Linking Corporate Governance to Firm Outcomes: Mediating Role of Green Innovation and Moderating Effects of Capital Structure

Raza Ullah,
PhD Scholar, Department of Management Sciences, Islamia College University, Peshawar
razaullah@icp.edu.pk

Dr. Anjum Ihsan,
Assistant Professor, Department of Management Sciences, Islamia College University, Peshawar
anjumihsan@icp.edu.pk

Abstract
Corporate governance (CG) is a key determinant of accountability, sustainability, and financial performance. In emerging economies, where regulatory and institutional frameworks are still evolving, effective governance is particularly critical. This study investigates the effects of CG mechanisms on firm financial performance (FFP) in Pakistan, incorporating the mediating role of green innovation (GI) and the moderating effect of capital structure (CS). An unbalanced panel dataset of non-financial firms listed on the Pakistan Stock Exchange from 1999 to 2019 was analyzed. Pooled OLS, fixed effects, and random effects models were estimated, and based on the Chow, Breusch–Pagan LM, and Hausman tests, together with a positive Wald test indicating heterogeneity, the Random Effects model with robust errors was selected. Mediation was tested using the Preacher and Hayes bootstrapping procedure, while moderation was assessed through interaction regressions. Firm size, sales growth, and liquidity served as control variables. The findings show that board size consistently enhances FFP, while board independence and meeting frequency yield mixed outcomes. Gender diversity and CEO duality display context-specific effects shaped by institutional and cultural factors. GI partially mediates the CG–FP relationship, and CS moderates it by reinforcing governance effectiveness under balanced leverage but weakening it under excessive debt. This study is among the first to jointly test governance, GI, and CS in Pakistan, thereby extending the CG–performance debate in emerging economies. It contributes to theory-building through combining perspectives of Agency, Trade-off and Socially Responsible Investing (SRI) and allows regulators and corporate management to consider strong governance codes, financing policies and embedding GI in sustainable performance strategies.

Keywords: *Corporate Governance, Firm Performance, Green Innovation, Capital Structure, Sustainability, Emerging Economies, Pakistan*

Introduction

In today's rapidly evolving economic landscape, organizations strive for excellence to remain competitive and sustainable. Establishing effective Corporate Governance (CG) mechanisms is essential for creating framework that fosters efficient management and accountability (Sharma et al., 2023; Price, 2018). The importance of CG has been underscored by high-profile corporate failure such as World Com and Enron, and the global financial crisis of 2008, which exposed the consequences of poor oversight and unethical practices. Its significance lies in managing the

relationship between ownership and control, promoting ethical conduct, and enhancing firm value (Paul, 2017). Recent evidence from Pakistan shows that corporate governance mechanisms—such as board size, gender diversity, and board independence play a decisive role in enhancing firm performance across multiple sectors, reinforcing CG as a driver of accountability and competitiveness (Akhtar, 2025). Similarly, Shakri et al. (2025) demonstrate that compliance with corporate governance codes significantly improves firm performance in the Pakistani context, further confirming the value of governance reforms in emerging economies.CG is increasingly important across both developed and developing countries, contributing to economic stability and investor confidence (Iskander & Chamlou, 2000). CG impacts firm financial performance (FFP) by influencing strategic decision-making, risk management, and operational efficiency (Aguilera et al., 2021). Transparent reporting, capable boards, and strong internal controls enhance accountability and aligns management interests with those shareholder (Bebchuk et al., 2020; Shleifer et al., 1997). Effective CG also mitigates financial mismanagement and promotes long term stability (Larcker & Tayan, 2021). Despite extensive literature, the CG-FP relationship yields mixed results due to varying industry context, timeframes, and performance measures (Hassan & Halbouni, 2013).

Moderating variables such as firm characteristics can explain these inconsistencies (Cuomo et al., 2016; Renders & Gaeremynck, 2010), as highlighted by Baron and Kenny's (1986) framework. Capital Structure (CS) plays a crucial role in this dynamic framework. Originating from Modigliani & Miller's (1958) research work, CS decision affect firm value, risk, and control mechanism (Chakraborty, 1975). Optimal CS can reduce capital costs and enhance shareholder value (De Wet & Dhanraj, 2007). In practice, CS associates with CG by impacting managerial behavior especially in the frame of the agency perspective (Jiraporn & Chintrakarn, 2013). However, much of the literature tends to consider CG and CS in isolation, with limited attention to their interaction to influencing FP (Mwambuli, 2019; Chow et al., 2018). This study examines how CS moderates the relationship of CG-FP, addressing gaps in theoretical and empirical understanding (Frank & Goyal, 2009). Amid growing sustainability expectations from stakeholders, Green Innovation (GI) has emerged as a strategic imperative. GI includes eco-friendly technologies, energy efficiency, waste reduction, and environmentally conscious product design (Kijkasiwat et al., 2024; Porter & Van der Linde, 1995). It increases firm competitiveness and support long term performance (Kang et al., 2023; Smith et al., 2021). GI increasingly seen as a mediating variable through which CG affects FP. Effective governance structures foster environmental responsiveness, aligning with global Environmental, Social, and Governance (ESG) expectations, and increasing both financial and ecological outcomes (Kang et al. 2023; Manrique & Marti-Ballester, 2017). Given these dynamics, this study investigates how CG impacts FP in the presence of CS as moderating variable and GI as mediating variable in the context of Pakistan's non-financial sector.

Literature Review and Theoretical Foundation

Jensen and Meckling (1976) developed agency theory, emphasizing the relationship between property rights, agency costs, and corporate finance. They argued that owners could reduce agency costs by increasing the managerial ownership or by incurring monitoring and bonding costs. Early empirical studies supported this perspective but overlooked the problem of endogeneity. Addressing endogeneity remains a central methodological challenge in CG–FP studies (Wintoki et al., 2012). Furthermore, Bui and Krajcsak (2023) investigated the impact of CG on financial

performance (FP) and found a positive association between transparency and FP, as well as a correlation with governance practice and company size. However, they did not find significant relationship for certain aspects of CG. The studies recommend that Policymakers establish clear criteria and regulations, while companies should prioritize adoption of ethical CG practices. Effective CG practices can enhance financial performance and strengthen investor confidence through improved risk assessment.

As Myers (1984) noted, implementing the CS adjustments can be time consuming, particularly, when firms must incur costs to facilitate such changes. Extensive literature suggests that firms encountering high adjustment costs, such as agency costs, financial distress, transaction expenses, and bankruptcy risks require more time to revert to their target CS (Chang et al., 2014; Faulkender et al., 2008). The magnitude of adjustment costs is influenced by the extent of conflict between shareholders and management, which subsequently affects **how swiftly firms can align their CS** with the optimal level. Several theoretical frameworks attribute the origins of adjustment cost to managerial self-interest and agency related concerns. Consequently, managers are expected to make rational financing decisions in response to these adjustment costs (Chang et al., 2014; Faulkender et al., 2008).

Fussler and James (1996) were among the first to define GI. Green Innovation, according to them, refers to innovative goods and processes that provide value to organizations and customers while having a lower negative impact on the natural environment. It entails management methods, goods, and services that result in a considerable reduction in environmental dangers (Ahmed et al., 2022). According to the available literature, GI refers to the introduction of significantly improved or new organizational products, processes, technologies, or waste management systems that significantly reduce natural resource consumption, toxic substance emissions, and negative environmental impact.

The theoretical foundation of CG research rests on Agency Theory, which highlights conflicts arising from the separation of ownership and control (Jensen & Meckling, 1976). Shareholders face difficulties in aligning managerial actions with corporate objectives, and governance mechanisms—such as independent boards and incentive contracts—are designed to mitigate these agency costs. Agency theory predicts a positive link between CG quality and FP, although results vary across institutional settings (Bhagat & Bolton, 2008). The Trade-off Theory provides insight into CS as a moderating factor. Firms seek an optimal debt–equity mix by balancing tax advantages of debt against potential costs of financial distress (Myers, 1984). Appropriate leverage enhances governance by disciplining managerial behavior through creditor monitoring, whereas excessive debt undermines performance. Thus, CS conditions the CG–FP relationship. The mediating role of GI is grounded in SRI and ESG perspectives, which suggest that well-governed firms are more likely to adopt sustainability-oriented innovations. GI not only reduces ecological harm but also enhances efficiency, legitimacy, and long-term profitability (Dangelico & Pujari, 2010). Integrating these perspectives, the framework posits that CG improves FP directly and indirectly through GI, with CS shaping the strength of these effects. This multi-theoretical approach captures both causal mechanisms and boundary conditions, offering a nuanced understanding of governance–performance dynamics in emerging economies.

Board size and Firm Financial Performance

Board size is a prominent yet contested construct in CG literature. According to agency theory, large boards can undermine governance effectiveness through coordination inefficiencies, suboptimal communication flow, and diminished fiduciary control (Lipton & Lorsch, 1992). According to resource dependence theory, larger boards enhance effectiveness by providing multidisciplinary insights, a broader strategic remit, and reinforce external ties, especially in uncertain or dynamic contexts (Pfeffer, 1972). Empirical findings are mixed: Yermack (1996) and Eisenberg et al. (1998) find adverse empirical correlations, whereas Zhang (2024), and Setiabudi et al. (2025) report positive effects in emerging economies. Sharma et al. (2023) propose a non-linear association between board size and performance. Prior studies have used accounting-based measures such as ROA, ROE, as well as market-based indicators such as Tobin's Q (TQ), to capture firm-level operational capability and external market appraisal, respectively (Al-Matari et al., 2014; Brown & Caylor, 2006). Given the theoretical-empirical misalignment, we offer the following non-directional hypothesis:

H_1: Board size has a significant impact on FFP, as measured by accounting-based indicators (ROA, ROE) and market-based valuation Tobin's Q (TQ).

Board independence and Firm Financial Performance:
Board independence remains a salient yet debated aspect in CG. According to agency theory, an increased proportion of non-executive directors (NEDs) strengthens board oversight, thereby reducing agency costs and enhances FP (Fama & Jensen, 1983; Shleifer & Vishny, 1997). NEDs also bring external perspectives and reputational capital to safeguard shareholders' interests. In contrast, stewardship theory contends that excessive independence may constrain firm-specific knowledge exchange and decisional efficiency (Donaldson and Davis, 1991). Empirical findings from mixed studies such as Dehaene et al. (2001), and Hu et al. (2023) report positive relationships between board independence and financial outcomes, particularly in volatile or under-performing environments. However, Hermalin and Weisbach (1991) and Rhoades et al. (2000) suggest the effect is often contingent on contextual factors. Khan and Saleem (2024) highlight a non-linear relationship, where moderate board independence results in comparatively better outcomes to extreme levels. To evaluate this relationship, firm-level financial performance is assessed using ROA, ROE, and TQ, reflecting both operational efficiency and external market appraisal (Brown & Caylor, 2006; Li & Tian, 2025). Based on theoretical divergence and empirical ambiguity, a non-directional hypothesis is proposed:
H2: Board independence has a significant impact on FFP, as measured by accounting-based indicators (ROA, ROE) and market-based valuation Tobin's Q (TQ

Board gender diversity and Firm Financial Performance:
Board-level gender diversity, supported by agency theory, resource dependence theory, and social identity theory, is regarded as a strategic governance mechanism that strengthens decision-making, promote innovation, and reinforce accountability (Hillman et al., 2007; Pfeffer & Salancik, 2003; Turner & Tajfel, 1986). Female directors are found to be more stakeholder-oriented and ethical-oriented, thereby enhancing board oversight and governance effectiveness (Bear et al., 2010; Adam & Ferreira, 2009). Several empirical studies associate a gender-diverse board with improved firm-level outcomes. For example, Carter et al. (2003) and Post & Byron (2015), identify positive effects of gender diversity on financial performance indicators such as ROA, ROE, and TQ. Moreover,

meta-analytical evidence suggests that performance advantages become more pronounced once gender diversity achieves critical mass (Joecks et al., 2013; Chen & Zhang, 2024). However, certain findings remain context-dependent and empirical findings, the following hypothesis is proposed:
H3: Board gender diversity has a significant impact on FFP, as measured by Returns on Assets (ROA, ROE, and Tobin's Q (TQ.

CEO Duality and Firm Financial Performance:
CEO duality, in which one individual serves as both CEO and board chairperson, remains a contested governance arrangement with mixed theoretical and empirical implications. According to agency theory, this dual role undermines board independence, heightens agency costs and impairs oversight efficacy (Jensen & Meckling, 1976; Lipton & Lorsch, 1992). Conversely, stewardship theory posits that unified leadership facilitates strategic alignment, prompt decision-making, and managerial coherence (Donaldson & Davis, 1991; Adam & Ferreira, 2007). Empirical findings remain inconclusive and context-dependent. Studies such as Rencher & Dalton (1991), Haniffa & Hudaib (2006), and Chahine & Tohme (2009) report improved financial outcomes associated with role separation. In contrast, evidence from Sheikh et al. (2024) indicate that CEO duality favorably influences ROA and ROE during volatile periods such as the COVID-19 pandemic. In Pakistan, Nasir et al. (2023) report a negative influence of CEO duality on investor sentiment and market-based valuation. These variations underscore the necessity of contextual examination, especially in emerging economies where ownership tends to be concentrated. Accordingly, this study assesses financial performance through ROA, ROE, TQ, and proposes a non-directional hypothesis:

H4: CEO duality has a significant impact on FFP, as measured by accounting-based indicators (ROA, ROE) and market-based valuation Tobin's Q (TQ).

Board Meeting Frequency and Firm Financial Performance:
Board meeting frequency is a critical aspect of board diligence and a fundamental mechanism in CG. Rooted in agency theory, increased board meeting frequency improves oversight, mitigates information asymmetry, and aligns managerial actions with shareholder interests (Jensen & Mecking, 1976; Fama & Jensen, 1983). Stakeholder theory expands this perspective by emphasizing that greater board engagement also reinforces accountability to broader stakeholder constituencies, including regulators, customers, and employees (Freeman, 1984). Moreover, SRI theory posits that regular meetings reflect a firm's commitment to ethical governance, sustainability, and transparency. Factors that are highly valued by contemporary investors (Renneboog & Zhang, 2008). Empirical studies offer mixed findings: Vafeas (1999) reported a positive correlation between board meetings and firm value, particularly in developing economies, while others, such as Fich and Shivdasani (2006), found adverse effects in developed markets. More recently, Al-Daoud et al. (2016) and Hossain and Oon (2022) found that increased board meetings enhance ROA, ROE, and TQ, particularly in the context of weak investor protection. These findings support the contingency perspective that the effectiveness of meeting frequency is contingent upon institutional quality and board engagement, ultimately influencing FP across key financial indicators.
H5: Board meeting frequency has a significant impact on FFP, as measured by Returns on Assets (ROA), Return on Equity (ROE), and Tobin's Q (TQ).

Mediating Role of Green Innovation:

The growing emphasis on environmental sustainability has redirected CG from traditional financial objectives to broader strategic orientations, particularly GI. Green Innovation entails the development of environmentally friendly products, processes, and business models that reduce environmental impact and foster sustainable value (Qiu & Yu, 2023). The growing body of literature posits that strong governance mechanisms, such as independent boards, CEO duality, a diverse board composition, serve as enablers of GI by enhancing transparency, mitigating agency conflicts, and aligning corporate strategy with stakeholder expectations (Lu & Wang, 2018; Wang et al., 2023). Firms that integrate GI as a strategic priority often achieve superior performance outcomes due to efficiency gains, optimized resource utilization, enhanced corporate reputation, and regulatory compliance advantages. These benefits lead to measurable financial outcomes, including improved profitability in market valuation (Porter & Linde, 1995; Jia et al., 2024). Hence, GI functions as an intervening mechanism through which governance practices influence FP. The mediating role of GI is particularly relevant in turbulent and regulated environments where innovation plays a buffering role and ESG-oriented studies postulate that GI mediates the nexus between CG and FP, as evaluated using both accounting-based metrics (ROA, ROE) and market-based indicators (TQ).

H6: GI mediates the relationship between CG and FP, as measured by Returns on Assets (ROA), Return on Equity (ROE), and Tobin's Q (TQ).

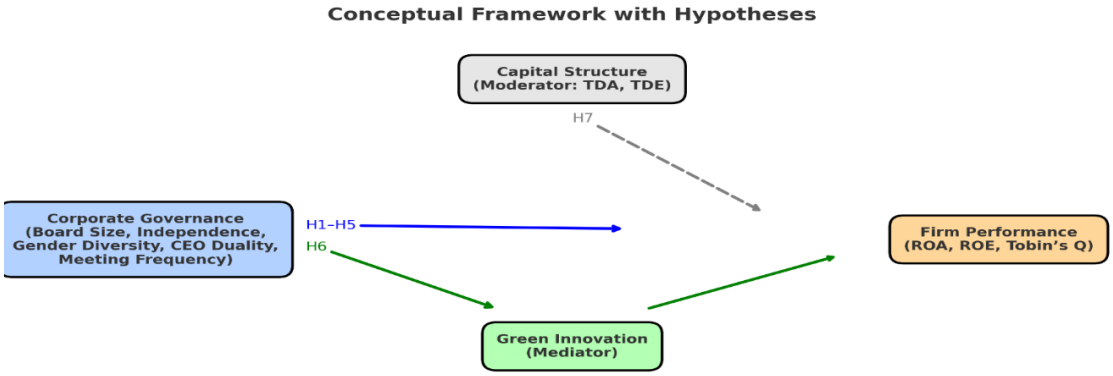
Moderating Role of Capital Structure

Numerous studies have proven that the association between CG and FP is not homogeneous across different firms and contexts; rather, it is influenced by a range of internal and external factors (Bhagat & Bolton, 2008; Tulcanaza-Prieto et al., 2024). CS, defined as the balanced mix of debt and equity, has emerged as a critical moderator that can either strengthen or weaken the effectiveness of governance mechanisms, drawing to Trade-Off Theory (Kraus & Litzenberger, 1973), optimal leverage contribute to performance by disciplining managerial actions and reducing agency costs. Conversely, excessive debt can constrain strategic flexibility and increase financial risk, diminishing governance effectiveness. Empirical evidence from both emerging and developed economies indicates that firms with robust governance structures, such as independent boards and transparent reporting, exhibit higher ROA, ROE, and TQ, when leverage is maintained at balanced levels (Al Amosh et al., 2023; Triphati et al., 2024). This recommends that CS serves as a boundary condition that moderates the CG-performance relationship. Therefore, investigating this moderating role is essential for understanding how governance can be aligned with firm-specific financial structures, particularly in markets where access to capital and regulatory enforcement is uneven.

H7: CS significantly moderates the relationship between CG and FP, as measured by Returns on Assets (ROA), Return on Equity (ROE), and Tobin's Q (TQ.

Conceptual Diagram of the Study:

This study links CG with FFP, incorporating GI as mediator and CS as moderator. Grounded in Agency, Trade-Off, and SRI theories, the framework shows CG mechanisms directly enhance FFP, indirectly through GI, and conditionally via CS (TDA, TDE).



Methodology

The analysis is based on firm-level non-financial entities enlisted at the Pakistan Stock Exchange (PSX) to examine the study variables on a sample of 285 firms over the period 1999–2019, consisting of 5,985 firm-year observations according to the fourteen sectors. We selected the sample and the sample size according to Yamane (1967), who strives for the required level of representation and exclude financial companies from sample due to their specific capital structures and regulation. The data was collected from various secondary sources such as companies' annual reports, PSX database, State Bank of Pakistan (SBP), corporate social responsibility (CSR) or sustainability report. The governance variables board size, CEO duality, board independence, gender diversity, and board meeting frequency were captured from the annual report. Corporate performance was assessed through three measures: return on assets (ROA) and return on equity (ROE) as accounting-based measures and TQ as a market-based measure. The moderating variable, capital structure, was measured by total debt to assets (TDE) and total debt to equity (TDA) while the mediating variable, green innovation (GI), was operationalized based on content analysis of environmental and CSR disclosures using a ten-item binary index. Control factors covered firm size, sales growth, and liquidity.

Statistical analyses used panel regression models, conducted in stages, from the initial descriptive and correlation analyses of bivariate relationships, to multivariate regression techniques that test proposed hypotheses of relations. Moderation was tested using interaction item between governance variables and capital structure, and mediation was carried out using panel-based causal mediation analysis using Preacher and Hayes approach, which is capable of isolating direct and indirect effects. Diagnostic tests— such as Breusch–Pagan LM, Hausman, Modified Wald, as well

as Wooldridge were employed to further confirm model selection as well as the potential econometric problems.

Table 1 Results of Descriptive Statistics

Variable	Mean	Minimum	Maximum	Std Dev
Return on Assets	0.105491	-0.331469	0.689478	2.33647
Return on Equity	0.0658269	-170.107	188.200	3.95327
Tobins' Q	-0.210226	-509.438	23.7088	8.00677
Total debts to Assets	7.92802	0.000000	5690.56	195.566
Total Debts to Equity	1.89875	-1604.52	1043.09	34.0119
Firm Size	15.7622	12.5665	19.2406	1.29183
Growth Sales	0.179269	-0.944652	7.98010	0.722977
Liquidity	1.11869	2.76930e-005	8.06709	0.960523
CEO	0.485046	0.000000	1.00000	0.499818
Board Size	8.87552	7.00000	14.0000	1.66687
Board Independence	0.641134	0.285714	1.42857	1.26939
Gender Diversity	0.0567701	0.000000	0.285714	0.702106
Meetings	2.82222	1.00000	4.00000	0.960521
GI	0.473868	0.100000	1.00000	0.136082

Correlation

Table 2 Correlation Matrix

Variable	ROA	ROE	TQ	TDA	TDE	FS	GR	LQ	CE	BS	BI	GD	MT	GI
Return on Assets	1													
Return on Equity	.24*	1												
Tobins' Q	.08	.64*	1											
Total debts to Assets	.31*	-.51*	-.44*	1										
Total Debts to Equity	-.27*	.02	.20*	.29*	1									
Firm Size	.49*	-.19*	.51*	.33*	.22*	1								
Growth Sales	-.22*	.12	.14	.04	-.49*	.13	1							
Liquidity	.34*	-.30*	.71*	.47*	.19*	.10	.21*	1						
CEO	.56*	.47*	-.06	.03	-.03	-.27*	-.03	-.02	1					
Board Size	-.37*	-.01	.11	.18	.46*	.31*	-.30*	.15	.40*	1				
Board Independence	-.05	.10	-.23	.42*	.82*	.14	.51*	.28*	.12	.51*	1			
Gender Diversity	.11	-.07	-.36*	.62*	.48*	-.57*	.31*	.65*	.55*	.33*	-.22*	1		
Meetings	.23*	.17	.49*	.34*	.14	.42*	-.18	.31*	.48*	.37*	.18	.44*	1	

GI	-.07	.13	-.09	.76*	.09	-.30*	.62* .02	-.07	.14	-.17	-.05	.27*	-.06	1

Random Effect Model

Table 3 Results of Random Effect Model

	ROA (R) *Coefficient*	**ROE (R)** *Coefficient*	**TQ (R)** *Coefficient*
Const	-0.138	-0.616	0.487***
CEO	0.0258***	-0.0017	0.117**
Board Size	0.0116**	0.0302***	0.034
Board Independence	-0.0589	0.238***	-0.300***
Gender Diversity	0.117***	-1.933***	0.405***
Meeting	-0.003	0.131***	0.008
Size	0.0024	-0.005	-0.057
Growth Sales	0.003	-0.036***	0.056**
Liquidity	0.025	-0.0004	0.078
R-Square	0.312682	0.421712	0.411548
F-value	6.472415	7.816251	7.401126
P-value	0.00000	0.000000	0.000000

Note: (R) *denotes heteroskedasticity-robust (White/HC1) standard errors applied to correct for heteroskedasticity. The RE model was chosen (after Hausman and other diagnostic tests) and heteroskedasticity-robust standard errors (White/HC1) were applied, ensuring unbiased inference even in the presence of heteroskedasticity. The explanatory power of the models is moderately strong, with R^2 values of 0.312 for ROA, 0.422 for ROE, and 0.412 for TQ, while the F-statistics are significant at the 1% level, indicating overall model reliability. A commonly accepted benchmark is that VIF values should be less than 10 (with tolerance values above 0.1) to confirm the absence of problematic collinearity. All variables in the study report VIF values ranging between 0.73 and 0.95, which are well below the threshold. These results indicate that multicollinearity is not a concern in the current analysis, and the estimated regression coefficients can therefore be considered reliable.*

Table 3 for ROA, the regression results show that CEO duality ($\beta = 0.0258$, $p < 0.01$), board size ($\beta = 0.0116$, $p < 0.05$), and gender diversity ($\beta = 0.117$, $p < 0.01$) significantly improve asset-based profitability, while board independence, meeting frequency, firm size, and growth sales remain insignificant. These findings suggest that unified leadership, broader board composition, and inclusive decision-making enhance operational efficiency. The positive role of gender diversity in ROA resonates with recent regional studies showing that diverse boards can improve internal monitoring and innovation when participation is substantive rather than symbolic. (Ahmed & Khan, 2023).

For ROE, board independence ($\beta = 0.238$, $p < 0.01$) and board size ($\beta = 0.0302$, $p < 0.01$) significantly improve shareholder returns, while gender diversity ($\beta = –1.933$, $p < 0.01$) and sales growth ($\beta = –0.036$, $p < 0.01$) exert strong negative effects. The positive impact of independence

reinforces the monitoring role of outside directors, consistent with agency theory, whereas the negative effect of gender diversity contrasts with expectations. This divergence may reflect compliance-driven rather than empowered appointments, which limit female directors' contributions in Pakistan's governance environment. The negative link between sales growth and ROE suggests that rapid expansion can dilute equity returns if not supported by efficient financing structures, echoing concerns highlighted in the trade-off theory (Myers & Majluf, 1984).

For TQ, the results show that CEO duality ($\beta = 0.117$, $p < 0.05$), gender diversity ($\beta = 0.405$, $p < 0.01$), and sales growth ($\beta = 0.056$, $p < 0.05$) significantly enhance market valuation, while board independence ($\beta = –0.300$, $p < 0.01$) has a negative effect. Markets appear to value decisive leadership and visible diversity, signaling adaptability and alignment with global ESG norms. However, the negative role of board independence indicates investor skepticism about the functional autonomy of "independent" directors in the Pakistani context, where family-dominated ownership may reduce their effectiveness (Orazalin, 2020).

Among the control variables, firm size and liquidity are consistently insignificant across the models, suggesting that scale and short-term solvency do not independently drive performance when governance structures are considered. Sales growth shows mixed effects—negative for ROE but positive for TQ—indicating that while markets reward growth prospects, they may undermine short-term shareholder returns if growth is inefficiently financed.

Overall, these findings demonstrate that governance-performance relationships differ depending on the metric applied. ROA is shaped primarily by leadership and inclusivity, ROE by independence and monitoring, and TQ by market perceptions of governance quality and growth prospects. This supports the argument advanced in the literature review that governance in emerging economies is multidimensional, with outcomes shaped both by internal board dynamics and by external investor expectations (Tripathi et al., 2024).

Random Effect Model (Moderating)

Table 4 Results of Moderating variables in Random effect Model

	ROA	**ROE**	**TQ**
	Coefficient	*Coefficient*	*Coefficient*
Const	0.216578***	-0.972933***	1.15556
CEO	-0.00816664**	0.119304	0.0130193
Board_Size	0.00349868	0.00675998	0.00391179
Board_Ind	0.0395796	0.303197	-0.0396709
Gender_Div	0.154489***	-1.77293***	0.478154
Meeting	0.00897817	0.111435***	0.0669013
Size	-0.0135769	0.0216933***	-0.0526908
Growth__Sales_	-0.00628968	-0.0461259***	0.0474563
Liquidity	0.0177874***	0.0765483***	0.0407089
TDA x Bd Sz	**-0.214364*** **	-0.00037457	**-0.2347816*** **
TDA x Bd Indp	-0.1478121***	**0.0267491*** **	**-0.00047174** **
TDA x Gen Div	0.223419	**-0.207469*** **	0.00041034

TDA x CEO	-0.00147388	**0.00021784*** **	**-0.204713698*** **
TDA x Meetings	**0.4137864*** **	0.007641001	0.000400557
TDE x Bd Sz	**-0.2200376*** **	-0.1237431	0.00331474
TDE x Bd Indp	0.146903197***	0.0041979	0.01455749
TDE x Gen Div	**-0.18377998*** **	**-0.379710369*** **	**0.25446548*** **
TDE x CEO	0.004101669	0.004471169	-0.01331106
TDE x Meetings	**-0.5622497*** **	**-0.24441002*** **	**-0.28997115*** **
R-Square	0.333365	0.472764	0.645108
F-value	4.602664	9.81904	29.061877
P-value	1.60e-06	1.27e-39	5.02e-14

The table 4 included the results of random effect model used to check the effect of CEO duality, board size, board independence, gender diversity, meeting, board size, growth sales and liquidity in the presence of moderating variables i.e. TDA and TDE on the profitability. The results of R-square in the table have shown the value of 0.330 for ROA, 0.472 for ROE and 0.645 for TQ. The value exhibits that CEO duality, board size, board independence, gender diversity, meeting, board size, growth sales and liquidity in the presence of moderating variables i.e. TDA and TDE showed combined effect of 33 percent on ROA, 47 on ROE and 64 percent on TQ. The values suggested that in the presence of TDA and TDE, the R-square values have been increased from pooled OLS model without moderating. The values of F-value in the table has been found significantly higher than 4 which recommended that the statically the model has been found significant.

For ROA, the analysis reveals that capital structure significantly moderates several governance–performance relationships. TDA negatively moderates the effects of board size and board independence, suggesting that under higher TDA, larger boards and independent directors reduce asset-based returns. Conversely, TDA shows a positive moderating effect of board meetings, indicating that frequent meetings improve ROA when firms are highly leveraged. Similarly, TDE demonstrates strong moderating effects: it reduces ROA through board size, gender diversity, and meeting frequency, while enhancing it through board independence.

For ROE, the results show that TDA enhances the role of board independence and CEO duality separation, both exerting a positive moderating effect on profitability. This indicates that independent oversight and distributed leadership become particularly valuable when firms operate with higher debt-to-assets. However, TDA negatively moderates gender diversity, suggesting that the positive contributions of diverse boards to profitability diminish under leveraged conditions. Notably, no significant moderating effects are observed for TDE on ROE.

For TQ, the findings highlight that TDA exerts a negative moderating effect on board size, board independence, and CEO duality, indicating that under higher leverage, these governance mechanisms reduce market valuation. In contrast, TDE shows a positive moderating effect of gender diversity, suggesting that diverse boards are still valued by investors even in equity-heavy structures. However, TDE negatively moderates meeting frequency, implying that frequent meetings under high leverage may be interpreted by markets as signals of financial distress rather than effective oversight.

Return on Assets (Mediation Analysis)

Table 5 Results of Mediation for Return on Assets

	Model 1	**Model 2**	**Model 3**	**Model 4**
Dep Variable	ROA	Green Inn	ROA	ROA
Const	-0.138648***	0.581134		0.054413**
Size	0.00244233	-0.00267771***		0.0479127*
Growth__Sales_	0.00372815	0.00595559***		0.00457644*
Liquidity	0.0256319**	-0.00465726		0.025031
CEO	0.0258509***	2.1582e-05		0.0256363
Board_Size	0.0116511**	0.00014449		0.0119991***
Board_Ind	-0.0589894**	-0.0803689***		-0.0804653**
Gender_Div	0.117712***	-0.143144***		0.0791242***
Meeting	-0.00358106	-0.00207313		-0.00433538***
GI			1.19032***	0.283125***
R-Square	0.312682	0.217664	0.100225	0.520137
F-value	6.472415	4.689315	4.642158	11.755815
P-value	0.00000	0.00000	0.141364	0.00000

The results for ROA indicate that CEO duality, board size, board independence, gender diversity, and liquidity have significant direct effects on profitability. Board independence shows a negative relationship, while gender diversity and board size are positive contributors. When GI is introduced, it exerts a strong and significant positive effect on ROA, raising the model's explanatory power substantially ($R^2 = 0.52$). This confirms that green innovation acts as a mediating channel, particularly transforming the role of independent boards, which appear detrimental in direct terms but enhance profitability indirectly through innovation-driven efficiencies and stakeholder trust.

Return on Equity (Mediation Analysis)

Table 6 Results of mediation for Return on Equity

	Model 1	**Model 2**	**Model 3**	**Model 4**
Dep Variable	ROE	Green Inn	ROE	ROE
Const	-0.616	0.11482***	-0.010924	0.22361***
Size	-0.005	0.541144***		-0.7766***
Growth__Sales_	-0.036***	0.006076*		0.00100
Liquidity	-0.0004	-0.005458		-0.0505**
CEO	-0.0017	0.001275		-0.00905
Board_Size	0.0302***	0.000142		-0.02592
Board_Ind	0.238***	-0.08300***		0.03544***
Gender_Div	-1.933***	-0.14797***		0.23511***
Meeting	0.131***	-0.002130		-1.88008***
GI			0.162183***	0.858874***
R-Square	0.421712	0.217039	0.110059	0.720283
F-value	7.816251	5.749704	0.167814	14.761412
P-value	0.000000	0.000000	0.000000	0.000000

For ROE, the baseline shows significant impacts of board size, board independence, gender diversity, and meeting frequency. Board independence has a positive direct effect, while gender diversity and meetings display negative relationships with ROE. With the inclusion of GI, the R^2 rises sharply from 0.421 to 0.720, showing a powerful mediating role. GI itself is highly significant, indicating that governance structures translate into stronger equity-based profitability when coupled with sustainability-driven innovation. These highlights partial to full mediation for several governance mechanisms, reinforcing innovation as the pathway from board characteristics to financial outcomes.

Tobins' Q (Mediation Analysis)

Table 6 Results of mediation for Market Value

	Model 1	**Model 2**	**Model 3**	**Model 4**
Dep Variable	TQ	Green Inn	TQ	TQ
Const	0.487***	0.447***	0.395576	1.108***
Size	-0.057	0.5759***		-0.0622
Growth__Sales_	0.056**	-0.0027		0.0619*
Liquidity	0.078	0.0060		0.0762
CEO	0.117**	-0.0044		0.1116***
Board_Size	0.034	0.0003		0.0367*
Board_Ind	-0.300***	1.1916***		-0.3977***
Gender_Div	0.405***	-0.079		0.2299***
Meeting	0.008	-0.142***		0.00729
GI			1.27996	1.024***
R-Square	0.411548	0.217451	0.100639	0.619475
F-value	7.401126	4.768155	4.787254	9.611734
P-value	0.000000	0.00000	0.00000	0.00000

The TQ results show significant direct effects of CEO duality, board independence, and gender diversity. CEO duality and gender diversity positively influence market valuation, while board independence has a negative direct effect. However, GI strongly reverses this pattern, as independent boards positively and significantly drive innovation, which in turn boosts TQ. The R^2 improves from 0.41 to 0.62, underscoring that innovation mediates the relationship between governance and market value. This demonstrates that markets reward innovation outputs, transforming independence from a direct liability into an indirect strength via green innovation.

Conclusion of the Study

This study examined how CG mechanisms influence FFP in Pakistan's non-financial sector, with GI as a mediator and CS as a moderator. Using panel data from 285 firms (1999–2019) and a multi-theoretical framework, the results confirm that CG significantly affects firm outcomes, though the effects are neither uniform nor universal. Board size consistently enhanced ROA, ROE, and Tobin's Q, while board independence, gender diversity, CEO duality, and meeting frequency produced mixed or context-specific outcomes. GI emerged as a strong mediator, transforming governance practices into sustainability-driven performance, whereas CS conditioned these effects,

reinforcing governance effectiveness under balanced leverage but weakening it under excessive debt.

The aim of this study was to investigate the complex relationship between CG mechanisms and FP of non-financial sector of Pakistan, specifically focusing on the mediating role of GI and the moderating effect of CS. Using panel data on listed companies and a multi-theoretical framework applying Agency Theory (Jensen & Meckling, 1976), RDT (Pfeffer & Salancik, 1978), Trade-Off Theory (Myers, 1984) and the SRI Framework (Renneboog & Zhang, 2008) the study has tested seven for independent variables and three for control variables hypotheses. The findings offer nuanced evidence that CG mechanisms matter for firm outcomes, but their effects are neither uniform nor universal. Instead, they are mediated by sustainability strategies and conditioned by financial structure, thereby incorporating both global theoretical debates in addition to Pakistan's institutional realities.

The first hypothesis (H1) tested the effect of board size on FP and was supported across all measures i.e. (ROA, ROE, and TQ). Larger corporate boards improved both FFP and market valuation, underscoring their value as strategic resources. This aligns with RDT, which posits that broader boards expand access to external resources, knowledge, and legitimacy (Jackling & Johl, 2009; Haniffa & Hudaib, 2006). In contexts like Pakistan—where external monitoring institutions remain weak—board size substitutes for missing institutional mechanisms, enabling firms to strengthen internal oversight and external credibility. Comparable findings have been reported in other emerging economies such as India and Nigeria, where larger boards provide both symbolic legitimacy and functional capacity (Abubakar & Fodio, 2024). At the same time, the results caution against assuming inefficiency in larger boards, as suggested in Western studies (Lipton & Lorsch, 1992), highlighting that institutional maturity shapes optimal board size.

The second hypothesis (H2) on board independence yielded mixed results: positive for ROE, negative for TQ, and insignificant for ROA. This illustrates the duality of independent directors' roles in concentrated ownership environments. From the Agency Theory viewpoint, independent directors strengthen monitoring and increase firm profitability. However, the negative influence on market valuation implies that investors in Pakistan are still unconvinced about the impartiality of independent directors, perceiving them as extensions of controlling families or political appointees. This is contrary to developing economies, where independence consistently fosters investor confidence (Bhagat & Bolton, 2008). This is consistent with the findings of South Asian studies where board independence enhanced internal FP, but did not have any influence on shaping external perceptions (Sheikh et al., 2020). This evidence therefore contributes to the argument that independent board is in itself insufficient for good CG attributes unless accompanied by real autonomy and enforcement provisions.

The third hypothesis (H3) tested was the impact of board gender diversity. The relationship revealed significant results, but mixed effects: positive in ROA & TQ, and negative in ROE. This finding is especially important since previous research from Pakistan has consistently downplayed board gender diversity as a concern (e.g. Nadeem et al., 2019). This evidence indicates that female directors do contribute a positive role in operational efficiency and market legitimacy, which may be attributed to reputational signaling effects and diverse perspectives in strategic decision-making.

The negative effect on profitability, however, demonstrates the persistence of socio-cultural and institutional limitations. Symbolic appointments and restricted influence in male-dominated boards narrow the ability of female directors to outline short-term financial results (Ararat et al., 2015). These findings aligns with the developed economies for instance while European studies commonly report high positive impact of gender diversity (Campbell and Minguez-Vera, 2008), the open field of Firms dynamics in emerging markets shows more indecisive results, that depend upon cultural and institutional maturity (Ahmed and Khan, 2023). Thus, the transfer of gender diversity in Pakistan is supposed to be contextually weak useful for legitimacy and signaling, although restricted with respect to poor profitability.

Hence, CEO duality (H4) yielded mixed findings, where a positive influence was found for ROA and TQ, while negative findings were evident for ROE. This contrasts with the conventional Agency Theory perspective that duality declining the independence of the board (Finkelstein & D'Aveni, 1994). In family-owned firms and in state-controlled firms in Pakistan, CEO duality could facilitate decisions and reduce bureaucratic delays, leading to better performance and higher valuation. This is also evident from other emerging markets like Indonesia and Turkey, where strong leadership is seen to create stability in an uncertain environment (Yusuf & Oliveira, 2025). However, the lack of effect on ROE suggests that while duality may help signal stability and improve asset utilization, it does not necessarily translate into higher accounting profitability. This reinforces the view that duality's impact is context-dependent, requiring careful interpretation in emerging economies.

Rather limited support is shown for board meeting frequency (H5), being only statistically significant for ROE. The frequent boards meeting increase profitability of the company by enabling better monitoring of operations and a swift response to operational problems, but do not implicitly affect market valuation or asset efficiency. This partial effect of meetings frequency supports the viewpoint align with Vafeas (1999) that meetings will enrich the performance if they are substantive, not routine. In Pakistan, the findings indicate that boards meeting more frequently have more pronounced effects on financial outcomes rather than market-based performance, reflecting the orientation of the boards towards internal monitoring rather than external signaling to investors. Also, evidence in other emerging markets suggests that board activeness is important, but its related benefits may be in-equivalent across different dimensions in terms of performance (Hossain & Oon, 2022).

Green Innovation (GI) mediation (H6) appeared to offer one of the most robust contributions in this study. The mediator effect of GI on the CG–FP relationship was significant in all of the performance constructs with substantial indirect effect (e.g., $\beta = 1.024^*$ for TQ). This indicates that governance structures do not contribute cognitively only (directly) but also indirectly by promoting strategies toward sustainability. This result is consistent with the SRI Framework and the Natural Resource-Based View (NRBV), which argue that sustainability acts as a strategic performance driver (El-Kassar & Singh, 2019). Recent research (Ahmed et al., 2024; Luo & Xu, 2025) shows that stronger governance firms adopt green practices and earn competitive and reputational benefits. In a place like Pakistan where the regulatory norms around sustainability are still developing—GI provides firms a formula for legitimization and profitability. This situates GI as not a peripheral CSR activity but a core value creation mechanism.

The moderating role of CS (H7) also received support, through CG mechanism and leverage interaction terms i.e. TDA, TDE. Board size, independence, gender diversity, and meetings had context dependent effects on TDA and TDE. These results support the trade-off theory that states that leverage can discipline the managers but also bring financial risks. From one perspective, moderate debt enhances the governance effectiveness, yet too much leverage deteriorates the performance. This is consistent with the results of Tripathi et al. (2024) and Shahzad et al. (2022) that highlighted the balancing effect of leverage on governance outcomes. These findings have implications for Pakistan, where the majority of firms are financially constrained, and point to the fact that there is a need to regulate debt financing in order to improve the quality of CG structure.

Theoretical Implications

Theoretically, this research contributes to the CG–FP debate by offering an integrated multi-theoretical framework. Agency Theory explains how governance mechanisms mitigate conflicts of interest between managers and shareholders, but the findings show these mechanisms alone cannot fully account for performance variations in emerging markets. By incorporating RDT, the study highlights how diverse boards and external linkages provide firms with critical resources, information, and legitimacy. Trade-Off Theory further demonstrates how CS moderates governance effects, as the balance between debt and equity shapes managerial discretion and risk-taking capacity. Finally, the SRI framework broadens the analysis to include non-financial outcomes, showing that governance influences performance not only directly but also indirectly through sustainability-oriented strategies such as GI. Together, these theories extend existing knowledge by illustrating that governance mechanisms do not operate in isolation but interact dynamically with financial structures and sustainability practices to influence performance across multiple pathways.

Theoretically, the results suggests policy implications for market regulators and policy makers to strengthen the CG codes, ensure real autonomy of independent directors, and align the financing policies with the effective governance. For management, to corporate leaders, our findings suggest the need to embedding GI into their strategic decision-making and maintain moderate debt level to optimize governance outcomes. Symbolic gender diversity and routine board meetings, however, offer limited benefits unless supported by genuine empowerment and substantive engagement.

Limitations and Future Research

This study has several limitations. First, the study is only concentrating on non-financial sector of Pakistan, which might confine the generalization of the results to the other sectors or economies. Second, GI was recorded using disclosure indexes, which may not fully represent the innovative intensity or quality. Third, using secondary data limits the understanding on firm-level cultural or behavioral differences. As for further research, it will be necessary to broaden cross-country comparison, especially in the South Asia and rising markets, in order to see how generalizable the findings are. There may also be more informative sources of longitudinal data that rely on primary data. Researchers could further investigate new dimensions of sustainability metrics (e.g., ESG scores, carbon intensity, green patents), and the impact of institutional investors, regulatory reforms, and digital governance as emerging contingencies in the CG–FP nexus.

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