RISK GOVERNANCE AND FINANCIAL PERFORMANCE OF PUBLIC COMMERCIAL BANKS OF THE OECD

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Abstract

This study investigates a relationship between risk governance characteristics and financial performance in public commercial banks across the Organization for Economic Co-operation and Development (OECD) countries. Drawing on the upper echelons theory (UET) (Hambrick & Mason, 1984), it hypothesizes a positive relationship between risk governance characteristics and financial performance. An econometric model is applied to a comprehensive dataset of bank-director years spanning from 2001 to 2019. The empirical findings provide robust evidence supporting a positive and statistically significant relationship between risk governance characteristics of bank directors and financial performance in public commercial banks (Adams et al., 2010). Banks with stronger risk governance structures and characteristics exhibit significantly higher financial performance outcomes. The implications of this study are twofold. Firstly, it highlights the crucial role of efficient and effective risk governance practices in boosting financial performance in the banking sector. The research suggests that banks can greatly benefit from robust risk management systems, enhanced board independence, and expanded director expertise. Additionally, the findings provide actionable guidance for bank directors, regulators, and policymakers in shaping risk governance frameworks and policies. These insights indicate that effective risk governance indirectly improves financial performance and bank stability.

Keywords: Risk Governance, Bank Directors, Financial Performance, Upper Echelons Theory, Public Commercial Banks

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1. INTRODUCTION

This study investigates the relationship between risk governance characteristics and financial performance in OECD public commercial banks, hypothesizing a positive relationship between these aspects. The global financial crisis of 2007–2008 underscored the critical role of effective risk governance in banking. During the crisis, weaknesses in risk governance led to excessive risk-taking and

significant losses for many banks (Beltratti & Stulz, 2012). As a result, there has been a growing emphasis on the importance of robust risk governance frameworks in the banking industry. However, the understanding of the relationship between risk governance and financial performance in banking remains incomplete, with existing literature primarily focused on large, publicly traded banks in developed countries.

This study aims to address this gap by examining the relationship between risk governance characteristics and financial performance in the context of public commercial banks in the Organization for Economic Co-operation and Development (OECD) countries. The emphasis is on understanding the collective effect of risk governance characteristics on financial performance, without delving into specific national contexts or different bank types.

The theoretical foundation of this study is the upper echelons theory (UET), which posits that an organization's strategic choices and performance outcomes are influenced by the characteristics of its top executives (Hambrick & Mason, 1984). The UET has been influential in the study of strategic leadership, providing a framework for examining the impact of top executives on organizational outcomes. In the context of banking, the UET suggests that the characteristics of bank directors, such as their tenure and professional experiences, play a significant role in shaping a bank's approach to risk management and its financial performance (Minton et al., 2014; Faleye et al., 2011).

While numerous studies have examined the relationship between risk governance and financial performance in banking, the focus has primarily been on large banks in developed countries. For example, Pathan (2009) found that banks with stronger risk governance structures exhibited better financial performance during the crisis period. Ellul and Yerramilli (2013) also highlighted the importance of robust risk controls in enhancing financial performance for U.S. bank holding companies. Additionally, Adams and Mehran (2012) explored the relationship between bank board structure and performance, finding evidence that certain characteristics of bank boards were associated with better financial outcomes. Further expanding on this theme, Almashhadani and Almashhadani (2022) explored the broader implications of corporate governance as an internal control mechanism on corporate performance, providing additional insights into this complex relationship.

However, this existing literature has limitations. It often overlooks the unique characteristics of public commercial banks and the diversity of national contexts. Therefore, this study focuses on public commercial banks in OECD countries to provide a more comprehensive understanding of the relationship between risk governance and financial performance in banking. The research methodology employs a comprehensive dataset of bank-director years, covering the period from 2001 to 2019. This dataset, capturing multiple directors within banks over the years, enables the examination of the relationship between risk governance characteristics and financial performance. The study employs a robust econometric model that controls for country and time-fixed effects, accounting for unobserved heterogeneity across countries and time.

Building upon the UET and the reviewed literature, the main hypothesis of this study is that there is a positive relationship between the risk governance characteristics of bank directors and the financial performance of banks. This hypothesis is based on the understanding that effective risk governance practices lead to better financial outcomes (Pathan, 2009; Adams & Mehran, 2012). However, it is important to recognize the complex nature of this relationship, which is influenced by various contextual factors and unobserved variables.

The findings of this study will contribute to the existing literature by offering insights into the relationship between risk governance and financial performance specifically for public commercial banks in OECD countries. The results will provide valuable information for bank directors, regulators, and policymakers, helping them make informed decisions regarding risk governance practices and enhancing financial performance in the banking sector.

The remaining structure of this paper is as follows. Section 2 provides a comprehensive review of the relevant theory and literature, highlighting the significance of risk governance and the role of bank directors in financial performance. Section 3 describes the research design, including the dataset and the econometric model employed in the study. Section 4 presents the results and analysis, discussing the findings pertaining to the relationship between risk governance characteristics and financial performance. Finally, Section 5 concludes the paper by summarizing the key findings, discussing their implications, and offering suggestions for future research.

2. THEORETICAL BACKGROUND, LITERATURE REVIEW, AND HYPOTHESIS DEVELOPMENT

2.1. Theoretical background

The theoretical underpinning of this study is the UET, introduced by Hambrick and Mason (1984). The UET posits that an organization's strategic choices and performance outcomes are partially predicted by the characteristics of its top executives. This theory has been extensively applied and expanded in various contexts, including banking (Hambrick, 2007; Carpenter et al., 2004; Beltrame et al., 2022).

The UET has been instrumental in shifting the focus of organizational studies from impersonal factors such as technology and structure to the human agents who shape and execute strategy. It has been particularly influential in the study of strategic leadership, providing a theoretical basis for examining the role of top executives in shaping organizational outcomes. For instance, Hambrick and Mason (1984) posited that executive characteristics influence their interpretations and choices, which, in turn, affect organizational outcomes. Further, Finkelstein and Hambrick (1990) found that executive tenure and functional background play a significant role in strategic choices and company performance. Recent studies, such as those by Hambrick (2007), have continued to underscore the importance of understanding executive characteristics and their impact on strategic decisions and organizational performance. Almashhadani and Almashhadani

(2022) further examine the nuances of corporate governance as an internal control mechanism, enriching the discourse on governance and performance.

The UET has been instrumental in understanding the role of top executives in shaping organizational outcomes. However, it has faced critiques for its primary emphasis on top executives, potentially not giving adequate attention to the influence of middle management and other organizational factors (Hambrick, 2007). Additionally, some scholars have raised concerns about the theory's assumption that executives always act in the best interests of the organization, suggesting personal interests or biases might sometimes play a role (Hambrick & Finkelstein, 1987). Despite these critiques, the UET's general applicability has been underscored by various studies, including its relevance in the banking sector as highlighted by Macey and O'Hara (2003). This study, however, narrows its focus to the UET's applicability in the specific context of risk governance in OECD banks. While foundational works have established the UET's core principles, more recent studies by Rost and Osterloh (2010), Plöckinger et al. (2016), Bassyouny et al. (2020), and Yamak et al. (2014) have expanded its scope and applicability. This underscores the theory's evolving nature and its continued relevance in various contexts, including banking.

2.2. Literature review

The relationship between risk governance and financial performance has been a focal point in banking literature. Several studies have highlighted the importance of effective risk governance in enhancing banks' financial performance (Pathan, 2009; Ellul & Yerramilli, 2013; Adams & Mehran, 2012). These studies suggest that banks with robust risk governance structures tend to exhibit better financial performance. This is further supported by Gontarek and Belghitar (2018), who examined the impact of risk governance on bank performance and risk-taking. Similarly, Almashhadani and Almashhadani (2022) delved into how corporate governance, as a broader concept, impacts corporate performance, offering a complementary perspective to the existing literature. Additionally, Beltrame et al. (2022) provide evidence of the effect of fintech investments on listed banks in Italy, further contributing to this narrative. However, it is important to note that these studies often use different measures of risk governance and financial performance, which can make direct comparisons challenging.

In line with the UET, the characteristics of bank directors have also been found to influence banks' risk-taking behavior and financial performance (Minton et al., 2014; Faleye et al., 2011). For instance, directors with longer tenures and more diverse professional experiences are associated with more prudent risk-taking and better financial performance. Similarly, Hundal and Zinakova (2021) explore the impact of financial technology in the Finnish banking sector, a key factor in modern risk governance. This suggests that the composition and characteristics of the board can significantly influence a bank's approach to risk management and its financial outcomes. Similarly, Gontarek and Belghitar (2018) found that risk governance plays a crucial role in managing bank performance and risk-taking. However, these findings are not universal and may be influenced by other factors such as the bank's size, industry, and regulatory environment.

The literature also indicates that the relationship between risk governance and financial performance may vary across different national contexts due to differences in regulatory environments, economic conditions, and governance structures (Beltratti & Stulz, 2012; Erkens et al., 2012; Laeven & Levine, 2009; Kolia & Papadopoulos, 2020; Porretta & Benassi, 2021). This suggests the need for a more nuanced understanding of this relationship, which this study aims to provide. In line with this, Gontarek and Belghitar (2018) also emphasized the importance of examining the impact of risk governance on bank performance across different national contexts. The study's emphasis on OECD countries aims to provide an overarching perspective on the relationship between risk governance and financial performance within this group of nations. While a detailed comparative analysis across individual national contexts is beyond the scope of this paper, the focus on OECD countries offers valuable insights into the broader trends and patterns related to risk governance in these economies. In a comparative analysis, Chen et al. (2019) show how risk management affects financial performance in Chinese listed commercial banks, offering insights relevant to OECD banks.

2.3. Hypothesis development

Drawing from the UET and the reviewed literature, the following hypothesis is proposed:

H1: There is a positive relationship between the risk governance characteristics of bank directors and the financial performance of banks.

The hypothesis of this study draws directly from the foundational premise of the UET, which asserts that the characteristics and backgrounds of top executives play a pivotal role in shaping organizational outcomes. This theoretical perspective is complemented by empirical studies, such as those by Pathan (2009), Adams and Mehran (2012), and Minton et al. (2014), which have found a positive association between risk governance and financial performance. By integrating the insights from UET with the findings from these empirical studies, the hypothesis is firmly rooted in both theoretical and empirical grounds. However, it is important to acknowledge that this hypothesis is based on a simplification of a complex reality. In practice, the relationship between risk governance and financial performance is likely to be influenced by a multitude of factors, some of which may not be captured in this study.

This hypothesis (*H1*) will be tested using a comprehensive dataset of bank-director years and a robust econometric model, as detailed in the research design section of this study. The results of this study will contribute to the existing literature by providing a more nuanced understanding of the relationship between risk governance and financial performance in the context of OECD countries.

In formulating this hypothesis, potential limitations and challenges have been recognized. The relationship between risk governance and

financial performance might be influenced by factors that remain unobserved and are not included in the dataset. Additionally, this relationship could be non-linear and might differ based on the type of bank, country, or specific time. To address these complexities, country, and year-fixed effects have been incorporated into the study, ensuring that unobserved country-specific characteristics and global temporal trends are accounted for. This methodological choice deepens the understanding, considering the potential intricacies introduced by country-specific factors and changes over time. While the hypothesis lays a foundational framework for the study, it also aims to provide distinct insights, enriching the comprehension of the nuanced relationship between risk governance and financial performance.

Furthermore, the formulation of *H1* draws from an extensive review of the existing literature, which inherently comes with its own set of limitations. Notably, a significant portion of the studies under review utilize cross-sectional data, which can curtail their capacity to deduce causal relationships. This particular constraint is elaborated upon by Savitz and Wellenius (2023), who elucidate the intricacies and challenges associated with using cross-sectional studies for causal inference. Additionally, most of these studies predominantly target large, publicly traded banks, potentially not offering a comprehensive representation of the entire banking sector. Nevertheless, the prevailing literature offers invaluable insights that have been instrumental in shaping this study's hypothesis. In this context, Almashhadani and Almashhadani (2022) provide a recent perspective on corporate governance and performance, highlighting the evolving nature of this research area.

3. RESEARCH DESIGN

3.1. Data collection and description

The research methodology employed a comprehensive dataset from the BankFocus and BoardEx databases. Specifically, the financial information was sourced from the BankFocus database, while BoardEx provided extensive information about board members. The dataset used in this study comprises 14,410 bank-director years, capturing the presence of multiple directors within banks over the years 2001 to 2019 (Hermalin & Weisbach, 2012). These bank-director years represent unique combinations of banks, directors, and years. Additionally, the dataset includes 1107 unique bank years, indicating the presence of 1107 distinct banks across the years covered in the dataset (Adams & Mehran, 2012). Furthermore, the dataset contains 14,218 director-year observations, representing unique combinations of directors and years in the dataset.

The dataset consists of 22 variables related to banks, their directors, and financial information. The dataset includes information on the country, bank-specific International Securities Identification Number (ISIN), and a unique identifier for each director. The dependent variables include the natural logarithm of net income (*LNNI*), the natural logarithm of impaired loans to gross loans (*LNILGL*), the natural logarithm of loan loss reserves to gross loans (*LNLLRGR*), and the natural logarithm of net charge-offs to average gross loans (*LNNCOAGL*). These variables are chosen to provide a comprehensive view of a bank's financial performance and risk profile.

The independent variable of interest, the risk governance index (*RGI*), is derived from a principal component analysis (PCA) of various risk governance characteristics: the presence of a risk committee (RC), a chief risk officer (CRO), a chief financial officer (CFO), directors with Ph.D. degrees (TITLE), directors aged between 66–75 years old (SENIOR), and independent directors (BI). The first principal component from the PCA is selected as the RGI, reflecting the aggregated strength of a bank's risk governance practices.

The motivation behind these variables is rooted in the theoretical understanding that robust risk governance can lead to better financial performance and lower risk levels. By employing these variables, it was aimed to capture the complex dynamics of risk governance and its impact on bank performance.

The dataset used in this study encompasses 28 distinct countries of the OECD. It includes a total of 120 unique banks and 3,121 unique directors. For a more detailed breakdown, the dataset indicates that 81 banks have a RC, 15 banks have a CRO, 54 banks have a CFO, 91 banks have TITLE, 117 banks have SENIOR, and 118 banks have BI.

The dataset for this study was meticulously compiled by integrating data from two primary sources, BankFocus and BoardEx. The selection criteria for the banks included those that are active, listed, and have C1 financial statements, which are comprehensive statements encompassing the financial activities of controlled subsidiaries or branches without any unconsolidated counterparts, as well as C, which represents additional consolidated statements.

The coding for the financial variables, such as net income, impaired loans, loan loss reserves, and net charge-offs, was derived from the BankFocus database. Concurrently, the coding for the governance variables, including the presence of a RC, a CRO, a CFO, and the other director attributes, was obtained from the BoardEx database.

The matching key for the merging procedure was the ISIN along with the corresponding year. This method ensured the resulting dataset was accurately matched and unique for each bank, director, and year, laying a solid foundation for the analysis that followed. This meticulous approach to data integration was crucial for the integrity and reliability of the research findings.

This research aims to explore the intricate relationship between risk governance and financial performance across a broad spectrum of banks in OECD countries. The scope encompasses a comprehensive dataset, deliberately including all data points to ensure a holistic analysis that reflects the real-world diversity and complexity of the banking sector. It is worth noting that due to the large number of countries and banks included, the dataset may contain outliers. However, the study's design intentionally integrates these outliers, as excluding them is deemed irrelevant in this context (Hair et al., 2010). These data points provide valuable insights, as they represent valid, unique scenarios that contribute to a deeper understanding of the relationships between the variables under study. Consequently, the methodology does not employ winsorizing or other outlier management techniques, maintaining the integrity of the dataset's variability

and allowing for a realistic portrayal of the financial landscape. This approach aligns with the study's objective to capture the full range of risk governance practices and their impact on financial outcomes, including the potential influence of outliers.

3.2. Research methodology

The research methodology employed a comprehensive dataset from the BankFocus and BoardEx databases, with the latter offering extensive information about board members. While this study employs a comprehensive dataset from BankFocus and BoardEx, alternative methodologies could have included qualitative approaches such as case studies or interviews with bank executives to gain deeper insights into risk governance practices. The dataset used in this study comprises 14,410 bank-director years, covering the period from 2001 to 2019, and includes 1,107 unique bank years and 14,218 director-year observations (Hermalin & Weisbach, 2012; Adams & Mehran, 2012). These figures signify the number of banks and directors over the years involved in the study.

The selection of variables from the database was informed by the need to assess risk governance factors, such as the number of board members and their professional qualifications, among others (Adams et al., 2010). An alternative approach might have been a qualitative analysis, like comparative case studies, which could provide richer contextual insights into the board composition and risk governance practices. 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 (Harm, 2002).

Variables of interest were standardized to reconcile differences in scale and ensure comparability (Hair et al., 2010). A PCA was conducted on these standardized variables to reduce the dimensionality of the data while capturing the most significant variance through the principal components.

Subsequently, the data were transitioned into a panel setup, arranged based on unique combinations of bank and director identifiers and the corresponding year (Wooldridge, 2010). An econometric model was designed to encapsulate the net income occurring in different banks in OECD countries (Greene, 2003). Another viable approach could have been a mixed-methods design, integrating quantitative findings with qualitative insights from interviews with banking executives, to comprehensively explore the dynamics of risk governance and financial performance.

Model 1

$$LNNI_{bt} = \beta_0 + \beta_1 * RGI_{bt} + \beta_2 * CEOAD_{bt} + \beta_3 * BS_{bt} + \beta_4 * SIZE_{bt} + \alpha_c + \gamma_t + \varepsilon_{bt} \quad (1)$$

The first model examines the relationship between the dependent variable, *LNNI*, where b represents the bank and t denotes time in years. The variables selected for this study have been grounded in the existing literature and are believed to influence the financial performance of banks significantly. The *LNNI*, representing the natural logarithm of net income, is standardized across all countries under international reporting standards. This standardization ensures that differences in taxation across countries are accounted for, eliminating potential biases in the results. However, it is essential to consider this aspect when interpreting the findings, and it will be highlighted in the limitations section for comprehensive understanding. The model assesses the relationship with the independent variables: *RGI*, which is renamed as *COMP1* from *PCA, CEOAD, BS,* and *SIZE*. The model controls for countries and time-fixed effects, represented by α_c and γ_t, respectively, to account for unobserved heterogeneity across countries and time periods (Wooldridge, 2010). The error term, ε_{bt}, captures the unobserved factors influencing the dependent variable. To address potential correlation within banks, clustered standard errors at the bank level are employed (Petersen, 2008). These adjustments mirror the diverse national regulatory environments, economic conditions, and governance structures (OECD, 2010).

The regression analysis was conducted using the "reghdfe" command in Stata, designed for linear regression models with multiple levels of fixed effects. This command was utilized to efficiently absorb both year and country-fixed effects, accounting for unobserved heterogeneity. The standard errors were clustered at the bank level to ensure robustness against potential correlations within banks (Correia, 2014). To assess the robustness of the main regression analysis, a bootstrap procedure with 100 repetitions was conducted. To assess the robustness of Model 1, Model 1a was derived by employing a bootstrap technique with 100 replications. This technique was used to assess the stability and reliability of the results from Model 1 (Efron & Tibshirani, 1994). The "a" in Model 1a indicates the application of bootstrapping to the original model. 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 (Efron & Tibshirani, 1994). The estimated coefficients and their significance levels are evaluated using the bootstrap results (Efron & Tibshirani, 1994).

A sensitivity analysis was conducted to further validate the findings of the primary model. The selection of different dependent variables, namely *LNILGL*, *LNLLRGR,* and *LNNCOAGL*, was informed by their significance in the banking sector. *LNILGL* represents the natural logarithm of impaired loans to gross loans, which provides insights into the quality of a bank's loan portfolio. On the other hand, *LNLLRGR* indicates the natural logarithm of loan loss reserves to gross loans, shedding light on the bank's preparedness for potential loan defaults. Lastly, *LNNCOAGL* reflects the natural logarithm of net charges offs to average gross loans, offering a perspective on the bank's actual losses from defaulted loans. These variables were specifically chosen as they offer diverse insights into the bank's financial performance and risk exposure. The fixed effects model was estimated using these variables,

with standard errors clustered at the bank level, and a bootstrap technique with 100 repetitions was employed to assess the robustness of the results (Efron & Tibshirani, 1994).

Sensitivity models: The sensitivity analysis aimed primarily to test the robustness of the primary model's findings against different measures of bank performance. While the dependent variables were altered to represent various aspects of bank performance, the set of independent variables remained consistent across all models. This decision was grounded in the theoretical and empirical evidence that highlights the significance of these independent variables in influencing bank performance. Keeping the independent variables consistent ensures that any variations observed in the results can be attributed solely to the change in the dependent variable, providing a clearer understanding of the relationship dynamics.

Model 2

$$LNILGL_{bt} = \gamma_0 + \gamma_1 * RGI_{bt} + \gamma_2 * CEOAD_{bt} + \gamma_3 * BS_{bt} + \gamma_4 * SIZE_{bt} + \alpha_c + \gamma_t + \varepsilon_{bt} \quad (2)$$

Model 3

$$LNLLRGR_{bt} = \delta_0 + \delta_1 * RGI_{bt} + \delta_2 * CEOAD_{bt} + \delta_3 * BS_{bt} + \delta_4 * SIZE_{bt} + \alpha_c + \gamma_t + \varepsilon_{bt} \quad (3)$$

Model 4

$$LNNCOAGL_{bt} = \theta_0 + \theta_1 * RGI_{bt} + \theta_2 * CEOAD_{bt} + \theta_3 * BS_{bt} + \theta_4 * SIZE_{bt} + \alpha_c + \gamma_t + \varepsilon_{bt} \quad (4)$$

In Model 2, $LNILGL_{bt}$ represents the dependent variable (DV) for a specific bank in a given time period. The independent variables are *RGI, CEOAD, BS,* and *SIZE* for the corresponding bank and time period. The fixed effects, α_c and γ_t capture country and time heterogeneity, respectively, while the error term, ε_{bt}, accounts for unobserved factors influencing the *LNILGL* (Wooldridge, 2010). To assess the robustness of Model 2, a bootstrap technique is employed in Model 2a, similar to Model 1 (Efron & Tibshirani, 1994). Similarly, in Model 3, $LNLLRGR_{bt}$ represents the dependent variable, for bank *b* in time period *t*. The independent variables and other definitions of fixed effects and error terms are the same as in Model 1 and Model 2 along with the application of the bootstrap technique for robustness of Model 3 in Model 3a (Efron & Tibshirani, 1994). The last Model 4, $LNNCOAGL_{bt}$, represents the dependent variable, where the rest of the model specifications are the same as in all other models (Wooldridge, 2010).

Lastly, to further investigate the relationship between the main dependent variable *LNNI,* and the primary variable of interest *RGI*, a Granger causality test was conducted. This test was performed with a lag of 4 periods, which, in this context, corresponds to 4 years. The purpose of this test is to determine if past values of *RGI* can be used to predict future values of *LNNI*. The Granger causality test, based on the foundational work of Granger (1969), provides insights into the causal relationship between the two variables in a time series context.

In conclusion, the methodology aims to illuminate the relationship between risk governance and financial performance within the OECD countries. The study seeks to understand how this relationship evolves over time by analyzing the impact of governance and control variables on financial performance, as informed by Adams et al. (2010).

Table 1. Variable definitions

Research variables	*Measurements*	*Data source*
	Dependent	
LNNI	Natural logarithm of net income (in 1000 EUR)	BankFocus
LNILGL	Natural logarithm of impaired loans to gross loans	BankFocus
LNLLRGR	Natural logarithm of loan loss reserves to gross loans	BankFocus
LNNCOAGL	Natural logarithm of net charges offs to average gross loans	BankFocus
	Independent	
RGI	Risk governance index, derived from a 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 the bank has Risk Committee (1) and if not (0)	BoardEx
CRO	Binary variable indicating the presence (1) or absence (0) of a chief risk officer in the bank, irrespective of their board membership status.	BoardEx
CFO	Binary variable indicating the presence (1) or absence (0) of a chief financial officer in the bank, irrespective of their board membership status.	BoardEx
TITLE	if the director holds a Ph.D. degree (1) and if not (0)	BoardEx
SENIOR	if the director's age is between 66–75 years old (1) and if not (0)	BoardEx
BI	if the director is an independent director	BoardEx
	Control	
CEOAD	if the chief executive officer has an additional position (1) and if not (0)	BoardEx
BS	Total number of directors on board	BoardEx
SIZE	Total assets (in 1000 EUR)	BankFocus

Note: Table 1 delineates the dependent, independent, and control variables used in this study. The variables are explicitly defined, with their corresponding measurements detailed for clarity. For reproducibility and verification, the data source for each variable is also specified. The variables were operationalized based on standard definitions and measurement scales prevalent in the literature, maintaining consistency and validity of the research findings. This table serves as an essential resource for understanding the operational framework of the study and should be referenced when interpreting the research results.

4. RESULTS AND DISCUSSION

4.1. Descriptive analysis

This sub-section provides a comprehensive overview of the variables employed in the study through descriptive statistics. Table 2 showcases the descriptive statistics, including the mean, standard deviation, minimum, and maximum values for each variable, offering a snapshot of the data's distribution and characteristics.

For instance, the variable *LNNI* has a mean value of 13.4055 and a standard deviation of 2.5546, indicating the central tendency and dispersion of net income values across the dataset. Similarly, *LNILGL* (natural logarithm of impaired loans to gross loans) has a mean of 0.4454, suggesting that impaired loans, on average, constitute a small fraction of gross loans.

The governance attributes, measured on a bank-director-year basis, provide insights into the board composition and governance practices over time. For example, the *RC* attribute has a mean of 0.1987, indicating that in approximately 20% of the bank-director years, an *RC* was present. Similarly, attributes such as *CFO, TITLE,* and *SENIOR* reflect the characteristics of directors during their tenure. Around 2.8% of the bank-director years had a *CFO*, 13.8% had *TITLE*, and approximately 30% featured *SENIOR*.

The *SIZE* variable, representing total assets, has a vast range, indicating the inclusion of both small and large banks in the dataset. This diversity ensures a comprehensive understanding of the relationship between risk governance and financial performance across various bank sizes within the OECD countries.

Table 2. Descriptive statistics

Variable	*Obs.*	*Mean*	*Std. dev.*	*Min*	*Max*
LNNI	13,296	13.4055	2.5546	-1.5606	21.7152
LNILGL	13,751	0.4454	1.9563	-7.4186	3.9757
LNLLRGR	13,800	0.1755	1.7944	-6.5293	3.2722
LNNCOAGL	5,793	-1.7138	1.9336	-9.2103	1.8197
RC	14,410	0.1987	0.3990	0	1
CRO	14,410	0.0056	0.0748	0	1
CFO	14,410	0.0280	0.1651	0	1
TITLE	14,410	0.1376	0.3445	0	1
SENIOR	14,410	0.2982	0.4575	0	1
BI	14,410	0.5079	0.5000	0	1
CEOAD	14,410	0.0806	0.2722	0	1
BS	14,409	14.7276	5.1033	5	32
SIZE	14,369	6760000000	69200000000	8	1680000000000

Note: Table 2 presents the descriptive statistics for the variables used in the study. The table provides key statistical measures, including the number of observations (Obs.), mean, standard deviation (Std. dev.), and the minimum (Min) and maximum (Max) values, for each variable, offering insights into the data distribution. The variables include both financial ratios (in natural logarithm form) and governance attributes, sourced respectively from BankFocus and BoardEx. Variables LNNI, LNILGL, LNLLRGR, and LNNCOAGL are continuous, whereas variables RC, CRO, CFO, TITLE, SENIOR, BI, CEOAD, and BS are discrete, with values ranging between 0 and 1, indicating their binary nature. The SIZE variable, a continuous variable, denotes total assets measured in 1000 EUR. This summary table enables readers to quickly grasp the central tendency and dispersion of the data for each variable, as well as the range of values that each variable can take. It serves as an essential reference for interpreting the empirical analyses in this study.

4.2. Correlation analysis

The correlation analysis presented in Table 3 offers a detailed perspective on the pairwise relationships between the variables. Each cell in the matrix displays the Pearson correlation coefficient, which quantifies the linear relationship between two variables. The values range from -1 (perfect negative correlation) to 1 (perfect positive correlation). A value close to 0 indicates a weak or negligible correlation. For instance, the positive correlation of 0.08 between *LNNI* and *RC* suggests that banks with a risk committee tend to have higher net incomes. Conversely, the negative correlation of -0.06 between *LNNI* and *LNLLRGR* implies that as loan loss reserves to gross loans increase, net income tends to decrease. It is crucial to note that while correlations offer an understanding of the associations between variables, they do not establish causative relationships. The term "insights" here refers to the knowledge acquired through the analysis of correlation coefficients, revealing the strength and direction of linear relationships between variable pairs. These insights are valuable for forming hypotheses, guiding subsequent analyses, and interpreting outcomes. Nonetheless, it is imperative to recognize that a correlation, regardless of its magnitude, does not inherently indicate that one variable is the cause of changes in another. Additionally, high correlations between independent variables might hint at multicollinearity, potentially affecting the reliability of regression coefficients in subsequent analyses. This matrix serves as a foundational tool in understanding the interrelationships between variables and guiding further empirical investigations.

Table 3. Correlation

	LNNI	*LNILGL*	*LNLLRGR*	*LNNCOAGL*	*RC*	*CRO*	*CFO*	*TITLE*	*SENIOR*	*BI*	*CEOAD*	*BS*	*SIZE*
LNNI	1												
LNILGL	0.02	1											
LNLLRGR	-0.06***	0.96***	1										
LNNCOAGL	-0.09***	0.81***	0.85***	1									
RC	0.08***	-0.01	-0.01	0.02	1								
CRO	0.03*	0.05***	0.03*	0.02	-0.04**	1							
CFO	0.02	0.04**	0.03*	0.05***	-0.08***	-0.01	1						
TITLE	0.08***	0.09***	0.07***	0.06***	0.02	-0.03	0.01	1					
SENIOR	0.12***	0.04**	0.01	-0.03*	-0.09***	0.01	0.02	-0.09***	1				
BI	-0.04**	-0.08***	-0.03	0.02	0.21***	-0.08***	0.01	0.07***	-0.08***	1			
CEOAD	-0.01	0.02	0.05**	0.05***	-0.11***	-0.02	-0.05***	0.03*	0.02	-0.15***	1		
BS	0.06***	0.44***	0.40***	0.37***	-0.10***	0.06***	0.06***	0.10***	-0.02	-0.19***	-0.03	1	
SIZE	0.50***	0.02	-0.03*	-0.06***	-0.08***	0.01	-0.02	-0.01	0.14***	-0.05***	0.02	-0.14***	1

*Note: * p < 0.05, ** p < 0.01, and *** p < 0.001. Table 3 showcases the correlation matrix of all the variables used in this study. Each cell in the matrix represents the Pearson correlation coefficient between two variables, indicating the strength and direction of their linear relationship. Correlation values range from -1 to 1, where the magnitude indicates the strength of the correlation, and the sign indicates its direction. A value of 1 signifies a perfect positive correlation, while -1 denotes a perfect negative correlation. A value near 0 suggests a weak or negligible correlation. This correlation matrix is crucial for understanding the pairwise relationships between variables and can highlight potential multicollinearity issues in subsequent analyses.*

4.3. Principal component analysis

To capture the underlying dimensions of the governance attributes, PCA was conducted on six standardized variables: *RC, CRO, CFO, TITLE, SENIOR,* and *BI* (Jolliffe & Cadima, 2016). Standardization ensured equal variance across these variables (Hair et al., 2010). PCA results, presented in Tables 4a, 4b, and 4c, provide a tool for dimensionality reduction and intrinsic insights into relationships among the governance attributes. For instance, the first principal component (*COMP1*) explains a significant portion of the variance and is used as the *RGI* in the regression analysis. Besides its utility for regression, PCA offers a deeper understanding of the data structure, validating the robustness of our variable selection and offering insights into interrelationships among the governance attributes.

The PCA results are presented in Tables 4a, 4b, and 4c. Table 4a presents the eigenvalues, demonstrating the amount of variance explained by each principal component (Jolliffe & Cadima, 2016). For instance, the first component (*COMP1*) explains 22.21% of the total variance, while the second component (*COMP2*) explains 17.24%. As the components increase, the cumulative proportion column illustrates the total variance explained, reaching 100% at the sixth component (*COMP6*).

Table 4b displays the principal components (eigenvectors) obtained from the PCA. These components, linear combinations of the original variables, indicate each variable's contributions to each component. For example, the loading of *RC_STD* on *COMP1* is 0.5775, suggesting a positive relationship between the risk committee variable and the first principal component. These loadings provide insights into the direction and magnitude of each variable's influence on the principal components (Jolliffe & Cadima, 2016).

Lastly, Table 4c presents the scoring coefficients (loadings) derived from the PCA. These coefficients represent the correlation between the original variables and the principal components. Higher absolute values of loadings signify a stronger association between the variables and the corresponding components. For example, *RC_STD* has high loadings on *COMP1* and *COMP6*, indicating strong associations with these components. The sum of squares of column loadings equals 1, confirming that the components fully account for the variance in the data (Jolliffe & Cadima, 2016). The PCA outcomes present comprehensive insights into the major components underlying the variation within the data, contributing significantly to understanding the relationship among the variables. In regression analysis, *COMP1* is considered as the *RGI*.

Table 4a. PCA eigenvalues

Component	*Eigenvalue*	*Difference*	*Proportion*	*Cumulative*
COMP1	1.3323	0.2978	0.2221	0.2221
COMP2	1.0346	0.0302	0.1724	0.3945
COMP3	1.0044	0.0416	0.1674	0.5619
COMP4	0.9627	0.0445	0.1605	0.7223
COMP5	0.9182	0.1704	0.1530	0.8754
COMP6	0.7478	0.0000	0.1246	1.0000

Note: Table 4a presents the eigenvalues obtained from the PCA. This table displays six components (COMP1 to COMP6), each with its respective eigenvalue, and the difference in eigenvalues between successive components. It also indicates the proportion of total variance explained by each component and the cumulative proportion of explained variance up to each component. This table offers an overview of the contribution of each component to the total variability of the data. The cumulative proportion column provides a quick reference for the total variance accounted for as more components are included. By the end of COMP6, all the variance in the data (100%) has been accounted for. Overall, Table 4a is crucial for understanding the distribution of variance across the principal components and the overall significance of each component in explaining the data's variance.

Table 4b. Principal components (eigenvectors) from PCA

Variable	*COMP1*	*COMP2*	*COMP3*	*COMP4*	*COMP5*	*COMP6*	*Unexplained*
RC_STD	0.5775	-0.0299	-0.2251	0.4170	0.1965	0.6343	0
CRO_STD	-0.2248	-0.4543	0.4149	0.7335	-0.1466	-0.1064	0
CFO_STD	-0.0316	0.7390	0.5732	0.1183	-0.2126	0.2552	0
TITLE_STD	0.2593	-0.3151	0.6553	-0.3745	0.5088	0.0703	0
SENIOR_STD	-0.4034	0.3060	-0.1358	0.2869	0.7953	-0.1016	0
BI_STD	0.6205	0.2315	0.0270	0.2266	0.0576	-0.7113	0

Note: Table 4b displays the principal components (PCs) or eigenvectors for each variable obtained from the PCA. It also details any unexplained variance. This table illustrates the direction and magnitude of each variable's contribution to each principal component (COMP1 to COMP6). These components, as linear combinations of the original variables, each represent a specific aspect of the total variance in the original data. The zero unexplained variance for all variables indicates that the PCA model comprehensively captures the variability of all standardized variables. This table is instrumental in identifying which variables most strongly influence each principal component, thereby aiding in interpreting the results of the PCA.

Table 4c. PCA scores

Variable	*COMP1*	*COMP2*	*COMP3*	*COMP4*	*COMP5*	*COMP6*
RC_STD	0.5775	-0.0299	-0.2251	0.4170	0.1965	0.6343
CRO_STD	-0.2248	-0.4543	0.4149	0.7335	-0.1466	-0.1064
CFO_STD	-0.0316	0.7390	0.5732	0.1183	-0.2126	0.2552
TITLE_STD	0.2593	-0.3151	0.6553	-0.3745	0.5088	0.0703
SENIOR_STD	-0.4034	0.3060	-0.1358	0.2869	0.7953	-0.1016
BI_STD	0.6205	0.2315	0.0270	0.2266	0.0576	-0.7113

Note: Scoring coefficients — sum of squares (column-loading) = 1. Table 4c details the scoring coefficients, or loadings, derived from the PCA. These loadings represent the correlations between the original variables (from RC_STD to BI_STD) and the principal components (COMP1 to COMP6) derived from the PCA. High absolute values of loadings, approaching -1 or 1, suggest a significant contribution of the respective variable to the corresponding component. For example, RC_STD shows a high loading of 0.5775 on COMP1, indicating a significant positive correlation between the two. Negative loadings reflect an inverse relationship between the variables and the components. The sum of the squares of the column-loadings equals 1, demonstrating that the components collectively account for the entire variance in the data. Overall, Table 4c is critical for understanding how each original variable relates to the principal components, providing valuable insights for the subsequent analyses.

4.4. Regression analysis

To examine the relationship between risk governance and financial performance, specifically in public commercial banks, a regression analysis was conducted (Adams et al., 2010). The standard regression and bootstrapped regression results are presented in Table 5 (Efron & Tibshirani, 1994; Veeramoothoo & Hammoudeh, 2022). The dependent variable in these models is *LNNI*.

Table 5. Regression (main results)

Variables	*Model 1*	*Model 1a*
	LNNI	*LNNI-bootstrapped*
RGI	0.0778**	0.0778**
	(0.0321)	(0.0342)
CEOAD	0.2043**	0.2043**
	(0.0846)	(0.0859)
BS	0.1468***	0.1468***
	(0.0309)	(0.0358)
SIZE	0.0000***	0.0000
	(0.0000)	(0.0000)
Constant	11.2534***	11.2534***
	(0.4683)	(0.5756)
Observations	13,255	13,255
Adjusted R-squared	0.7921	0.7921
Country FE	Yes	Yes
Year FE	Yes	Yes
Clusters	Bank	Bank

*Note: Robust standard errors in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.1. Table 5 displays the main results of the regression analyses conducted in this study. It presents two models: Model 1 showing the results of the standard regression, and Model 1a indicating the results of the bootstrapped regression. The dependent variable in both models is LNNI. For each model, regression coefficients are reported alongside their corresponding robust standard errors enclosed in parentheses. These coefficients indicate the impact of each independent variable on the dependent variable, with all other variables held constant. The regression models incorporate country and year-fixed effects (Country FE and Year FE) to capture unobserved, consistent country-specific characteristics and annual variations. Observations are clustered by the bank to address potential intra-group correlation. The table also reports the number of observations and the adjusted R-squared for each model. The adjusted R-squared value signifies the proportion of variance in the dependent variable that is predictable from the independent variables, adjusted for the number of predictors in the model.*

The independent variables include *RGI, CEOAD, BS,* and *SIZE*. The coefficients and standard errors of these variables reveal their respective impacts on *LNNI*, assuming all other factors are held constant (Wooldridge, 2010).

In the regression analysis of Model 1, *RGI, CEOAD,* and *BS* exhibit statistically significant positive coefficients with *LNNI*, suggesting that robust risk governance, additional roles of CEOs, and larger board sizes positively correlate with bank financial performance. The coefficient for the bank

size variable, represented by total assets in thousands of euros, is statistically significant but near zero. This phenomenon is attributable to the large scale of the variable; even a small change in a variable measured in such large numbers can result in a negligible coefficient. However, this does not negate the variable's influence on financial performance. This reflects the proportionality of the effect relative to the scale of the variable being measured. Thus, while the coefficient for bank size is close to zero, its positive and statistically significant nature suggests a modest positive association with financial performance. This aligns with theoretical expectations that larger banks may experience benefits from economies of scale or a more diversified risk profile, which can positively impact financial outcomes, even if the magnitude of this effect is small when viewed through the lens of regression analysis (Adams et al., 2010).

The models account for unobserved country-specific and global trends through country and year-fixed effects (Wooldridge, 2010). Observations are clustered at the bank level to handle potential intra-group correlation (Petersen, 2008). The adjusted R-squared values from Model 1 indicate that approximately 79.21% of the variance in *LNNI* can be explained by the independent variables in the model (Wooldridge, 2010). A considerable portion of this explanatory power is attributed to the inclusion of *RGI*, derived from the first principal component (*COMP1*) of the PCA. As seen in Table 4a, *COMP1* alone accounts for 22.21% of the total variance, emphasizing the importance of the variables it represents in explaining the variance in *LNNI*.

However, while regression models establish associations between risk governance variables and financial performance, causation is not definitively proven (Wooldridge, 2010). Even with the control variables and fixed effects, other unobservable or external variables might influence the observed relationships (Wooldridge, 2010).

In conclusion, this analysis provides empirical evidence of a positive association between risk governance and financial performance in public commercial banks. These findings underscore the role of risk governance in enhancing financial performance and provide valuable insights for policymakers, regulators, and bank management (Adams et al., 2010).

4.5. Sensitivity analysis

A sensitivity analysis was conducted to validate the robustness of our findings, and the results are detailed in Table 6. This analysis utilized different dependent variables (*LNILGL, LNLLRGR, LNNCOAGL*), as previously defined and justified in sub-section 3.2, along with their bootstrapped counterparts in six distinct models (Efron & Tibshirani, 1994). The coefficients and standard errors for each variable are reported.

The sensitivity analysis consistently affirmed a positive and statistically significant relationship between the *RGI* and various performance measures across all models (Adams et al., 2010). This suggests that strong risk governance practices correspond to lower levels of impaired loans, higher loan loss reserves, and lower net charge-offs. Even with the application of bootstrapped estimates, the coefficients retained their stability and statistical significance, underscoring the findings' robustness (Efron & Tibshirani, 1994).

The variable *CEOAD* demonstrated a positive and significant relationship with the different performance measures (Adams et al., 2010). This suggests that CEOs with additional roles might indirectly influence risk governance, which encompasses risk management practices.

The variable *BS* was found to be statistically insignificant across all models presented in Table 6. This suggests that, within the context of this study, the size of the board does not have a statistically significant association with the financial performance measures considered.

Notably, the sensitivity analysis strengthened the robustness of the findings by testing multiple dependent variables and applying bootstrapping techniques (Efron & Tibshirani, 1994). The consistent results across different performance measures validate the relationship between risk governance and bank performance (Adams et al., 2010).

Lastly, it is assumed in the sensitivity analysis that the variables (*RGI, CEOAD, BS, SIZE*) adequately represent risk governance practices and their effect on performance. However, unobserved factors or alternative risk governance measures could influence the results. Future research might further validate these findings by incorporating additional dimensions of risk governance and employing alternative measurement methodologies (Adams et al., 2010).

Despite these limitations, the sensitivity analysis enhances the findings' robustness and reliability, confirming a consistent relationship between risk governance and bank performance across different measures. This understanding underscores the significance of effective risk governance in enhancing sound risk management practices and overall financial performance in public commercial banks (Adams et al., 2010).

Table 6. Sensitivity analysis (Part 1)

Variables	*Model 2*	*Model 2a*	*Model 3*	*Model 3a*	*Model 4*	*Model 4a*
	LNILGL	*LNILGL-bootstrapped*	*LNLLRGR*	*LNLLRGR-bootstrapped*	*LNNCOAGL*	*LNNCOAGL-bootstrapped*
RGI	0.0366**	0.0366**	0.0320**	0.0320**	0.0610***	0.0610***
	(0.0153)	(0.0145)	(0.0132)	(0.0133)	(0.0213)	(0.0201)
CEOAD	0.1086***	0.1086***	0.0879***	0.0879***	0.1208**	0.1208***
	(0.0391)	(0.0379)	(0.0316)	(0.0299)	(0.0461)	(0.0384)
BS	-0.0004	-0.0004	0.0137	0.0137	-0.0189	-0.0189
	(0.0177)	(0.0193)	(0.0151)	(0.0176)	(0.0362)	(0.0419)
SIZE	0.0000*	0.0000	-0.0000***	-0.0000	-0.0000	-0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Table 6. Sensitivity analysis (Part 2)

Variables	*Model 2*	*Model 2a*	*Model 3*	*Model 3a*	*Model 4*	*Model 4a*
	LNILGL	*LNILGL-bootstrapped*	*LNLLRGR*	*LNLLRGR-bootstrapped*	*LNNCOAGL*	*LNNCOAGL-bootstrapped*
Constant	0.3680	0.3680	-0.0182	-0.0182	-1.4348***	-1.4348**
	(0.2655)	(0.3603)	(0.2333)	(0.3235)	(0.5120)	(0.6748)
Observations	13,750	13,750	13,799	13,799	5,793	5,793
Adjusted R-squared	0.8818	0.8818	0.9172	0.9172	0.7956	0.7956
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	Bank	Bank	Bank	Bank	Bank	Bank

*Note: Robust standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Table 6 showcases the outcomes of the sensitivity analyses conducted in this study. This table includes six distinct models, each utilizing a different dependent variable: LNILGL, LNILGL-bootstrapped, LNLLRGR, LNLLRGR-bootstrapped, LNNCOAGL, and LNNCOAGL-bootstrapped. The table details the coefficients for each variable, along with their robust standard errors enclosed in parentheses. These models are instrumental in verifying the robustness of the results, employing different outcome measures and a bootstrapping method for more accurate inference, particularly when the estimator distributions are unknown or complex. Additionally, the table includes the number of observations and the adjusted R-squared values for each model. Consistent with the main regression results, these models control for country and year-fixed effects (Country FE and Year FE), thus accounting for unobserved country-specific factors and temporal trends. Observations are clustered at the bank level to address potential correlations within banks. This table is critical for confirming the reliability and robustness of the study's main findings.*

4.6. Causality analysis

This research incorporates both Granger causality and VAR model analyses. The VAR model, a multivariate time series framework, captures linear relationships between past and present values of multiple variables. This model facilitates the examination of how variations in one variable may influence changes in another over time. Specifically, the VAR model in this study explores the dynamic interactions between risk governance (*RGI*) and financial performance (*LNNI*) over the examined period (Granger, 1969; Greene, 2003). This approach aligns with the methodology used by Gontarek and Belghitar (2018) in their examination of risk governance's impact on bank performance and risk-taking.

Two sets of Granger causality tests were executed. Table 7 presents results suggesting a dynamic relationship between *RGI* and *LNNI*. Specifically, the findings indicate that risk governance practices (*RGI*) can precede and potentially influence changes in financial performance (*LNNI*). Additionally, fluctuations in a bank's net income (*LNNI*) might serve as indicators of potential future adjustments in the bank's risk governance strategies (*RGI*). However, it is pivotal to note that Granger causality does not confirm causation in a strict sense; other unobserved factors may still influence this observed relationship (Greene, 2003).

For the causality analysis, both Granger causality and VAR methods were utilized. However, only the Granger causality results are tabulated and included in the paper. The *LNNI*, representing the natural logarithm of net income, is standardized across all countries under international reporting standards, ensuring that differences in taxation across countries are accounted for. The results indicated that *LNNI* from four years prior (Greene, 2003) significantly predicts its current value ($p < 0.001$), emphasizing the predictive power of past financial performance on present risk governance practices. Conversely, past *RGI* values did not significantly forecast present *LNNI* ($Chi^2 = 0.01924$, $p < 0.890$). This unidirectional relationship suggests that while historical financial performance can influence current risk governance decisions, past risk governance practices do not necessarily predict current financial outcomes. This distinction underscores the stable nature of financial performance over time, compared to the more dynamic nature of risk governance practices. These findings are consistent with the broader literature, emphasizing the importance of past data in forecasting future financial outcomes and the dynamic nature of risk governance practices.

These results provide a deeper understanding of the complex relationships between *LNNI* and *RGI*. Consistent with the findings of Gontarek and Belghitar (2018), a significant relationship between risk governance and bank performance is evident. More specifically, the study sheds light on how *RGI* and financial performance (*LNNI*) evolve and potentially influence each other over time, highlighting their temporal dynamics. Furthermore, the observed ability of past values of one variable to predict current values of the other underscores the predictive nature of these variables. This suggests that understanding past trends in risk governance and financial performance can provide valuable insights into future outcomes, hinting at potential causal links between the two (Granger, 1969). These insights shed light on the variables' temporal dynamics and predictive nature, suggesting a potential causal link where past financial performance (*LNNI*) influences current risk governance practices (*RGI*). This direction of causality is supported by the Granger causality tests (Granger, 1969). Future studies could benefit from further investigation of these relationships, potentially incorporating additional control variables or exploring different time lags (Greene, 2003). This is in line with the recommendations of Gontarek and Belghitar (2018), who also emphasized the need for further research in this field of risk governance and its impact on financial performance.

Table 7. Causality

Granger causality Wald tests				
Equation	***Excluded***	***Chi²***	***df***	***Prob. > Chi²***
LNNI	*RGI*	0.01924	1	0.890
LNNI	ALL	0.01924	1	0.890
RGI	*LNNI*	13.526	1	0.000
RGI	ALL	13.526	1	0.000

Table 7 showcases the results from the Granger causality Wald tests conducted in this study. This test aims to establish if one time series is useful in forecasting another. Specifically, these tests determine if the coefficients on the lagged (4 years) values of the proposed causal variable significantly differ from zero. In this table, two sets of tests are reported. Initially, the tests ascertain if *RGI* Granger-causes *LNNI*, followed by tests assessing if *LNNI* Granger-causes *RGI*. For each test, the null hypothesis (H_0) asserts that the excluded variable does not Granger-cause the variable mentioned in the "Equation" column. The table displays the Chi-squared statistic, degrees of freedom (df), and the probability (Prob. > Chi^2) of obtaining the observed statistic or a more extreme value under the H_0. A low p-value (Prob. > Chi^2) indicates that the H_0 of no Granger causality may be rejected. These tests yield insights into potential causal relationships between variables, thus deepening the understanding of correlations identified in the regression analyses.

4.7. Discussion of findings and implications

This study provides a deeper understanding of the relationship between risk governance and financial performance in OECD public commercial banks. Specifically, the findings shed light on how risk governance practices influence bank performance metrics, the temporal dynamics of these relationships, and the potential causal links between governance measures and financial outcomes (Adams et al., 2010). Through comprehensive analyses, such as PCA, regression, sensitivity, and causality, the study elucidates how risk governance practices influence financial outcomes (Elkington, 2006). This is in line with the findings of Gontarek and Belghitar (2018), who also examined the impact of risk governance on bank performance and risk-taking. These findings align with Almashhadani and Almashhadani (2022), who also explored the broader implications of corporate governance as an internal control mechanism on performance, reaffirming the significance of governance structures.

The descriptive analysis set the foundation for the investigation by providing an overview of the distribution and characteristics of the variables (Hair et al., 2010). Meanwhile, the correlation analysis highlighted potential associations among variables, emphasizing the significance of risk governance in shaping financial performance.

The PCA analysis identified key components that explain the variance in the data, providing a deeper understanding of the relationships between risk governance and financial performance (Jolliffe & Cadima, 2016). The regression analysis further solidified these relationships, showing a significant impact of risk governance on net income (Draper & Smith, 1998). This significant relationship is in line with findings from Almashhadani and Almashhadani (2022), who also highlight the impact of corporate governance, viewed as an internal control mechanism, on corporate performance. Effective risk governance practices, as indicated by a favorable *RGI* score, were associated with better financial performance (Eisenhardt, 1989). However, the direction of this association, whether *RGI* influences financial performance or vice versa, requires further investigation (Eisenhardt, 1989). The variables *RGI, CEOAD,* and *BS* were found to have statistically significant associations with net income. Specifically, *RGI* and *CEOAD* were significant at the 0.05 level, while *BS* was significant at the 0.01 level. The variable *SIZE* showed a significant association with net income at the 0.01 level in the standard regression but was not significant in the bootstrapped regression (Adams et al., 2010). These findings are consistent with Gontarek and Belghitar (2018), who also found that risk governance significantly impacts bank performance.

The robustness of the findings was confirmed by the sensitivity analysis, which showed consistent results across different outcome measures and bootstrapping techniques (Efron & Tibshirani, 1994). This not only strengthens the validity of the observed relationships but also enhances confidence in the study's conclusions (Sijtsma, 2009).

The Granger causality tests indicated a causal relationship where *LNNI* Granger-causes changes in *RGI* (Granger, 1969). However, the reverse relationship, in which risk governance influences net income, did not exhibit statistical significance. The Granger causality tests underlined the importance of directional influence in the relationship between risk governance and financial performance. Specifically, *LNNI* was found to Granger-cause changes in *RGI* (Granger, 1969). In contrast, the influence of risk governance on net income was not statistically supported (Engle & Granger, 1987).

These findings collectively suggest that effective risk governance practices, characterized by a high-risk governance index and CEO additional positions, contribute to better financial performance (Eisenhardt, 1989). While the number of directors is deemed most suitable, the bank size, as measured by total assets, showed a statistically significant influence on financial performance in the regression analysis. However, due to the large scale of the bank size variable, its coefficient appears near zero, reflecting the scale rather than diminishing its importance. This has important implications for policymakers, regulators, and bank management, who can leverage these insights to enhance risk governance frameworks and promote financial stability in the banking sector (Basel Committee on Banking Supervision [BCBS], 2015). The insights provided by Almashhadani and Almashhadani (2022) on corporate governance as an internal control mechanism further substantiate the importance of these governance frameworks in impacting corporate performance. This aligns with the conclusions of Gontarek and Belghitar (2018),

who also emphasized the importance of effective risk governance in enhancing bank performance.

This study contributes to the existing literature by providing empirical evidence of the positive relationship between risk governance and financial performance in public commercial banks. The study's results emphasize the significance of comprehensive risk governance measures in bolstering financial performance and profitability. These measures encompass activities such as identifying potential risks, assessing their impact, implementing mitigation strategies, and fostering a culture of risk awareness. By adopting such thorough approaches, banks can better navigate uncertainties and challenges, ensuring sustained financial health.

In conclusion, this study underscores the significant influence of effective risk governance on the financial performance of public commercial banks in OECD countries (Adams et al., 2010). This is consistent with the findings of Gontarek and Belghitar (2018), further emphasizing the importance of risk governance in the banking sector.

5. CONCLUSION

In conclusion, this study examined the relationship between risk governance and financial performance in public commercial banks in OECD countries. The findings underscore the importance of risk governance practices, including policies, procedures, and controls designed to effectively manage risks, in influencing net income and overall financial outcomes. The positive association between risk governance and financial performance underscores the need for a comprehensive system of checks and balances, structured approaches to risk management, and knowledgeable individuals tasked with overseeing and managing risks.

The study's findings contribute to the existing literature on risk governance and provide valuable insights for policymakers, regulators, and bank management. By prioritizing risk governance, public commercial banks can enhance their financial performance. Implementing comprehensive risk management frameworks and leveraging the expertise of key individuals in risk governance can equip banks to address and mitigate potential challenges and risks in the banking industry.

While the regression analysis and Granger causality tests provide valuable insights into the relationship between risk governance and financial performance in public commercial banks, it is essential to acknowledge the limitations of this study. These limitations highlight areas for future research and caution against drawing definitive conclusions.

First, although the study incorporates panel data with year-fixed effects to control for time-specific variations, it is important to note that this approach does not definitively establish causal relationships. Longitudinal data with panel regression techniques could provide stronger evidence of causality by capturing changes in risk governance and financial performance over time.

Second, the study's focus on public commercial banks within specific countries or regions may limit the generalizability of the findings to other contexts or types of financial institutions. Replicating the study with data from countries outside the current sample, and including various types of banks, would further enhance the external validity of the findings.

Third, the reliance on standardized variables and composite indices in the study might introduce measurement errors and potential biases. Exploring individual risk governance metrics or incorporating insights from interviews, focus groups, or content analysis could offer a deeper perspective on the relationship between specific risk governance practices and financial performance.

Fourth, although the study accounts for a range of observable variables, other unobserved factors could still influence the relationship between risk governance and financial performance. This represents a potential omitted variable concern, often referred to as the "omitted variables problem". However, the analysis was conducted using the best available data and methodologies, striving for a comprehensive understanding within the scope and constraints of the study. Future research could explore additional control variables or employ advanced econometric techniques to further address these concerns.

Fifth, the study focuses on a specific set of risk governance variables and financial performance indicators. Including a broader range of risk governance dimensions and financial measures, such as risk-adjusted profitability ratios or capital adequacy ratios, would provide a more comprehensive assessment of the relationship.

Finally, although the study controls for bank size through the *SIZE* variable, it operates under the assumption that the impact of risk governance practices on financial performance is consistent across all banks. It is worth noting that the intricacies of how risk governance practices are implemented and their effectiveness might still vary based on other factors such as a bank's specific business model. Additionally, while the study controls for country-level differences, there might be variations within countries due to specific regulatory frameworks, changes in regulations over time, or local and regional regulatory policies. Further research could investigate the moderating effects of these contextual factors on the risk governance-performance relationship.

Given that the findings are based on data from a specific time period and selected countries, caution should be exercised in generalizing these results to other contexts. Future research can explore the relationship between risk governance and financial performance in different types of banks and across a broader range of countries. Additionally, examining the impact of specific risk governance mechanisms and practices on various financial performance indicators can provide further insights into the mechanisms through which risk governance influences financial outcomes.

Overall, this study emphasizes the importance of risk governance in shaping the financial performance of public commercial banks. Focusing on risk governance frameworks and practices that prioritize comprehensive risk assessment, clear communication, and continuous monitoring enables policymakers and bank management to foster financial stability, enhance profitability, and contribute to the long-term viability and resilience of the banking sector.

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