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Does Board Cultural and Gender Diversity Influence Firm Performance? Panel Data Evidence from US Listed Companies

¿La diversidad cultural y de género de la junta directiva influye en el desempeño de la empresa? Datos de panel Evidencia de empresas que cotizan en bolsa en EE. UU.

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Georgiana Danilov
Bucharest University of Economic Studies, Doctoral School of Finance, Bucharest, Romania
Email: danilovgeorgiana18@stud.ase.ro
ORCID: https://orcid.org/0009-0002-0085-7613

Abstract

By uncovering the nuanced effects of board diversity on key performance metrics, this study contributes to a deeper understanding of the dynamics shaping modern corporate governance. Thus, this study investigates the impact of cultural and gender diversity in the boards of directors of American companies listed in the S&P 500 index. Focusing on 204 firms from the IT, industrial, and health sectors, the analysis spans from 2000 to 2023. The quantitative framework consists of fixed and random-effects linear and non-linear regression models, covering also interaction terms in order to capture the effects of the COVID-19 global health crisis. The empirical findings reveal several noteworthy insights. Firstly, the presence of a diversity policy on boards positively influences return on equity and return on assets. Secondly, gender diversity on boards is positively associated with firm performance as measured by return on equity and return on assets. On the contrary, cultural diversity exhibits a negative impact on firm performance. Moreover, non-linear models reveal the presence of a turning point at 35.78 for gender diversity. Beyond this point, its impact transitions from positive to negative while retaining statistical significance. Furthermore, models incorporating interaction variables based on the pandemic crisis reveal interesting dynamics. In models without effects, the pandemic crisis negatively influences cultural diversity, suggesting a detrimental impact. Overall, these findings highlight the complex interplay between board diversity, firm performance, and external factors such as the pandemic crisis, offering valuable insights for policymakers and managers aiming to foster inclusive corporate governance and navigate crises effectively.

***Keywords*:** Corporate governance; Board gender diversity; Board cultural diversity; Firm performance; Panel data regression models.

Resumen

Al descubrir los efectos matizados de la diversidad de los consejos de administración en las métricas clave de rendimiento, este estudio contribuye a una comprensión más profunda de las dinámicas que dan forma al gobierno corporativo moderno. Así, este estudio investiga el impacto de la diversidad cultural y de género en los consejos de administración de las empresas estadounidenses que cotizan en el índice S&P 500. Centrándose en 204 empresas de los sectores de TI, industrial y sanitario, el análisis abarca desde 2000 hasta 2023. El marco cuantitativo consta de modelos de regresión lineal y no lineal de efectos fijos y aleatorios, que abarcan también términos de interacción con el fin de capturar los efectos de la crisis sanitaria mundial de la COVID-19. Los hallazgos empíricos revelan varias ideas dignas de mención. En primer lugar, la presencia de una política de diversidad en los consejos de administración influye positivamente en la rentabilidad de los fondos propios y en la rentabilidad de los activos. En segundo lugar, la diversidad de género en los consejos de administración se asocia positivamente con el rendimiento de la empresa, medido por la rentabilidad de los fondos propios y la rentabilidad de los activos. Por el contrario, la diversidad cultural muestra un impacto negativo en el desempeño de las empresas. Además, los modelos no lineales revelan la presencia de un punto de inflexión en 35,78 para la diversidad de género. Más allá de este punto, su impacto pasa de positivo a negativo, sin perder la significación estadística. Además, los modelos que incorporan variables de interacción en función de la crisis pandémica revelan dinámicas interesantes. En los modelos sin efectos, la crisis pandémica influye negativamente en la diversidad cultural, lo que sugiere un impacto perjudicial. En general, estos hallazgos ponen de manifiesto la compleja interacción entre la diversidad de los consejos de administración, el rendimiento de las empresas y factores externos como la crisis de la pandemia, lo que ofrece información valiosa para los responsables políticos y los gestores que pretenden fomentar un gobierno corporativo inclusivo y navegar las crisis de forma eficaz.

Palabras claves: Gobierno corporativo; Diversidad de género en la Junta Directiva; Diversidad cultural de la Junta; Desempeño de la empresa; Modelos de regresión de datos de panel.

Introduction

Profitability remains a cornerstone of corporate finance, driving decisions and shaping strategies across industries. The ongoing debate around the variables influencing profitability has highlighted corporate governance as a critical factor. This paper aims to explore the key corporate governance indicators that significantly impact firm performance, with a specific focus on companies within the IT, industrial, and healthcare sectors of the S&P 500 index from 2000 to 2023. These sectors were chosen due to their pivotal role in the global economy, as well as the remarkable fluctuations in their performance over the past two decades, driven by technological advancements, shifts in demand, and evolving market conditions. As a benchmark, the S&P 500 offers a comprehensive view of the United States market, providing a robust and representative sample for assessing the influence of governance practices on profitability.

The central research question guiding this study seeks to uncover how specific corporate governance factors, such as policy board diversity, gender diversity and cultural diversity, affect the profitability of firms in the IT, industrial, and healthcare sectors. Gaining insights into these relationships is vital for corporate leaders, investors, and policymakers who are striving to improve firm performance, foster sustainable growth, and navigate both market opportunities and challenges. By examining these sectors, which have experienced significant transformations and disruptions in recent years, this study aims to shed light on how effective governance can help firms remain competitive and resilient in dynamic economic environments.

This research distinguishes itself through several unique aspects. First, the extensive 24-year timeframe allows for a thorough analysis of long-term trends and the evolution of governance practices over different economic cycles, including periods of stability, growth, and crisis. The inclusion of nonlinear regression models offers a more nuanced understanding of the intricate relationships between governance variables and profitability, revealing patterns that traditional linear models might overlook. Additionally, the integration of a dummy variable to account for the pandemic crisis provides a critical lens through which the study can assess

how governance dynamics shift under extraordinary circumstances. This approach enriches the analysis, enabling the identification of governance factors that either mitigate or exacerbate the impacts of global disruptions.

The broader significance of this study lies in its contribution to the global discourse on corporate governance and profitability. By demonstrating how governance practices influence financial performance, this research not only enhances transparency but also underscores the importance of ethical and responsible management. These findings have the potential to attract international investors, promote sustainable business practices, and elevate governance standards across industries worldwide. The insights gained here are particularly relevant in a globalized economy where firms must adapt to a complex array of regulatory environments, stakeholder expectations, and competitive pressures.

The structure of the paper is designed to guide the reader through a logical progression of ideas. It begins with an introduction that sets the stage for the research, followed by a comprehensive literature review that situates the study within the broader context of corporate governance and firm performance. The methodology section outlines the data sources and econometric techniques used, with a focus on the innovative use of nonlinear models and crisis-specific variables. The findings are presented in detail, accompanied by a discussion that connects the results to existing theories and practical implications. Finally, the paper concludes with a summary of key insights, limitations, and suggestions for future research, offering a pathway for continued exploration in this field.

Literature review

Taking into consideration policy board diversity, Ararat, Aksu, and Cetin, (2015) investigated the impact of this indicator using a sample of 95 companies listed on the Istanbul Stock Exchange for the year 2006. The study employed multiple regression models, nonlinear regressions, and regressions with interaction variables. Their analysis revealed a positive effect of policy board diversity on company profitability, contributing to the understanding of how diverse boards can

enhance financial performance through varied perspectives and decision-making processes. Bernile et al., (2018) expanded on this research by analyzing data from 2000 companies in the ExecuComp database from 1996 to 2014. Using panel data linear regressions and regressions with interaction variables, they also found that policy board diversity positively impacts profitability. Their study confirmed the significance of diversity at the board level across a broader and more diverse sample over an extended period, reinforcing the findings of earlier research.

Regarding board gender diversity, Brahma et al., (2020) conducted a study on 100 companies from the FTSE 100 index in the United Kingdom, covering the period from 2005 to 2016. They utilized panel data linear regressions to explore the relationship between board gender diversity and profitability. The results indicated a positive correlation, suggesting that greater gender diversity on boards leads to better financial performance. In a similar vein, Omri & Alfaleh (2024) analyzed 2542 companies from 5 European countries (France, the United Kingdom, Germany, Italy, and Spain) between 2018 and 2023. Their use of panel data linear regressions also demonstrated a positive effect of board gender diversity on profitability, further supporting the notion that gender-diverse boards contribute to better financial outcomes. García-López, et al., (2024) focused on 27 Spanish companies included in the IBEX 35 index from 2018 to 2021, using Poisson regression models to examine the impact of gender diversity on profitability. Their findings echoed those of previous studies, showing a positive relationship between gender diversity and profitability in the Spanish market. Conversely, Doddb et al., (2023) conducted a study on companies included in the S&P 1500 index in the United States from 2004 to 2015. Using a combination of panel data linear regressions and regressions with interaction variables, they found a negative impact of board gender diversity on profitability, challenging the prevailing view and suggesting that the effect of gender diversity may vary depending on context and market dynamics.

Taking into account board cultural diversity, Khan & Subhan (2019) examined this variable using a sample of companies included in the PSX 100 stock index from 2008 to 2017. Their study, which employed panel data linear regressions, revealed

a negative impact of cultural diversity on profitability, suggesting potential challenges in managing culturally diverse boards in the Pakistani context. In contrast, (Dodd & Zheng, 2022) analyzed 213 companies included in the ASX 200 index in Australia from 2004 to 2018. They utilized panel data linear regressions and nonlinear regressions, finding a positive effect of cultural diversity on profitability. This study highlighted the potential benefits of cultural diversity in enhancing company performance in a different cultural and regulatory environment. Dodd et al., (2023) revisited the topic of cultural diversity in their study of companies in the S&P 1500 index. These results suggest that cultural diversity can be an asset for companies in certain markets, potentially leading to better decision-making and financial outcomes. Ararat, Aksu, and Cetin (2015) also explored the impact of cultural diversity on board performance in their earlier study of 95 companies listed on the Istanbul Stock Exchange. Their findings, based on multiple and nonlinear regression analyses, indicated a positive relationship between cultural diversity and profitability, reinforcing the view that diverse cultural perspectives can enhance company performance.

Firm size is a control variable in this study. Milovanovic, Basic, & Bubas (2022) studied 963 companies from Southeastern Europe during the period 2019 to 2020. They employed the Weighted Least Squares Method to assess the impact of firm size on profitability, finding a positive effect. Their study suggested that larger firms tend to benefit from economies of scale and greater market influence, contributing to improved financial performance. Rompotis (2024) conducted a similar analysis on 80 companies listed on the Athens Stock Exchange from 2018 to 2022. Using panel data linear regressions, the study also found a positive relationship between firm size and profitability, aligning with previous findings and confirming the advantages of scale in the Greek market.

Considering firm age, Neves and his colleagues (2022) explored the impact of this indicator on profitability in a study of 3113 wine-producing companies in Spain and Portugal, covering the period from 2011 to 2018. The researchers used the Generalized Method of Moments and found a negative relationship between firm age

and profitability, suggesting that older firms may face challenges in maintaining competitiveness and innovation. Chaudhary & Arora (2023) investigated the same indicator in the context of automobile companies listed on the Indian Stock Exchange from 2004 to 2020. Using panel data linear regressions, their study revealed a positive effect of firm age on profitability, indicating that older firms in this sector may benefit from established market positions and experience.

Sales Revenue Growth Rate is an indicator used in most research studies as a control variable. The Tripathi, Aziz, and Joshi, (2024) studied non-financial companies listed on the Indian Stock Exchange from 2000 to 2021, using panel data linear regressions to assess the impact of this indicator on profitability. The findings indicated a negative relationship, suggesting that rapid revenue growth may not always translate into higher profitability, possibly due to increased costs or inefficiencies. In contrast, (Rasheed & Shahzad, 2022) analyzed 126 textile companies in Pakistan from 2010 to 2014, finding a positive impact of sales revenue growth rate on profitability through panel data linear regressions. Their study highlighted the importance of revenue growth for improving financial outcomes in the textile sector.

Taking into consideration dividend payout ratio, Vintilă (2024) investigated the relationship between this variable and profitability in 466 pharmaceutical companies in Europe and the United States from 2012 to 2021. The study, which used panel data linear regressions, found a negative effect, suggesting that higher dividend payouts may reduce retained earnings and hinder long-term profitability. Similarly, Asmaul and Ibnu (2019) analyzed 138 companies listed on the Indonesia Stock Exchange from 2013 to 2016, also finding a negative impact of dividend payout ratio on profitability. These findings support the notion that high dividend payouts may not always be conducive to sustained financial performance.

Regarding current ratio Seissian et al (2018) explored the effect of this indicator on profitability in 94 companies listed on the New York Stock Exchange from 2014 to 2015, using panel data linear regressions. The study found a negative relationship, indicating that a higher current ratio, often associated with liquidity, may

not always lead to better profitability, possibly due to inefficient use of assets. Conversely Zhou et al., (2018) found a positive effect of current ratio on profitability in companies listed on the Athens Stock Exchange from 2008 to 2012. Their research, based on panel data linear regressions, suggested that maintaining adequate liquidity levels could be beneficial for firms in the Greek market.

Debt to capital is another control variables used in this study. Mercè (2023), examined the impact of this variable on financial performance in agricultural companies in Spain from 2008 to 2020. The study, using panel data linear regressions, found a positive relationship, suggesting that leveraging debt can enhance profitability in this sector, possibly by funding growth opportunities. In contrast, Rezana (2019) found a negative impact on profitability in a study of 8 chemical companies listed on the Indonesia Stock Exchange from 2013 to 2017. The findings, based on panel data linear regressions, indicated that higher debt levels may increase financial risk and reduce profitability in the chemical industry.

Pandemic crisis is the last control variable considered in this study. Turkson et al., (2021) studied this variable in 419 companies from Italy during the year 2020. Their analysis, using regressions with interaction variables, revealed a negative effect, highlighting the significant financial challenges posed by the pandemic to companies in Italy. Similarly, Chu et al (2021) analyzed 70 companies in the real estate sector listed on the Shanghai and Shenzhen Stock Exchange in 2020, using time series analysis. Their study also found a negative impact, underscoring the severe disruptions caused by the pandemic on the real estate market in China.

In summary, the diverse methodologies and findings across these studies illustrate the complex interplay between various indicators and company profitability, emphasizing the importance of context, industry, and regional factors in determining the effectiveness of these indicators. These insights contribute to a deeper understanding of corporate performance drivers and highlight areas for future research.

Despite extensive research on corporate indicators and their impact on profitability, a significant gap exists in the literature. Specifically, there has been insufficient investigation into the performance of IT, industrial, and healthcare companies within the S&P 500 index. This gap is particularly notable regarding the use of nonlinear regressions and interaction variables to explore how the pandemic crisis has influenced governance variables in these sectors. Addressing this gap could provide valuable insights into the unique challenges faced by these industries during the crisis and enhance our understanding of the pandemic's impact on corporate performance and governance in critical sectors.

Table 1. Overview of the literature review

Indicators	Study	Companies	Years	Methodology	Effect
Policy Board Diversity	(Ararat, Aksu, & Cetin, 2015)	95 companies listed on the Istanbul Stock Exchange	2006	Multiple regressions Nonlinear regressions Regressions with interaction variables	+
	(Bernile, Bhagwat, & Yonker, 2018)	2000 companies from the ExecuComp database	1996 – 2014	Panel data linear regressions Regressions with interaction variables	+
Board Gender Diversity	(Brahma, Nwafor, & Boateng, 2020)	100 companies from the United Kingdom, included in the FTSE 100 index	2005 – 2016	Panel data linear regressions	+
	(Omri & Alfaleh, 2024)	2542 companies from France, the United Kingdom, Germany, Italy, and Spain	2018 – 2023	Panel data linear regressions	+
	(García-López, Pacheco-Olivares, & Hamoudi, 2024)	27 Spanish companies included in the IBEX 35 stock index	2018 – 2021	Poisson regression models	+
	(Dodd, Frijns, Gong, & Liao, 2023)	Companies included in the American stock index S&P 1500	2004 – 2015	Panel data linear regressions Regressions with interaction variables	-
	(Bogdan et al., 2023)	102 entities, listed on two stock markets, namely Bucharest Stock Exchange (BSE) and ATHEX	2019	Multiple regression model	

Indicators	Study	Companies	Years	Methodology	Effect
Board Cultural Diversity	(Khan & Subhan, 2019)	Companies included in the PSX 100 stock index	2008 – 2017	Panel data linear regressions	-
	(Dodd & Zheng, 2022)	213 companies included in the ASX 200 stock index	2004 – 2018	Panel data linear regressions Nonlinear regressions	+
	(Dodd, Frijns, Gong, & Liao, 2023)	Companies included in the American stock index S&P 1500	2004 – 2015	Panel data linear regressions Regressions with interaction variables	+
	(Ararat, Aksu, & Cetin, 2015)	95 companies listed on the Istanbul Stock Exchange	2006	Multiple regressions Nonlinear regressions Regressions with interaction variables	+
Firm Size	(Milovanovic, Basic, & Bubas, 2022)	963 companies from Southeastern Europe	2019 – 2020	Weighted Least Squares Method	+
	(Rompotis, 2024)	80 companies listed on the Athens Stock Exchange	2018 – 2022	Panel data linear regressions	+
Firm Age	(Neves, Dias, Ferreira, & Henriques, 2022)	3113 wine-producing companies in Spain and Portugal	2011 – 2018	Generalized Method of Moments	-
	(Chaudhary & Arora, 2023)	Automobile companies listed on the Indian Stock Exchange	2004 – 2020	Panel data linear regressions	+
	Safari, Kazemi_Saraskanrood, 2023)	112 companies from the Tehran Stock Exchange. were selected	2015 - 2020	Multiple regressions Nonlinear regressions	+
Sales Revenue Growth Rate	(Tripathi, Aziz, & Joshi, 2024)	Non-financial companies listed on the Indian Stock Exchange	2000 – 2021	Panel data linear regressions	-
	(Rasheed & Shahzad, 2022)	126 textile companies in Pakistan	2010 – 2014	Panel data linear regressions	+
Dividend Payout Ratio	(Vintilă, 2024)	466 pharmaceutical companies in Europe and the United States	2012 – 2021	Panel data linear regressions	-
	(Asmaul & Ibnu, 2019)	138 companies listed on the Indonesia Stock Exchange	2013 – 2016	Panel data linear regressions	-
Current Ratio	(Seissian, Gharios, & Awad, 2018)	94 companies listed on the New York Stock Exchange	2014 – 2015	Panel data linear regressions	-

Indicators	Study	Companies	Years	Methodology	Effect
	(Zhou, Owusu-Ansah, & Maggina, 2018)	Companies listed on the Athens Stock Exchange	2008 – 2012	Panel data linear regressions	+
Debt to Capital	(Mercè, 2023)	Agricultural companies in Spain	2008 – 2020	Panel data linear regressions	+
	(Rezana, 2019)	8 companies in the chemical industry listed on the Indonesia Stock Exchange	2013 – 2017	Panel data linear regressions	-
Pandemic Crisis	(Turkson, Addai, Chowdhury, & Mohammed, 2021)	419 companies from Italy	2020	Regressions with interaction variables	-
	(Chu, Lu, & Tsang, 2021)	70 companies in the real estate sector listed on the Shanghai and Shenzhen Stock Exchange	2020	Time series analysis	-

Source: Authors' work

The research study is guided by the following hypotheses:

H_1: Financial performance is positively influenced by policy board diversity.

H_2: Financial performance is positively impacted by gender diversity on the board.

H_3: Financial performance is positively affected by cultural diversity within the board.

Methodologies and Data

Description of the database and variables

This study examines companies from the IT, industrial, and healthcare sectors listed on the S&P 500 index from 2000 to 2023. By leveraging data from the Thomson Reuters Eikon platform, the research delves into the financial and operational performance of these sectors over more than two decades. The goal is to analyze how recent industry-specific developments have impacted financial metrics and governance structures in these crucial sectors. The results aim to provide insights into the broader economic and social trends influencing these industries and their role in shaping contemporary market dynamics.

Table 2 presents a detailed overview of the research variables, including their symbols, economic definitions, and methods of calculation.

Table 2. Overview of key variables

Dependent variables	Symbol	Meaning	Measurement
Return on Equity	ROE	Represents the annual return that shareholders receive from their investment in the company's equity.	$\text{ROE} = \frac{\text{Net profit}}{\text{Equity}}$
Return on Assets	ROA	Represents the annual financial return that shareholders obtain from their investment in the company's assets.	$\text{ROA} = \frac{\text{Net profit}}{\text{Total assets}}$
Independent variables	Symbol	Meaning	Measurement
Corporate Governance Variables			
Policy Board Diversity	PBD	Indicates whether the company has a policy regarding gender and cultural diversity on the board.	Binary variable: 1 if such a policy exists, 0 if it does not.
Board Gender Diversity	BGD	Represents the proportion of female members on the board of directors.	$\text{BGD} = \frac{\text{Number of women in board}}{\text{Total members of board}}$
Board Cultural Diversity	BCD	Indicates the proportion of board members from diverse cultural backgrounds.	$\text{BCD} = \frac{\text{Members different cultural backgrounds}}{\text{Total members of board}}$
Control Variables			
Firm Size	FS	Firm size is assessed by calculating the natural logarithm of the company's sales revenue.	$\text{FS} = \ln(\text{Sales Revenue})$
Firm Age	FA	Firm age denotes the length of time a company has been operational since its establishment.	$\text{FA} = \text{Year}_{\text{t}} - \text{Year}_{\text{foundation}}$
Sales Revenue Growth Rate	SRGR	Reflects the yearly percentage variation in sales revenue.	$\text{SRGR} = \left(\frac{\text{Sales revenue}_{\text{t}}}{\text{Sales revenue}_{\text{t}-1}}\right) - 1$
Dividend Payout Ratio	DPR	Represents the proportion of net profit distributed as dividends to shareholders.	$\text{DPR} = \frac{\text{Dividends}}{\text{Net Profit}}$

Current Ratio	CR	Represents the ability of a business to meet its short-term financial obligations.	$\text{CR} = \frac{\text{Current assets}}{\text{Short term liabilities}}$
Debt to Capital	DC	Represents a company's capacity to fulfill its long-term financial commitments.	$\text{DC} = \frac{\text{Long term liabilities}}{\text{Equity} + \text{Long term liabilities}}$
Pandemic Crisis	COVID	Denotes whether a pandemic crisis occurred in a specific year.	Binary variable: 1 if the year is 2020, 2021, or 2022; 0 if it is any other year.

Source: Authors' work

The calculation formulas presented in Table 2 are in accordance with those outlined in several expert sources, including Stancu & Stancu (2012) and Anghelache (2009).

Description of econometric methods

The econometric methodologies detailed in this paper are predominantly derived from analyses performed using the Stata software. The dataset was imported into Stata for comprehensive analysis, which included calculating descriptive statistics and constructing a Pearson correlation coefficient matrix. Additionally, the initial data was transformed to conduct a more accurate econometric study. Outliers were identified, and the winsorization procedure was applied to all variables, excluding PBD, BGD, FS and FA. With a 90% winsorization, data above the 95th percentile were capped at the 95th percentile, while data below the 5th percentile were capped at the 5th percentile. The entire analysis in the study was then performed on the winsorized data.

The quantitative research methodology employed encompasses multiple stages. Initially, baseline regression models were formulated without the inclusion of effects to establish preliminary results. Following this, both fixed effects and random effects linear regression models were executed. The selection of the most appropriate model was determined through the Hausman test, with a significance level set at 5%. Models exceeding this significance threshold were designated as

random effects models, whereas those below the threshold were classified as fixed effects models.

In addition, interaction variables, particularly those related to the Covid-19 pandemic, were incorporated into the regression models to examine the impact of the pandemic on various indicators reported by the companies under study. For these models involving interaction variables, the fixed effects model was initially tested, followed by the application of the random effects model and Hausman test to confirm the optimal model choice. Furthermore, nonlinear regression models were evaluated by examining the interaction between two independent variables. The methodology applied to these nonlinear models was consistent with the approach used for linear regressions.

The following is a summary presentation of the regression model formulations. For linear regression models, Equation 1 is employed:

$$Firm\ performance_{it} = a_0 + a_1 Financial\ variables_{it} + a_2 Governance\ variables_{it} + a_3 COVID_{it} + \varepsilon_{it} \quad (1)$$

The general formulations for nonlinear regression models are presented in Equation 2:

$$Firm\ performance_{it} = a_0 + a_1 Financial\ variables_{it} + a_2 Financial\ variables_{it}^2 + a_3 Governance\ variables_{it} + a_4 Governance\ variables_{it}^2 + a_5 COVID_{it} + \varepsilon_{it} \quad (2)$$

The general formulation for regression models incorporating an interaction variable is illustrated in Equation 3:

$$Firm\ performance_{it} = a_0 + a_1 Financial\ variables_{it} + a_2 Financial\ variables_{it} * COVID_{it} + a_3 Governance\ variables_{it} + a_4 Governance\ variables_{it} * COVID_{it} + a_5 COVID_{it} + \varepsilon_{it} \quad (3)$$

Where: a_0 = constant; a_1 … a_{10} = the coefficients linked to the explanatory variables; ε = errors; firm performance = [ROE, ROA]; financial variables = [FS, FA,

SRGR, DPR, CR, DC, COVID]; governance variables = [PBD, BGD, BCD]; i = [1, 204]; t = [2000, 2023].

The following chapter focuses on interpreting and thoroughly analyzing the econometric results obtained, as well as examining their relationship with the broader economic context.

Results and discussion

Descriptive statistics and correlation analysis

Table 3 provides a comprehensive summary of the dataset's descriptive statistics. By examining the mean and standard deviation values, we can assess the variability of each variable included in the study. Variables exhibiting a standard deviation greater than their mean, sales revenue growth rate, dividend payout ratio, debt to capital and pandemic crisis, indicate a high level of fluctuation and instability within the data. In contrast, variables with standard deviations lower than their mean demonstrate more consistency and less volatility. Additionally, the table presents the minimum and maximum values for each variable, offering further insight into the range and dispersion of the data utilized in this research.

Table 3. Descriptive statistics

Variables	Obs	Mean	Std. Dev.	Min	Max	Skew.	Kurt.
ROE w	4246	.189	.175	-.163	.633	.598	3.883
ROA w	4484	.076	.066	-.074	.205	-.159	3.068
PBD	3315	.59	.492	0	1	-.366	1.134
BGD	3301	18.725	10.345	0	100	.378	3.931
BCD w	623	13.896	8.66	7.143	41.667	1.994	6.392
FS	4607	22.39	1.714	10.82	26.7	-.697	4.99
FA	4175	33.39	29.344	1	136	1.335	4.089
SRGR w	4403	10.632	15.432	-14.315	50.808	.932	3.828
DPR w	4059	.228	.247	0	.812	.875	2.732
CR w	4412	2.107	1.156	.795	5.121	1.228	3.723
DC w	4344	.74	.839	0	3.292	1.828	5.77
COVID	4896	.125	.331	0	1	2.268	6.143

Source: Authors' work

In descriptive analysis, skewness is an important indicator that measures the asymmetry of a distribution in relation to a particular variable. Within the analyzed dataset, all indicators exhibit skewness values that deviate significantly from 0. This deviation suggests that these distributions are highly skewed. Additionally, indicators like return on assets, policy board diversity and firm size display negative skewness, indicating distributions that are heavily left-skewed. Conversely, other indicators in the study show positive skewness values, differing from 0 and pointing to right-skewed distributions.

Kurtosis, another critical statistical measure, reflects the peakedness or flatness of a distribution. For certain variable such as policy board diversity and dividend payout ratio, the kurtosis value is less than 3, indicating platykurtic distributions with flatter tails. On the other hand, variables with a kurtosis greater than 3 exhibit leptokurtic distributions, which are more peaked and have excess kurtosis greater than 0.

Finally, an essential aspect of database analysis is the examination of correlations between the variables under consideration. The correlation matrix for these variables is presented in Table 4.

Table 4. Matrix of correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) ROE_w	1.000										
(2) ROA_w	0.658	1.000									
(3) PBD	0.134	0.168	1.000								
(4) BGD	0.144	0.043	0.287	1.000							
(5) BCD_w	0.222	0.297	0.047	0.066	1.000						
(6) FS	0.231	-0.050	-0.062	0.317	-0.102	1.000					
(7) FA	0.063	-0.036	-0.027	0.074	-0.200	0.304	1.000				
(8) SRGR_w	0.136	0.211	0.051	-0.072	0.029	-0.063	-0.175	1.000			
(9) DPR_w	-0.090	-0.277	0.109	0.183	-0.111	0.409	0.316	-0.281	1.000		
(10) CR_w	-0.099	0.295	0.017	-0.243	-0.069	-0.306	-0.179	0.175	-0.189	1.000	
(11) DC_w	0.451	-0.152	-0.021	0.058	0.010	0.264	0.165	-0.045	0.180	-0.292	1.000
(12) COVID	0.020	0.021	0.283	0.393	0.038	-0.040	-0.011	0.103	0.055	-0.066	0.050
Variables	(12)										
(12) COVID	1.000										

Source: Authors' work

In this study, a correlation coefficient greater than 0.5 was used to denote a strong positive relationship between variables, while a coefficient of -0.5 was interpreted as a strong negative relationship. However, no significant correlations were observed among the variables in this analysis.

Results of the regression models

The findings of this study are presented in Tables 5 and 6. Table 5 details both the linear regression models without effects and those incorporating effects. Additionally, the nonlinear regression models are illustrated in Models 7 and 8. The Hausman test results indicate that the appropriate regression models are those with fixed effects.

Table 5. Linear and Nonlinear Regression Models

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ROE_w	ROA_w	ROE_w	ROE_w	ROA_w	ROA_w	ROA_w	ROA_w
			fe	*re*	*fe*	*re*	*fe*	*re*
PBD	0.0676***	0.0205***	0.0181	0.0326**	0.00771	0.00846*	0.00604	0.00782*
	(4.35)	(4.39)	(1.33)	(2.66)	(1.88)	(2.27)	(1.46)	(2.09)
BGD	0.00145	0.000313	0.00171*	0.0020**	0.00076***	0.00067***	0.0019***	0.0017***
	(1.76)	(1.26)	(2.28)	(3.19)	(3.39)	(3.38)	(3.55)	(3.03)
BGDxBGD							-0.0001*	-0.0002*
							(-2.37)	(-1.98)
BCD_w	0.00415***	0.00177***	-0.0028**	-0.00108	-0.000310	0.0000805	-0.00018	0.00017
	(5.99)	(8.45)	(-2.75)	(-1.15)	(-1.00)	(0.28)	(-0.59)	(0.61)
FS	0.0328***	0.00670***	0.0460**	0.0440***	0.0139**	0.00950**	0.0133**	0.0093**
	(5.12)	(3.50)	(2.69)	(4.41)	(2.70)	(3.08)	(2.60)	(3.01)
FA	0.000325	0.000208***	0.00258	0.000528	-0.00054	0.000187	-0.0002	0.00019

					2		7	
	(1.81)	(3.84)	(1.29)	(1.27)	(-0.90)	(1.45)	(-0.45)	(1.49)
SRGR_w	0.00134*	0.000393*	0.000471	0.000653	-0.000004	0.000119	0.00001	0.00013
	(2.56)	(2.50)	(1.36)	(1.85)	(-0.00)	(1.11)	(0.14)	(1.22)
DPR_w	-0.158***	-0.0518***	-0.402***	-0.349***	-0.129***	-0.114***	-0.130***	-0.11***
	(-5.92)	(-6.47)	(-15.57)	(-14.20)	(-16.73)	(-15.25)	(-16.84)	(-15.32)
CR_w	0.0142	0.0166***	-0.00586	0.00289	-0.000240	0.00690**	-0.00061	0.00659*
	(1.95)	(7.53)	(-0.63)	(0.34)	(-0.09)	(2.66)	(-0.22)	(2.55)
DC_w	0.0889***	-0.00464*	0.0880***	0.0872**	0.00238	-0.000593	0.00154	-0.0010
	(11.83)	(-2.06)	(11.20)	(11.79)	(1.01)	(-0.26)	(0.65)	(-0.48)
COVID	-0.0285	-0.00347	-0.036***	-0.0307**	-0.00445	-0.00428	-0.00461	-0.0040
	(-1.73)	(-0.70)	(-3.41)	(-2.85)	(-1.38)	(-1.31)	(-1.43)	(-1.24)
_cons	-0.728***	-0.134**	-0.866*	-0.825***	-0.190	-0.139	-0.197	-0.144*
	(-4.95)	(-3.05)	(-2.24)	(-3.56)	(-1.63)	(-1.94)	(-1.70)	(-2.02)
Obs	514	515	514	514	515	515	515	515
R-sq	0.369	0.316	0.148	0.252	0.0493	0.144	0.0573	0.139
F-stat	29.45***	23.30***	47.58***		37.16***		34.65***	
Mean VIF	1.28	1.28						
Wald				427.6***		307.5***		314.5***
Hausman			106.56***		368.45***		659.95***	
Turning point							35.780	37.157

t statistics in parentheses: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, *Source: Authors' work*

Table 6 presents the regression models that include interaction variables.

Table 6. Interaction variable regression models

	(1)	(2)	(3)	(4)	(5)
	ROE_w	ROA_w	ROE_w	ROA_w	ROA_w
			fe	*fe*	*fe*
PBD	0.0669***	0.0205***	0.0187	0.00749	0.00760
	(4.32)	(4.39)	(1.37)	(1.82)	(1.85)
BGD	0.00148	0.000314	0.00176*	0.00086***	0.000748***
	(1.80)	(1.26)	(2.36)	(3.59)	(3.33)
BGDxCOVID				-0.000402	
				(-1.17)	
BCD_w	0.00507***	0.00177***	-0.0024*	-0.000294	-0.000402*
	(6.34)	(7.29)	(-2.28)	(-0.95)	(-1.26)
BCD_wxCOVID	-0.00349	-0.0000055	0.00141*		0.000320*
	(-2.27)	(-0.01)	(1.52)		(1.14)
FS	0.0332***	0.00671***	0.046**	0.013**	0.0137**
	(5.21)	(3.49)	(2.74)	(2.64)	(2.67)
FA	0.000319	0.000208***	0.00249	-0.000590	-0.000522
	(1.78)	(3.83)	(1.24)	(-0.98)	(-0.87)
SRGR_w	0.00136**	0.000393*	0.000474	-0.000008	-0.00000153
	(2.61)	(2.50)	(1.37)	(-0.08)	(-0.01)
DPR_w	-0.154***	-0.0518***	-0.398***	-0.130***	-0.130***
	(-5.78)	(-6.44)	(-15.42)	(-16.77)	(-16.77)
CR_w	0.0149*	0.0166***	-0.00514	-0.000479	-0.000398
	(2.05)	(7.51)	(-0.55)	(-0.17)	(-0.14)
DC_w	0.0900***	-0.00464*	0.0890***	0.00220	0.00214
	(12.00)	(-2.05)	(11.31)	(0.93)	(0.91)
COVID	0.0212	-0.00339	-0.0161	0.00641	-0.00914
	(0.78)	(-0.41)	(-0.92)	(0.65)	(-1.75)
_cons	-0.755***	-0.134**	-0.892*	-0.182	-0.184
	(-5.14)	(-3.04)	(-2.31)	(-1.56)	(-1.58)
Obs	514	515	514	515	515
R-sq	0.376	0.316	0.155	0.0472	0.0498
F-stat	27.46***	21.14***	43.59***	33.94***	33.93***

Mean VIF	1.76	1.76			
Hausman			92.76***	373.93***	482.16***

t statistics in parentheses: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, *Source: Authors' work*

Regarding policy board diversity, this indicator has a positive but statistically insignificant impact on the financial performance of the analyzed companies. Thus, companies should implement gender and cultural diversity policies on their boards to enhance decision-making, drive innovation, and improve overall performance. Diverse boards bring varied perspectives that can lead to better problem-solving and more effective strategies. These findings validate the research hypothesis and align with the results obtained by Ararat et al., (2015) and Bernile et al., (2018).

Board gender diversity has a positive and statistically significant impact on the financial performance of the analyzed companies. Gender diversity on boards is important because it enhances decision-making, fosters innovation, and reflects a broader range of perspectives, leading to improved organizational performance and better representation of diverse stakeholders. These findings validate the research hypothesis and align with the results obtained by Brahma et al., (2020), Omri & Alfaleh (2024) and García-López et al., (2024). However, during the health crisis period, the impact became negative and statistically insignificant. The impact became negative during the health crisis due to increased operational challenges and disruptions that overshadowed the benefits of board diversity. Additionally, there is a turning point in this case: up to a level of 35, the influence of board gender diversity is positive, after which it becomes negative.

Board cultural diversity has a negative and statistically significant impact on financial performance. These findings do not validate the research hypothesis and align with the results obtained by Khan & Subhan (2019). Cultural diversity can negatively impact financial performance due to potential communication barriers, conflicts in decision-making processes, and challenges in aligning diverse perspectives with organizational goals. However, during the pandemic crisis, the impact became positive and statistically significant. The positive impact of cultural diversity during the pandemic crisis occurred because diverse perspectives and

experiences helped companies adapt to rapidly changing circumstances, innovate, and address complex challenges more effectively.

The control variables analyzed in this research, such as company size, age, sales growth rate, and debt-to-capital ratio, were found to enhance financial performance. On the other hand, factors like dividend payout ratio, current ratio, and the effects of the pandemic had a detrimental effect on profitability. Consequently, the study identified both beneficial and adverse influences, with two of the proposed hypotheses being confirmed.

Conclusion

This study undertook a comprehensive quantitative analysis of key corporate governance factors influencing the profitability of IT, industrial, and healthcare companies in the United States between 2000 and 2023, focusing on a sample of 204 firms listed in the S&P 500 index. The primary objective was to explore how critical governance variables relate to firm performance across different economic conditions. To achieve this, a rigorous methodological approach was employed, utilizing both linear and nonlinear regression models, alongside interaction models that incorporated a dummy variable to account for the impact of the pandemic crisis.

The findings indicate that board diversity, in terms of policy implementation, consistently contributed to better financial outcomes, regardless of the presence of a crisis. In contrast, gender diversity on boards had a generally positive effect but exhibited a shift to negative during the crisis period, with a notable inflection point where the impact reversed. Similarly, cultural diversity on boards, which negatively affected profitability during stable periods, showed a marked improvement during the pandemic, becoming a positive influence as companies leveraged diverse perspectives to navigate uncertainty. The inclusion of control variables enhanced the precision and explanatory power of the regression models.

Policy recommendations suggest that companies should prioritize implementing policies that foster board diversity, including gender, cultural, and skill-

based diversity. The study demonstrates that diversity positively impacts financial performance, especially during periods of crisis. Therefore, establishing and maintaining diverse boards can enhance resilience and decision-making in times of uncertainty. While gender diversity on boards generally improves profitability, the shift to a negative impact during crises suggests the need for adaptive strategies. Companies should regularly assess the effectiveness of gender diversity initiatives and develop contingency plans to address challenges that may arise during turbulent periods. Additional support mechanisms, such as leadership development programs, may help mitigate these negative effects. Given the positive impact of cultural diversity during the pandemic, companies should explore ways to better utilize diverse cultural perspectives, particularly in crisis management and innovation. Policy frameworks should encourage the inclusion of individuals from varied cultural backgrounds to enhance problem-solving and adaptability in dynamic environments. Since diversity impacts are context-dependent, companies should implement regular reviews of their diversity policies to ensure alignment with evolving business environments. This includes revisiting board composition in response to shifts in the market or macroeconomic conditions, ensuring that diversity continues to drive positive financial performance.

Despite the valuable insights gained, the study's limitations are tied to its focus on a specific set of companies and the defined time frame, making the results most applicable to the S&P 500 firms during this period. Future research could broaden the scope by incorporating additional governance variables, extending the analysis to other sectors and global markets, and exploring the role of macroeconomic conditions. More advanced econometric techniques could further refine the understanding of these relationships over time.

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