial Performance in Indonesia and Thailand with Corporate Governance as Moderating Variable in 2015-2019",* Oblik i Finansi, No. 94, pp.71-80.

Erin, O., Asiriuwa, O., Olojede, P., Ajetunmobi, O. and Usman, T. (2018), *"Does risk governance impact bank performance? Evidence from the Nigerian banking sector",* Academy of Accounting and Financial Studies Journal, Vol. 22 No. 4, pp.1-14.

Erkens, D. H., Hung, M., and Matos, P. (2012), *"Corporate governance in the 2007–2008 financial crisis: Evidence from financial institutions worldwide",* Journal of Corporate Finance, Vol. 18, pp. 389–411.

Fiene, R. (2016), *"A Treatise on the Theory of Regulatory Compliance",* Journal of Regulatory Science, Vol. 7 No. 1-3.

Francis, B. B., and Osborne, M. (2012), *"Capital requirements and bank behavior in the UK: Are there lessons for international capital standards?",* Journal of Banking and Finance, Vol. 36 No. 3, pp. 803-816.

Gontarek, W., and Belghitar, Y. (2018), *"Risk governance: Examining its impact upon bank performance and risk-taking",* Financial Markets, Institutions and Instruments, Vol. 27 No. 5, pp. 187-224.

Gropp, R., Mosk, T., Ongena, S., Simac, I., and Wix, C. (2021~~).~~), *"Supranational rules, national discretion: Increasing versus inflating regulatory bank capital~~?~~.? ",* Journal of Financial and Quantitative Analysis, pp. 1-58.

Karyani, E., Kolade, O. and Dewo, S.A. (2020), *"Risk governance, market competition and operational risk disclosure quality: a study of the ASEAN-5 banking sector",* Journal of Operational Risk, Vol. 16 No. 2.

Kirkpatrick, G. (2009), *"The corporate governance lessons from the financial crisis",* OECD Journal: Financial Market Trends, Vol. 2009 No. 1, pp.61-87.

Lingel, A. and Sheedy, E. A. (2012), *"The Influence of Risk Governance on Risk Outcomes – International Evidence",* Macquarie Applied Finance Centre Research Paper 37, available at SSRN: https://ssrn.com/abstract=2187116 (accessed 21 June 2023).

Lubberink, M. J. P., and Willett, R. J. (2023~~).~~), *"How sensitive are bank market values to regulatory adjustments of capital~~?~~.? ",* Available at SSRN 4172870.

McNulty, T., Florackis, C., and Ormrod, P. (2013), *"Boards of directors and financial risk during the credit crisis",* Corporate Governance: An International Review, Vol. 21 No. 1, pp. 58–78.

Minton, B. A., Taillard, J. P., and Williamson, R. (2014), *"Financial Expertise of the Board, Risk Taking, and Performance: Evidence from Bank Holding Companies",* Journal of Financial and Quantitative Analysis, Vol. 49 No. 2, pp. 351–380.

Mongiardino, A., and Plath, C. (2010), *"Risk governance at large banks: have any lessons been learned? ",* Journal of Risk Management in Financial Institutions, Vol. 3, pp. 116–123.

Nguyen, Q. K. and Dang, V. C. (2022), *"The impact of risk governance structure on bank risk management effectiveness: evidence from ASEAN countries",* Heliyon, Vol. 8 No. 10, e11192–e11192. https://doi.org/10.1016/j.heliyon.2022.e11192.

Quintyn, M. and Chenard, K. (2004~~).~~), *"Does Regulatory Governance Matter for Financial System Stability? An Empirical Analysis~~,~~"*, IMF Working Paper No. 04/89, available at SSRN: https://ssrn.com/abstract=878912 (accessed 21 June 2023).

Rachdi, H., and Ben Bouheni, F. (2016), *"Revisiting the effect of regulation, supervision, and risk on banking performance: Evidence from European banks based on PSTR model"*, Journal of Financial Regulation and Compliance, Vol. 24 No. 1, pp. 24–40.

Srivastav, A. and Hagendorff, J. (2016), *"Corporate governance and bank risk-taking"*, Corporate Governance: An International Review, Vol. 24 No. 3, pp.334-345.

Stock, J.H., and Watson, M.W. (2008), *"Heteroskedasticity-Robust Standard Errors for Fixed Effects Panel Data Regression"*, Econometrica, Vol. 76 No. 1, pp. 155–174. https://doi.org/10.1111/j.0012-9682.2008.00821.x.

Stolz, S., Heid, F., and Porath, D. (2003), *"Does capital regulation matter for bank behavior? Evidence for German savings banks"*, Kiel Working Paper, No. 1192, Kiel Institute for the World Economy (IfW), Kiel.

Streukens, S., and Leroi-Werelds, S. (2016), *"Bootstrapping and PLS-SEM: A step-by-step guide to get more out of your bootstrap results"*, European Management Journal, Vol. 34 No. 6, pp. 618-632.

Van Greuning, H. and Bratanovic, S.B. (2020), *"Analyzing Banking Risk: A Framework for Assessing Corporate Governance and Risk Management~~,~~"*, World Bank Publications.

Yao, J., Hisham Noori Hussain, A. H., Waleed Noori, H., and Haider Noori, H. (2023~~).~~), *"Comparative Analysis of the Global Banking System A Study of the American and Chinese Banking Regulations~~.~~"*, International Journal on Economics, Finance and Sustainable Development, Vol. 5~~(~~ No. 11~~),~~ pp. 73-82.