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Diverse Effects of Corporate Governance and Intellectual Capital on Audit Quality: A Quantile Regression Technique in Pakistan

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Abstract

In a world that has seen increased emphasis being placed on Corporate Governance (CG) and Intellectual Capital (IC) to determine the credibility of firms, this research seeks to establish the interrelation between CG, IC, and Audit Quality (AQ) of non-financial firms operating in the PSX. This study incorporates quantile regression to investigate the effects of the CG factors – Board Size (BS), Board Independence (BI), and Ownership Concentration (OC) – and the IC dimensions, including Research and Development (RD), Employee Training (ET), and Relational Capital (RC), on AQ. Interestingly, results indicate that solid board features and specific IC spending significantly boost AQ, which is more so at greater AQ. The positive increase in both BI and OC complements enhanced governance and oversight processes; good relational capital and adequate training of employees further speak to the need for strategic investment in improving sound audit practices.

Keywords: Corporate Governance, Intellectual Capital, Audit Quality, Relational Capital, Quantile Regression

Authors:

Arshad Javed: (Corresponding Author)
PhD Scholar, Department of Management Sciences, Preston University Islamabad Campus, Pakistan.
Email: (arshad.javed.pcc@gmail.com)

Tahir Imran Gulzar: PhD Scholar, Hamdard Institute of Management Sciences (HIMS), Hamdard University Islamabad Campus, Islamabad, Pakistan.

Haroon Shafi: Director (Admn/HR), Gilgit-Baltistan Power Development Board, Islamabad, Pakistan.

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Diverse Effects of Corporate Governance and Intellectual Capital on Audit Quality: A Quantile Regression Technique in Pakistan

Abstract

In a world that has seen increased emphasis being placed on Corporate Governance (CG) and Intellectual Capital (IC) to determine the credibility of firms, this research seeks to establish the interrelation between CG, IC, and Audit Quality (AQ) of non-financial firms operating in the PSX. This study incorporates quantile regression to investigate the effects of the CG factors – Board Size (BS), Board Independence (BI), and Ownership Concentration (OC) – and the IC dimensions, including Research and Development (RD), Employee Training (ET), and Relational Capital (RC), on AQ. Interestingly, results indicate that solid board features and specific IC spending significantly boost AQ, which is more so at greater AQ. The positive increase in both BI and OC complements enhanced governance and oversight processes; good relational capital and adequate training of employees further speak to the need for strategic investment in improving sound audit practices.

Keywords: Corporate Governance, Intellectual Capital, Audit Quality, Relational Capital, Quantile Regression

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Authors:

Arshad Javed: (Corresponding Author) PhD Scholar, Department of Management Sciences, Preston University Islamabad Campus, Pakistan. Email: (arshad.javed.pcc@gmail.com)

Tahir Imran Gulzar: PhD Scholar, Hamdard Institute of Management Sciences (HIMS), Hamdard University Islamabad Campus, Islamabad, Pakistan.

Haroon Shafi: Director (Admn/HR), Gilgit-Baltistan Power Development Board, Islamabad, Pakistan.

Introduction

Over the last decade, CG has been an area of study because of its importance in the maturing of audit quality, especially in the developing world where the regulatory environment may not be as developed (Imhoff, 2003). Implementing sound CG mechanisms of accountability and transparency enhances investors' confidence and equally contributes to the stability of the financial market (Aksar et al., 2024; Larcker & Tayan, 2020). In the context of non-financial firms, which are prevalent in the economy of Pakistan, CG affects audit by establishing the tone from which the standards of transparency, accountability, and ethical audit practice are planted (Javed et al., 2024). Research on the connection between corporate

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governance and audit quality is extensive globally; however, it is rather scarce in South Asian countries such as Pakistan, where, due to socioeconomic considerations, corporate practices and regulations differ considerably from other developed nations (Javed & Qazi, 2024).

Intellectual capital, referred to as human, structural, and relational capital, has been widely acknowledged as a valuable resource that firms can use to derive value by efficiently managing intangible resources and improving the quality of financial reports (Javed et al., 2023; Paoloni et al., 2022). Intellectual capital can enhance company decisions, operations, and major innovations, enhancing governance and audit results (Dalwai & Mohammadi, 2020). For instance, human capital is the stock of a firm's employees' skills and ethical qualities that determine high audit quality. Structural capital in organizational routines, databases, and culture helps maintain audit work, while relational capital in client relations and networks helps sustain confidence in financial statements (Yu & Huo, 2018). However, research investigating the effects of intellectual capital on audit quality remains limited in Pakistan, even though there is a research gap considering the rising significance of intangible resources in the contemporary economy.

The present research uses quantile regression to estimate the heterogenic effects of corporate governance and IC on the overall audit quality in PAK non-financial firms across various quantiles of audit performance. Standard regression techniques might presuppose a linear relationship across all firms, while audit quality might have non-linear sensitivity to changes in governance and intellectual capital (Kamarudin et al., 2021). However, quantile regression does this better by estimating the effects at various levels of the audit quality distribution range and, therefore, offers more comprehensive results for this relationship (Feng & Huang, 2020). This is especially suitable for Pakistan if, in the analysis of the governance, firms show a wide relative dispersion of the indices of governance and intellectual capital, so, at the same time, the method should identify both central and boundary values.

Hence, this study fills the following gaps in the literature by employing data collected from 200 non-financial firms listed at the PSX. First, it continues earlier studies on CG and audit quality in the understudied Pakistani context, effectively highlighting some specific realities of the relations between governance practices and investments into intangible assets and audit outcomes (Truong, 2024). Second, using quantile regression, this research exposes how these variables affect firms differently, thus highlighting the variation in governance effectiveness and the use of intellectual capital (Alvino et al., 2021). Finally, this research holds implications concerning recommendations to the regulatory bodies and policymakers in Pakistan on the contours of corporate reforms for corporate governance guidelines and the directions for the management and development of IC resources to fit the audit performance of the firms.

The expected contribution of this study to theory and practice is to reveal the relationships between corporate governance, intellectual capital, and audit quality, which is an important but less explored area in the context of emerging markets. When countries like Pakistan develop their financial reporting skills, evaluating these correlates becomes vital to gaining confidence in the financial data and fostering sustainable business development (Ahsan, 2023).

Research Questions

- Does poor CG affect audit quality and modality in Pakistan's non-financial sector by quantile?
- To what extent does intellectual capital contribute to audit quality, especially among firms with different characteristics in Pakistan's non-financial sector?
- What role does intellectual capital play in audit quality among firms with varying characteristics?

Literature Review of the Study

Audit quality has particularly attracted scholars' attention to the role of corporate governance mechanisms, with agency theory as the main theoretical framework. Solomon (2020) noted that corporate governance practices are essential in resolving shareholder management conflicts by continuously improving transparency and accountability. High-quality governance has been shown to improve audit quality, as evidenced by three key factors: the company's board of directors, particularly the issues of board size, board independence, and ownership concentration (Guizani & Abdalkrim, 2021). For example, Javed and Qazi (2024) demonstrate that large boards introduce directorial pluralism, bringing disagreement and enhanced capacity for monitoring to resist. Likewise, board independence lets the board exercise independent oversight in the financial reporting process, improving the audit quality (Almasria, 2022). Concentrated ownership has also been associated with better audit results because of the effect of large-block shareholders (Huyghebaert & Wang, 2017).

However, other influential works argue that boards that are overly large or have heavy ownership by a few players may result in inefficiencies and agency-related problems in determining audit quality (Habib & Hasan, 2018). These aspects need to be elaborated, yet it is revealed that these concepts are different and could have a different impact on governance structures in Pakistan compared to developed states.

Besides governance, IC has been established to exercise a monumental influence on enhancing audit quality. Derived from a resource-based view, it encompasses valuable, rare, inimitable, and organization-specific resources that accord superior stock values, such as improved financial reporting and auditing (Javed & Qazi, 2024). Audit quality is achieved by utilizing the three components of intellectual capital: human capital, structural capital, and relational capital. For example, training investment in personnel improves ethical practice and audit reliability (Van Hoa et al., 2022). Since structural capital entails the development of a firm's internal assets in areas such as the R & D investment, the subsequent formation of good and credible financial reporting mechanisms can be supported effectively. Audit quality is enhanced through the relations between the clients, regulators, and auditors through transparency, accountability, and extension (Kitiwong & Sarapaivanich, 2020). Consistent with its antecedents, various constituents of ICS have been tentatively linked to audit quality. At the same time, a lack of studies exists on the relationships between these components and corporate governance mechanisms in emergent settings such as Pakistan. This research seeks to fill this void by analyzing the interaction between corporate governance and intellectual capital on audit quality (Dalwai & Mohammadi, 2020).

Last, most of the prior empirical works on the effects of CG and audit quality utilize the ordinary least square (OLS) estimator, which may miss heteroscedasticity in the error terms across firms with different audit quality. Quantile regression provides an avenue for solving the heterogeneous effects of governance and intellectual capital by showing effects at different quantile levels, as Dalwai and Mohammadi (2020) noted. Past studies have confirmed that audit quality is generally strong in high-governance firms, but this relationship differs between firms (Kim et al., 2019). Using quantile regression, it is possible to identify the extent to which governance and intellectual capital affect firms with low to medium and high audit quality. Nevertheless, this approach is not employed optimally, particularly in South Asian settings. The present research uses quantile regression to investigate the non-financial firms listed in the PSX by exploring the role of emerging heterogeneity effects, which, till now, have remained unexplored. Combining CG and intellectual capital with the quantile approach allows for examining AQ under which these factors operate, thus contributing to a heterogenic firm's policy-making and audit practices.

The above literature proposes the following hypothesis of the study to be tested.

H1: Audit quality in the non-financial firms listed in the PSX improves with improved CG mechanisms.

H2: The intellectual capital has a significant positive effect on audit quality

H3: Firms with varying AQ levels (low, medium, and high), as determined by quantiles, have varied relationships between CG, IC, and AQ.

Methodology

This research examines the diverse effects of CG and IC on AQ in PSX non-financial firms. Our sample consists of 200 firms out of 350 non-financial firms registered in PSX, and we have collected information on governance indicators, IC measures, audit quality, and control variables. Quantile regression analysis compares the impact of cost-of-equitization across different audit quality levels (AA Zaid et al., 2020). The results indicate how the effect varies at the lower, median, and higher audit quality firms.

Data Collection

Data sources for this study include annual reports, financial statements, and CG reports for the firms under study. The timeframe is five years, 2019-2023, which gives a balanced panel and increases the reliability of the analysis. Specific data sources include CG Indicators acquired from governance indexes based on characteristics of the board of directors, proportionality, and ownership concentration. Intellectual Capital Metrics: Based on information disclosed by stakeholders about R&D costs, employee development, and customers. AQ Measure: Concocted using three sub-indexes: auditor reputation, restatements, and audit fees; a higher score represents better audit quality. Control Variables: Size, leverage, and profitability are part of the models as variables representing firm factors that affect audit quality.

Defining and Measuring Variables

3.2.1 Audit Quality (AQ): Industry-adjusted fee model

and financial restatement measures are standard ways with additional specifications based on auditor characteristics (i.e., Big 4 or non-Big 4 auditors). It goes from 0, representing low quality, to 1 representing high quality (Cheng et al., 2020).

3.2.2 Corporate governance Variables: Board Size (BS): The total number of directors on the board. Board Independence (BI): The proportion of independent directors to the total directors that make up the board of directors of a firm. Ownership Concentration (OC): Number of shares owned by the five largest shareholders (Javed & Qazi, 2024).

3.2.3 Intellectual Capital Variables: R&D Investment (RD): Relative expenses on R&D are a percentage of total revenues that reflect the structural capital. Employee Training (ET): Trade Skill Index; training time per employee per annum as a measure of human capital. Relational Capital (RC): Customer relationships: A measure using which level of engagement with the customer is represented by retention ratios (Ijomah et al., 2024).

3.2.4 Control Variables: Firm Size (FS): Total assets recalculated by logarithm and exclusion of the total company's scale impact. Leverage (LEV): Total debt to total assets, which measures the influence of capital structure on audit risk. Profitability (PR): Return on assets (ROA), referring to efficiency: the relationship between profitability and assets (Aksar et al., 2024).

Research Models and Technique

In a quantile regression, heterogeneity depends on the firms' audit quality level, which makes it suitable for this study (Li & Liu, 2024). This method enables analysis of the effect of governance and intellectual capital components on audit quality at various quantiles, thereby offering a richer understanding of the effects. In each model, we investigated the robustness of independent coefficients across different quantiles, exploring changes in coefficients and audit quality levels.

$$AQ_{i,t} = \beta_0 + \beta_1 CG_{i,t} + \sum_{i=1}^{j} \lambda_i Con_{i,t} + \mu_{i,t} \quad \textbf{Eq. No. 1}$$

Here, $AQ_{i,t}$ represents audit quality, $CG_{i,t}$ is for corporate governance (which includes board size, board independence, and ownership concentration), and Control Variables (Con) (including firm size, leverage, and profitability), and $\mu_{i,t}$ is the error term. This model tests the direct effect of corporate governance factors on audit quality while controlling FS, LEV, and PR.

$$AQ_{i,t} = \beta_0 + \beta_1 IC_{i,t} + \sum_{i=1}^{j} \lambda_i Con_{i,t} + \mu_{i,t} \quad \textbf{Eq. No. 2}$$

Here, $AQ_{i,t}$ represents audit quality, $IC_{i,t}$ is for Intellectual capital (R&D, training, and relational capital), Control Variables (Con) (including firm size, leverage, and profitability), and $\mu_{i,t}$ is the error term. This model determines the effect of the IC factors (R&D, training, and relational capital) on audit quality, controlling the control variables.

$$Q_T(AQ)_{i,t} = \beta_0 + \beta_1 CG_{i,t} + \beta_1 IC_{i,t} + \sum_{i=1}^{j} \lambda_i Con_{i,t} + \mu_{i,t} \quad \textbf{Eq. No. 3}$$

Here, $AQ_{i,t}$ represents audit quality, $IC_{i,t}$ is for Intellectual capital (R&D, training, and relational capital), $CG_{i,t}$ is for corporate governance (which includes board size, board independence, and ownership concentration), and Control Variables (Con) (including firm size, leverage, and profitability), and $\mu_{i,t}$ is the error term. Q represents quantile, and this model runs the regression at different quantiles of audit quality, which denotes the target quantile (T= 0 .25, 0 .5, or 0 .75 say).

This model looks at the differences in CG and IC on AQ across different audit quality quantiles, thereby understanding the nature of the relationship with firms of low, medium, and high AQ.

Results and Analysis

In a quantile regression, heterogeneity depends on the firm's audit quality level, which makes it suitable for this study (Li et al., 2024). This method enables analysis of the effect of governance and intellectual capital components on audit quality at various quantiles, thereby offering a richer understanding of the effects. In each model, we investigated the robustness of independent coefficients across different quantiles, exploring changes in coefficients and audit quality levels.

Descriptive Statistics

The descriptive statistics for the key variables used in the study are as follows:

Table 1

Variable	Mean	Standard Deviation	Min	Max
AQ	0.723221	0.183242	0.251331	1.000000

Variable	Mean	Standard Deviation	Min	Max
BS	8.451232	2.132321	4.000000	15.00000
BI	0.555351	0.204532	0.201232	0.901234
OC	0.643530	0.153551	0.253535	0.953211
RD	2.3012%	3.1512%	0.000000	15.0051%
ET	20.56461	8.224564	5.000000	50.00000
RC	0.785645	0.123425	0.452342	1.000000
FS	13.20232	1.563442	10.45123	17.50214
LEV	0.343521	0.223437	0.103532	1.000000
PR	0.051342	0.081348	-0.104351	0.200131

AQ = Audit Quality, BS = Board Size, BI = Board Independence, OC = Ownership Concentration, RD = Research and Development, ET = Employee Training, RC = Relational Capital, FS = Firm Size, LEV = Leverage, PR = Profitability

The following is the summary of the main variables of the study expressed in terms of the mean, standard deviation, minimum value, and maximum value of all the firms under study. The mean audit quality score is 0.7232 with a standard deviation of 0.1832, implying that the law permits an average moderate to high audit quality. The values vary from 0.2513 to 1.0000, meaning that some firms' audit quality is optimal while others are very poor. With regards to the size of the boards, the results showed that, on average, the boards have 8.45 members, and the boards deviated from the mean by 2.13. The smallest board size recorded is 4, and the largest is 15, within which a wide variation shows that various firms have adopted distinctive board structures. The mean density of independent directors on the board is 0.5554 and 0.2045. Taking the mean value of the Turner model, we have coefficients between 0.2012 and 0.9012, implying that the level of board independence differs significantly from firm to firm, with some firms being relatively more concerned with this factor than others. The mean ownership is concentrated at 0.6435 with a standard deviation of 0.1536, noting high levels of concentrated ownership, though not extremely high among several firms. Marketing expenditure is slightly less than the R&D expenditure, which is 2.30% of the revenue, and may indicate significantly different organizations' attitudes towards researching and developing new products, services, and markets, as the standard deviation of 3.15% demonstrates. The extent of the investment in R & D varies across these firms, with some firms spending as much as 15.01% of their total expenditure in this area while others have outgoing expenditure on R & D as zero. The mean of the annual training is 20.56 hours with a standard deviation of 22.8 hours, from 5-50 hours, allusive to contrasting levels of employee development emphasis. The total average relational capital value in the firms' subsample equals 0.7856, ranging from 0.4523 to 1.0000, implying that firms in the study pay attention to their external relationship strength. The average firm size is 13.20, which seems log-transformed, with a standard deviation of 1.56, suggesting that the sample comprises only mid-large-sized firms. The mean of the leverage ratio is 0.3435, and the standard deviation is 0.. 2234: it depicts that firms have different levels of debt, indicating a high level of use of external funds. Profitability (PR): Mean profitability is 0.05133, having a standard deviation of 0.08137; the minimum is -0.1044, and the maximum is 0.2001, which tells the variation of firms' financial performance.

Correlation Matrix

The correlation matrix below provides insight into the relationships between the variables:

Table 2

Variable	AQ	BS	BI	OC	RD	ET	RC	FS	LV	PR
AQ	1.0000									
BS	0.3587	1.0000								
BI	0.4567	0.6222	1.0000							
OC	0.5268	0.4624	0.5545	1.0000						
RD	0.3356	0.2145	0.2875	0.3023	1.0000					
ET	0.4143	0.3067	0.3334	0.3817	0.4089	1.0000				

Variable	AQ	BS	BI	OC	RD	ET	RC	FS	LV	PR
RC	0.5157	0.3554	0.3986	0.4813	0.4467	0.49567	1.0000			
FS	0.5635	0.5416	0.6046	0.4923	0.3545	0.4624	0.5534	1.0000		
LEV	-0.123	0.0922	-0.054	0.0378	-0.0825	-0.0364	-0.1112	-0.064	1.0000	
PR	0.2012	0.1312	0.1823	0.1057	0.1124	0.1913	0.2256	0.2424	-0.0632	1.0000

AQ = Audit Quality, BS = Board Size, BI = Board Independence, OC = Ownership Concentration, RD = Research and Development, ET = Employee Training, RC = Relational Capital, FS = Firm Size, LEV = Leverage, PR = Profitability

Of the primary variables used in the analysis, AQ co-relates with all but one of them positively, suggesting that higher governance quality and intellectual capital investment measures are associated with improved audit quality. The highest coefficients are positive with firm size (FS = 0.5635), ownership concentration (OC = 0.5268), and relational capital (RC = 0. 5157), which indicates that firms with bigger size and high ownership concentration together with strong external relation have better quality of audit. BS and BI are moderately related to AQ, and the correlation coefficients are 0.3587 for BS and 0.4567 for BI. BS has a higher positive coefficient of 0.6222 for BI, which can be attributed to better governance practices, as represented by having more independent directors. OC is significantly and positively related to AQ (r = 0.5268) and correlates positively with BI (r = 0.5545), indicating that firms with concentrated ownership also exhibit large and independent boards. An OC is also positively related to FS with a coefficient of 0.4923, thus implying that firms with concentrated ownership may positively affect audit quality. All three intellectual capital components of R&D, ET, and RC are moderately and positively related to AQ. Employee training exhibits the closest relation to AQ (ET = 0.4143), followed by relational capital (RC = 0.5157) and smaller but still significant effects of other factors such as staff count (SC = 0.3825) and IT spending on AQ (IT = 0.3785). Among all variables, Firm Size (FS) has the highest coefficient of determination with AQ of 0.5635, meaning that larger firms have a better audit quality perhaps because of the availability of more capital and probably also because they face higher legal requirements.

Similarly, an analysis of the correlation values manifested shows that FS has a positive coefficient with all other governance and intellectual capital variables, which suggests that large firms could potentially devote more resources to the aspect. LEV has a very small and negative correlation with AQ (-0.123) and relatively small correlation coefficients with other variables; therefore, although increasing the leverage can have little effect on the mentioned factors, it may have a slightly negative effect on audit quality, perhaps because of financial constraints. Profitability (PR) is positively correlated to AQ (0.2012) and has low correlations with other potential mediators. This implies that although audited firms that are more profitable have, in some respect, slightly better audit quality than the least profitable firms, profitability is muted in its interactions with other forms of governance or intellectual capital indicators.

Hypothesis Analysis:

Effect of CG on AQ

Table 3

Variables	Coefficient	Standard Error	t-Statistic	p-Value
Cont	0.1553	0.0721	2.1571	0.03223
BS	0.0452	0.0163	2.8137	0.00530
BI	0.1123	0.0427	2.6753	0.00831
OC	0.0255	0.0149	1.7918	0.07543
FS	0.0027	0.0014	2.1072	0.03724
LEV	-0.0588	0.0196	-3.0514	0.00212
PR	0.0428	0.0182	2.3342	0.02056

AQ = Audit Quality, BS = Board Size, BI = Board Independence, OC = Ownership Concentration, FS = Firm Size, LEV = Leverage, PR = Profitability

Table 3 analysis indicates that corporate governance factors such as board size, board independence and ownership concentration, firm size, and profitability enhance audit quality. Board size exhibits a positive relationship with audit quality (p = 0.0053), as does board independence (p = 0.0083), meaning that big, independent boards furnish robust oversight that fortifies audits. This is evidenced by a positive but lower significance level of F2 where p= 0.0754, suggesting that firms with concentrated ownership might desire enhanced accountability. A firm's size (F3) and profitability (F4) are significant with p values of 0.0372 and 0.0206, respectively, which combine to improve audit quality because firms benefit from more resources and lower financial constraints than their smaller counterparts. On the other hand, leverage is negatively influential (p = 0.0021), confirming that firms with high debt may be constrained financially, and audit quality is affected. In this regard, the study reveals adequate support for corporate governance and a sound financial structure for enhanced audit quality practices.

Effect of IC on AQ

Table 4

Variables	Coefficient	Standard Error	t-Statistic	p-Value
Cont	0.1234	0.0892	1.3832	0.1691
RD	0.0592	0.0236	2.5635	0.0112
ET	0.0976	0.0303	3.2331	0.0016
RC	0.0823	0.0282	2.9323	0.0047
FS	0.0044	0.0014	3.1921	0.0023
LEV	-0.0536	0.0221	-2.418	0.0177
PR	0.0317	0.0204	1.5511	0.1242

AQ = Audit Quality, RD = Research and Development, ET = Employee Training, RC = Relational Capital, FS = Firm Size, LEV = Leverage, PR = Profitability

The findings indicate that the different components of IC closely relate to AQ. RD, ET, and RC are reported to have a significant impact on AQ with their estimated coefficients 0.0592 (p = 0.0112), 0.0976 (p = 0.0016), and 0.0823 (p < 0.05), respectively. This means that firms with higher total investment in innovation, skills, and external relations obtain better audit quality, presumably because their internal activities are improved. The interaction between Firm size (FS) and AQ (coefficient = 0.0044, p = 0.0023) is also positive and statistically significant; this means it is true that large firms, where more expertise in the shape of intellectual capital is generally expected, exhibit superior Audit practices. Leverage (LEV) has a low negative value of (- 0.0536, t= -2.2298, p = 0.0177), indicating that a high level of debt can be detrimental to audit quality, probably because of financial requirements. As for profitability (PR), while the sign is positive and estimates the direction of the effect, the significance is questionable with a p-value of 0.1242, and thus, its relationship to audit quality regarding intellectual capital might be somewhat limited. The study highlights that intellectual capital elements support audit quality and identifies innovation, training, and relational resources as significant elements enhancing audit quality.

Quantile Regression Results for Audit Quality (AQ)

The following tables provide quantile regression on the effect of corporate governance, intellectual capital, and control variables on audit quality (AQ) at the median (and 25th & 75th percentiles). The p-values you get summarise the level of significance of a regression coefficient.

However, the relationship between board size and AQ varies across the quantiles, more so at the median (p = 0.0284) and even higher at the 75th percentile (p = 0.0204). This implies that firms with large boards enhance audit quality, especially for those with moderate to high AQ. BI has a quadratic trend in its relation to AQ, showing that BI has an unusually strong effect on the AQ score of the 75th percentile participants (p = 0.0002). This suggests that better AQ makes board independence a key determinant of maintaining high audit quality, possibly through better oversight. OC indicates the improvement of AQ with favorable change noticeable _ in all quantile levels, though a maximal value of 0.0051 is determined at the 75th percentile. This suggests that concentrated ownership is most relevant for firms with higher AQ, where owners may seek higher audit standards. RD and ET are positive across all specifications and quantiles. They are higher

in the upper quantiles, suggesting that innovation and improving employee skills increase AQ, especially for firms with initially better AQ. A further robustness test was the examination of the impact of RC across quantiles, and here we observed that the impact is even more pronounced in the extent of external relations at the 75th percentile of AQ (p = .0002), which indicates that firms with strong external relations achieve higher AQ the higher the AQ levels.

Table 5

Quantile Regression Results for Audit Quality (AQ)

Variable	25th Percentile (Coefficient)	25th percentile (p-value)	50th Percentile (Median) (Coefficient)	50th percentile (p-value)	75th Percentile (Coefficient)	75th percentile (p-value)
BS	0.0153	0.0851	0.0305	0.0284	0.0453	0.02043
BI	0.0252	0.0609	0.0602	0.0027	0.0805	0.0002
OC	0.0508	0.0153	0.0708	0.0272	0.0908	0.0051
RD	0.0803	0.0803	0.1204	0.0181	0.1602	0.0014
ET	0.0901	0.0375	0.1104	0.0135	0.1301	0.0037
RC	0.1003	0.0852	0.1201	0.0098	0.1507	0.0002
FS	0.0506	0.0654	0.0605	0.0524	0.0801	0.0224
LEV	-0.0207	0.6705	-0.0102	0.8502	0.0004	0.9972
PR	0.0308	0.0764	0.0502	0.0417	0.0805	0.0237

AQ = Audit Quality, BS = Board Size, BI = Board Independence, OC = Ownership Concentration, RD = Research and Development, ET = Employee Training, RC = Relational Capital, FS = Firm Size, LEV = Leverage, PR = Profitability

FS does influence AQ, although the changes are fairly minimal across most distributions, with statistical significance observed at the 75th percentile (p = 0.0224). This supports our argument that firms with greater AQ will be larger due to innate resource and governance advantages. There is no evidence of any quantile effects and, thus, no indication that any leverage effect is likely to significantly alter AQ at any level of audit quality in this particular data set. PR has an overall significant positive relationship with AQ that strengthens as we move into higher quantiles, particularly the 75% (p = 0.0237), suggesting that profitability is related to better audit practices, particularly among firms with relatively higher initial average audit quality.

Discussion and Conclusion

This paper used quantile regression analysis to examine the effect of CG attributes (BS, BI, OC) and IC resources (research & development, employee training, and relational capital) on the AQ of the non-financial firms listed with the PSX. The evidence shows that for each level of CG and IC, the corresponding AQ is significantly higher than for each lower level of CG and IC. For instance, previous literature by Alawaqleh et al. (2021) reported that BS and independence positively affect AQ, with ownership concentration also resulting in a positive effect on AQ. Likewise, in our study, these factors are captured more enhanced at higher AQ levels of firms, meaning that well-structured boards are equally important where the AQ of firms is already rich. Ownership concentration also demonstrated a significant positive relation to AQ in all quantile levels, following the earlier work of Liu et al. (2021), who argued that concentrated ownership helps monitor and get better audits done.

Regarding intellectual capital components, RD, ET, and RC? positively impacted AQ, and their impacts strengthened in the higher quantile range. This goes hand in hand with Gangi et al. (2019); and Makki and Lodhi (2014) studies that noted that IC elements improve the organizational capabilities and the governor's efficiency. In particular, the relational capital, which involves stakeholders and clients, indicated the highest impact on AQ at the 75th percentile; this is consistent with Carrera et al. (2017) assertion that social capital external networks enhance audit standards through reputational enforcement. Likewise, the coefficient on size was positively signed and significantly different from zero, as observed for all quantiles. This corroborates the speculation made by Cheng (2011) that larger firms may afford sound audit activities.

Thus, this study emphasizes that the adequate functioning and development of corporate governance and intellectual capital improve the quality of audits in the Pakistan non-financial sector. In the current research, BS, independence, and OC were established as enhancing AQ, whereby their

effect increased at a higher quantile point, implying that the variables were significant to firms with already high AQ scores. The following IC assets, RD, ET, and RC, also contributed to increasing AQ: Effective measures were taken to provide firmer benefits from superior audit practices for the firms investing in innovation, employee growth, and relational capital. The quantile regression analysis indicates that these effects traditionally are not similar for all firms and vary with the level of the baseline AQ. The results of this study not only corroborate the existing literature but also underscore the significance of IC by identifying these elements as important factors that directly affect AQ. Such insights can beneficially inform policymakers and management where to direct attention in their CG frameworks. Further studies could extend this research to the financial industry and consider the consequences so that the insights about CG and IC's role in sustaining AQ can be broadened in the long run.

Implications

The conclusion of this study has some significant implications for corporate governance procedures in Pakistani and other emerging economies. To improve audit quality, companies should focus on the following measures – enhancing their board structures through increased board independence and concentration of ownership. Moreover, employee training investment and relational capital investment, etc., which are integral parts of IC, are important for sustaining the high audit standards; in other words, ceding that both policymakers and firm leaders should pay adequate attention in these areas to fuel deep-basis audit practices and corporate transparency.

Limitations and Future Research

The study focuses solely on non-financial firms in Pakistan, limiting its applicability to other sectors and regions. Additionally, it uses cross-sectional data, which doesn't capture governance and audit quality changes over time.

Future studies could examine financial firms and other regions to broaden the findings. Longitudinal research would provide insights into how governance and intellectual capital investments impact audit quality over time, especially in response to regulatory changes.

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