Journal of Information Systems Engineering and Management
2024,9(2)
e-ISSN: 2468-4376
https://www.jisem-journal.com/ **Research Article**

Exploring the Governance-Investment Efficiency Nexus: Evidence from Indian Listed Companies (2015-2024)

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ARTICLE INFO

Received: 15 Apr 2024

Accepted: 26 Jun 2024

ABSTRACT

This study examines the impact of corporate governance mechanisms on the investment efficiency of Indian listed firms, using a sample of 913 firms from the National Stock Exchange (NSE) and the Bombay Stock Exchange (BSE) over the period 2015–2024. The analysis focuses on three key governance factors: board composition (board size, independent director ratio, and female director ratio), ownership structure (promoter ownership and its quadratic effect), and corporate social responsibility (CSR) spending. Investment efficiency is measured using Return on Equity (ROE), Return on Assets (ROA), and Tobin's Q. The results from fixed-effects panel regression models indicate that greater board diversity, a higher proportion of independent directors, and larger board size significantly improve investment efficiency. Promoter ownership demonstrates a non-linear relationship with investment efficiency, enhancing it at low to moderate levels but diminishing it at higher levels. CSR spending positively impacts all measures of investment efficiency, underscoring the strategic value of responsible corporate practices. The findings provide valuable insights for policymakers, investors, and corporate managers aiming to enhance governance frameworks and financial performance in Indian firms.

Keywords: Corporate governance, investment efficiency, board composition, ownership structure, CSR, Indian listed firms, panel regression.

I. Introduction

Corporate governance refers to the rules and practices that guide how companies are managed and controlled. Good governance ensures that the interests of shareholders and management are aligned, reducing conflicts and improving decision-making (Jensen & Meckling, 1976). Investment efficiency reflects how well a company invests its resources to maximize value while avoiding poor investments.

In India, corporate governance has gained importance due to reforms like the Companies Act of 2013 and mandatory CSR spending. However, the effectiveness of these governance practices in improving investment efficiency remains unclear.

This study investigates how three key governance factors — board composition, ownership structure, and CSR — influence investment efficiency in Indian listed firms. The analysis covers ten years (2015–2024) and uses panel data models to account for firm-specific effects and improve accuracy.

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Research Gap

Despite extensive literature on corporate governance and firm performance, several research gaps persist. First, most studies focus on developed markets, with limited comprehensive analysis of emerging economies like India, which have distinct institutional frameworks and ownership structures (Bhatt & Bhattacharya, 2024). Second, the non-linear effects of promoter ownership on investment efficiency remain underexplored in the Indian context, where family-owned businesses are prevalent (Kumar & Sharma, 2023). Third, while recent regulations have mandated CSR spending for large Indian firms, the relationship between CSR intensity and investment efficiency lacks empirical investigation (Mishra & Patel, 2024).

Furthermore, previous studies have predominantly examined individual governance mechanisms in isolation rather than comprehensively analyzing their combined impact (Narayanan & Singh, 2025). This study addresses these gaps by employing a holistic approach that simultaneously examines board composition, ownership structure, and CSR intensity within the unique institutional context of Indian capital markets. By integrating these governance dimensions and investigating their interactions, this research provides a more nuanced understanding of how governance mechanisms collectively influence investment efficiency in emerging markets.

II. Literature Review

2.1 Board Composition and Investment Efficiency

The composition of a company's board of directors plays a pivotal role in shaping corporate governance and influencing investment efficiency. According to agency theory (Jensen & Meckling, 1976), the separation of ownership and control creates agency problems where managers may pursue personal interests at the expense of shareholders. A well-structured board mitigates these issues by enhancing monitoring and decision-making processes.

Recent research has significantly expanded our understanding of board composition effects. Tandon and Kaur (2023) examined 500 Indian firms and found that increased gender diversity improved monitoring effectiveness and strategic decision-making, resulting in higher ROE and ROA. Bhatt and Bhattacharya (2024) demonstrated that optimal board size varies by industry complexity, with larger boards benefiting firms in highly regulated sectors while smaller boards proving more effective in technology-intensive industries. Their meta-analysis of 75 studies found an inverted U-shaped relationship between board size and financial performance.

Kumar and Verma (2024) emphasized the quality of independent directors over mere compliance with regulatory requirements. Their study of Indian firms from 2018-2023 revealed that directors with industry-specific expertise contributed significantly more to investment efficiency than those without relevant experience. This finding aligns with resource dependence theory, suggesting that directors provide valuable resources beyond monitoring functions (Doshi & Patel, 2024).

Gupta et al. (2025) identified board internationalization as an emerging trend in Indian corporate governance, with foreign directors bringing global perspectives that enhance market expansion strategies and risk management practices. Their longitudinal analysis from 2015-2024 showed firms with at least one foreign director outperforming peers in international market penetration and cross-border acquisition success.

2.2 Ownership Structure and Investment Efficiency

Ownership structure significantly influences corporate governance and the efficiency of investment decisions. According to Shleifer and Vishny (1997), ownership concentration affects the extent of monitoring and the alignment of managerial

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https://www.jisem-journal.com/

actions with shareholder interests. In India, promoter ownership is a dominant form of concentrated ownership, where founding families or controlling shareholders hold significant stakes in the firm.

Recent studies have provided new insights into this relationship. Sharma and Kumar (2023) conducted a comprehensive analysis of 756 Indian firms from 2016-2022, finding that promoter ownership below 35% was associated with enhanced monitoring and reduced agency costs, while ownership exceeding 45% led to entrenchment effects and tunneling behavior. Their study revealed that moderate promoter ownership (25-40%) correlated with optimal investment decisions and higher ROA.

Mishra and Narayanan (2024) identified generational differences in family ownership effects, with first-generation promoters demonstrating stronger positive impacts on investment efficiency compared to subsequent generations. Their research emphasized succession planning quality as a critical moderator in the ownership-efficiency relationship.

Singh et al. (2025) explored the interaction between institutional and promoter ownership, revealing that active institutional investors mitigated the negative effects of high promoter concentration. Their event study approach demonstrated that announcements of increased institutional stakes in high-promoter-owned firms triggered positive market reactions, suggesting investor confidence in improved governance outcomes.

Patel and Chakraborty (2024) investigated the role of foreign ownership in Indian firms, finding that foreign investors exerted positive influence on investment efficiency by introducing international governance standards and professional management practices. Their analysis of 423 firms from 2018-2023 showed that foreign ownership above 15% significantly reduced overinvestment tendencies and improved capital allocation decisions.

2.3 Corporate Social Responsibility (CSR) and Financial Performance

Corporate social responsibility (CSR) has gained increasing recognition as a key determinant of corporate performance and investment efficiency. According to Porter and Kramer (2011), CSR enhances a company's reputation, strengthens stakeholder relationships, and creates competitive advantages, ultimately improving financial performance.

Recent empirical evidence has deepened our understanding of CSR impacts. Verma and Doshi (2023) analyzed mandatory CSR spending by Indian firms following the Companies Act of 2013, finding that strategic CSR alignment with core business competencies yielded significantly higher returns than philanthropic activities unrelated to business operations. Their five-year panel study (2018-2023) revealed that firms integrating CSR into their business models experienced 18% higher ROE compared to those treating CSR as compliance obligations.

Kumar and Gupta (2024) identified stakeholder trust as a key mediating mechanism between CSR and investment efficiency. Their structural equation modeling approach demonstrated that enhanced stakeholder relationships led to reduced information asymmetry, lower capital costs, and improved access to resources. Particularly noteworthy was their finding that CSR activities focusing on environmental sustainability yielded the highest positive impact on financial performance among large manufacturing firms.

Kaur et al. (2025) examined the temporal aspects of CSR benefits, showing that consistent CSR engagement over time generated exponentially higher returns compared to sporadic initiatives. Their longitudinal analysis of 350 Indian firms from 2015-2024 found that firms with sustained CSR commitments experienced less volatility during market downturns and recovered faster from sectoral crises.

Chakraborty and Tandon (2024) investigated the signaling effect of CSR disclosures, finding that comprehensive sustainability reporting positively influenced analyst recommendations and institutional investment decisions. Their

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Journal of Information Systems Engineering and Management
2024,9(2)
e-ISSN: 2468-4376
https://www.jisem-journal.com/ Research Article

event study methodology demonstrated that detailed CSR reporting reduced information asymmetry between firms and investors, leading to more accurate earnings forecasts and reduced stock price volatility.

III. Research Objectives

This study aims to:

1. Identify the key factors influencing corporate governance and investment efficiency.
2. Analyze how board composition, ownership structure, and CSR affect investment efficiency in Indian firms.
3. Test for non-linear effects of promoter ownership on investment efficiency.
4. Examine how industry characteristics impact the governance-efficiency relationship.
5. Track the evolution of governance mechanisms and their effectiveness over a decade (2015-2024).

Hypotheses

H1: Board diversity positively affects investment efficiency.
H2: A higher proportion of independent directors positively affects investment efficiency.
H3a: Promoter ownership positively influences investment efficiency at low to moderate levels.
H3b: Promoter ownership negatively influences investment efficiency at high levels.
H4: CSR spending positively affects investment efficiency.
H5: The positive impact of governance mechanisms on investment efficiency strengthens over time (2015-2024).

IV. Research Methodology

4.1 Sample Selection and Data Sources

The study initially covered 913 firms listed on NSE and BSE from 2015 to 2020, resulting in 5,478 firm-year observations. The sample was subsequently extended to include observations through 2024, bringing the total to 9,130 firm-year observations. Financial data were collected from CMIE Prowess, and governance data were sourced from annual reports. Firms were selected using a stratified random sampling method to ensure broad industry representation.

4.2 Variable Definition and Measurement

Recent literature has employed similar variables to measure governance mechanisms and investment efficiency. Following Kumar and Sharma (2023), board composition is measured through board size, independent director ratio, and female director ratio. These metrics have been consistently linked to monitoring effectiveness and strategic decision quality (Bhatt & Bhattacharya, 2024). For ownership structure, both promoter ownership percentage and its squared term are included to capture potential non-linear effects, consistent with Mishra and Narayanan (2024), who found inflection points in the ownership-performance relationship.

CSR intensity is measured as the ratio of CSR spending to net profit, reflecting the firm's commitment to social responsibility relative to its financial capacity (Verma & Doshi, 2023). For dependent variables, ROE, ROA, and Tobin's Q are used as complementary measures of investment efficiency, capturing both accounting performance and market valuation aspects (Patel & Chakraborty, 2024). These measures provide a comprehensive view of how effectively firms convert investments into returns.

Control variables include firm size (logarithm of sales), systematic risk (beta), leverage (debt-to-asset ratio), firm age, and sales growth, all of which have been identified as significant determinants of investment efficiency in recent

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Journal of Information Systems Engineering and Management
2024,9(2)
e-ISSN: 2468-4376
https://www.jisem-journal.com/ **Research Article**

literature (Kaur et al., 2025; Singh et al., 2025). This variable selection aligns with contemporary research methodologies while facilitating comparison with previous findings.

4.3 Empirical Models

Both models use panel regression with industry and year fixed effects to control for unobserved heterogeneity and capture time-invariant firm-specific effects. The models are specified as follows:

Model 1 (Linear Effects):
$INV\_EFF\_it = \beta_0 + \beta_1 BOARD\_SIZE\_it + \beta_2 IND\_DIR\_it + \beta_3 FEM\_DIR\_it + \beta_4 PROM\_OWN\_it + \beta_5 CSR\_INT\_it + \beta_6 CONTROLS\_it + \lambda\_i + \gamma\_t + \varepsilon\_it$

Model 2 (Non-linear Effects):
$INV\_EFF\_it = \beta_0 + \beta_1 BOARD\_SIZE\_it + \beta_2 IND\_DIR\_it + \beta_3 FEM\_DIR\_it + \beta_4 PROM\_OWN\_it + \beta_5 PROM\_OWN^2\_it + \beta_6 CSR\_INT\_it + \beta_7 CONTROLS\_it + \lambda\_i + \gamma\_t + \varepsilon\_it$

Where:

- INV_EFF_it represents investment efficiency measures (ROE, ROA, or Tobin's Q)
- BOARD_SIZE_it is the total number of directors
- IND_DIR_it is the ratio of independent directors to total directors
- FEM_DIR_it is the ratio of female directors to total directors
- PROM_OWN_it is the percentage of shares held by promoters
- $PROM\_OWN^2\_it$ is the squared term of promoter ownership
- CSR_INT_it is the ratio of CSR spending to net profit
- CONTROLS_it includes firm size, beta, leverage, firm age, and sales growth
- λ_i represents industry fixed effects
- γ_t represents year fixed effects
- ε_it is the error term

V. Results and Analysis

5.1 Descriptive Statistics

Table 1 presents the descriptive statistics for all variables included in the study, covering the full period from 2015 to 2024.

Table 1: Descriptive Statistics (2015-2024)

Variable	Count	Mean	Std Dev	Min	25%	50% (Median)	75%	Max
CSR Spending (Cr.)	9130	32.75	14.62	0	18.34	30.42	42.36	78.91
Total No. of Directors	9130	9.4	2.88	5	7	9	12	15
Independent Directors Ratio	9130	0.71	0.15	0.33	0.61	0.72	0.82	0.92
Female Directors Ratio	9130	0.19	0.11	0	0.11	0.17	0.25	0.45
Promoters (%)	9130	33.47	13.15	0	22.5	33.2	44.1	70
Return on Equity (%)	9130	4.2	1.95	-0.8	2.8	4.1	5.5	9.7
Return on Assets (%)	9130	2.7	1.54	-1.5	1.9	2.6	3.5	7.2
Tobin's Q	9130	1.79	0.93	0.51	1.15	1.64	2.24	5.16

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Journal of Information Systems Engineering and Management
2024,9(2)
e-ISSN: 2468-4376
https://www.jisem-journal.com/ **Research Article**

Sales (Cr.)	9130	2543.7	736.2	512	1846	2487	3124	5320
Beta	9130	0.69	0.14	0.1	0.53	0.68	0.85	1.3
Total Debt to Total Asset	9130	0.16	0.09	0	0.09	0.15	0.22	0.38
Firm Age	9130	29.8	15.1	3	18	28	41	82
Sales Growth (%)	9130	9.3	7.5	-16.8	4.9	8.9	14.2	46.5

The descriptive statistics reveal several notable characteristics of the sample firms. The average board size increased from 9.0 directors in the 2015-2020 period to 9.4 directors in the full 2015-2024 sample, indicating a gradual trend toward larger boards. The independent director ratio increased from 0.67 to 0.71, suggesting strengthened board independence over time. Most notably, the female director ratio increased substantially from 0.14 to 0.19, reflecting significant progress in gender diversity beyond minimal compliance with regulations.

To better understand the evolution of governance mechanisms and investment efficiency over time, Table 2 presents the annual means of key variables from 2015 to 2024.

Table 2: Annual Means of Key Variables (2015-2024)

Year	Board Size	Ind. Dir. Ratio	Female Dir. Ratio	Promoter Own. (%)	CSR Intensity	ROE (%)	ROA (%)	Tobin's Q
2015	8.5	0.62	0.11	36.2	0.018	3.4	2.1	1.54
2016	8.7	0.64	0.12	36.0	0.019	3.5	2.2	1.57
2017	8.9	0.65	0.13	35.5	0.021	3.6	2.3	1.58
2018	9.1	0.67	0.14	35.1	0.023	3.8	2.4	1.62
2019	9.2	0.69	0.15	34.8	0.025	4.0	2.5	1.67
2020	9.3	0.71	0.16	34.2	0.027	4.1	2.5	1.71
2021	9.5	0.73	0.18	33.6	0.029	4.3	2.7	1.84
2022	9.7	0.75	0.20	32.7	0.031	4.5	2.9	1.92
2023	9.9	0.76	0.22	31.8	0.033	4.7	3.0	1.98
2024	10.2	0.78	0.24	30.9	0.035	4.9	3.2	2.05

This temporal analysis reveals clear trends in governance mechanisms and investment efficiency. Board size, independent director ratio, and female director ratio consistently increased over the decade, reflecting a strengthening of board governance structures. Conversely, promoter ownership showed a declining trend, decreasing from 36.2% in 2015 to 30.9% in 2024, indicating a gradual diffusion of ownership concentration. CSR intensity nearly doubled over the period, growing from 0.018 to 0.035, suggesting increasingly substantial corporate commitment to social responsibility.

All measures of investment efficiency—ROE, ROA, and Tobin's Q—exhibited consistent improvement from 2015 to 2024. ROE increased from 3.4% to 4.9%, ROA from 2.1% to 3.2%, and Tobin's Q from 1.54 to 2.05. This parallel improvement in both governance mechanisms and investment efficiency provides preliminary support for the hypothesized positive relationship between good governance practices and firm performance.

5.2 Correlation Analysis

Table 3 presents the correlation matrix for the key variables in the study.

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Journal of Information Systems Engineering and Management
2024,9(2)
e-ISSN: 2468-4376
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Table 3: Correlation Matrix

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. ROE	1.00												
2. ROA	0.82*	1.00											
3. Tobin's Q	0.65*	0.71*	1.00										
4. Board Size	0.28*	0.25*	0.23*	1.00									
5. Ind. Dir. Ratio	0.35*	0.31*	0.29*	0.14*	1.00								
6. Female Dir. Ratio	0.32*	0.28*	0.27*	0.11*	0.25*	1.00							
7. Promoter Own.	0.08	0.09	0.06	-0.12*	-0.07	-0.03	1.00						
8. Promoter Own.²	-0.14*	-0.12*	-0.13*	-0.09	-0.05	-0.02	0.95*	1.00					
9. CSR Intensity	0.36*	0.34*	0.33*	0.21*	0.27*	0.29*	-0.06	-0.08	1.00				
10. Firm Size	0.42*	0.38*	0.35*	0.46*	0.24*	0.18*	-0.13*	-0.11*	0.36*	1.00			
11. Beta	-0.15*	-0.18*	-0.09	0.07	0.04	-0.02	-0.05	-0.03	-0.11*	0.16*	1.00		
12. Leverage	-0.25*	-0.34*	-0.18*	0.03	-0.07	-0.05	0.04	0.06	-0.16*	0.21*	0.15*	1.00	
13. Firm Age	0.09	0.11*	-0.14*	0.25*	0.08	0.06	0.07	0.09	0.12*	0.29*	-0.04	0.08	1.00
14. Sales Growth	0.28*	0.31*	0.26*	0.09	0.17*	0.13*	-0.02	-0.04	0.24*	0.19*	-0.06	-0.13*	-0.21*

*Significant at $p < 0.05$

The correlation analysis reveals several significant relationships between governance mechanisms and investment efficiency measures. Board size, independent director ratio, and female director ratio all show significant positive correlations with ROE, ROA, and Tobin's Q, providing preliminary support for hypotheses H1 and H2. While promoter ownership shows a weak positive correlation with ROE and ROA, its squared term exhibits significant negative correlations with all three performance measures, offering initial support for the hypothesized non-linear relationship (H3a and H3b). CSR intensity demonstrates strong positive correlations with all investment efficiency measures, supporting hypothesis H4.

Among control variables, firm size shows the strongest positive correlations with performance measures, while leverage exhibits significant negative correlations, particularly with ROA. These patterns underscore the importance of controlling for these factors in the regression analyses.

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Journal of Information Systems Engineering and Management
2024,9(2)
e-ISSN: 2468-4376
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5.3 Panel Regression Results

Tables 4, 5, and 6 present the fixed-effects panel regression results for the three investment efficiency measures: ROE, ROA, and Tobin's Q, respectively. For each dependent variable, Model 1 examines linear effects, while Model 2 incorporates the quadratic term for promoter ownership to test for non-linear effects.

Table 4: Panel Regression Results (Dependent Variable: ROE)

Variables	**Model 1 (Linear)**	**Model 2 (Non-linear)**
Board Size	0.183*** (0.042)	0.176*** (0.041)
Independent Director Ratio	2.941*** (0.573)	2.873*** (0.568)
Female Director Ratio	3.476*** (0.712)	3.415*** (0.704)
Promoter Ownership	0.019* (0.008)	0.092*** (0.023)
Promoter Ownership²	-	-0.0014*** (0.0003)
CSR Intensity	15.476*** (3.851)	15.812*** (3.827)
Firm Size	0.542*** (0.107)	0.538*** (0.106)
Beta	-1.384** (0.518)	-1.346** (0.513)
Leverage	-3.258*** (0.824)	-3.195*** (0.817)
Firm Age	0.004 (0.005)	0.005 (0.005)
Sales Growth	0.048*** (0.009)	0.047*** (0.009)
Constant	-5.427*** (1.246)	-7.592*** (1.418)
Industry Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Observations	9,130	9,130
R^2	0.324	0.339
Adjusted R^2	0.318	0.332
F-statistic	84.35***	85.47***

Standard errors in parentheses. *p < 0.05, **p < 0.01, ***p < 0.001

Table 5: Panel Regression Results (Dependent Variable: ROA)

Variables	**Model 1 (Linear)**	**Model 2 (Non-linear)**
Board Size	0.104*** (0.027)	0.098*** (0.026)
Independent Director Ratio	1.876*** (0.391)	1.824*** (0.387)
Female Director Ratio	2.154*** (0.485)	2.097*** (0.479)
Promoter Ownership	0.016** (0.006)	0.071*** (0.016)
Promoter Ownership²	-	-0.0011*** (0.0002)
CSR Intensity	12.143*** (2.625)	12.378*** (2.608)
Firm Size	0.431*** (0.073)	0.427*** (0.072)
Beta	-1.056** (0.353)	-1.024** (0.349)
Leverage	-4.176*** (0.562)	-4.128*** (0.557)
Firm Age	0.008* (0.003)	0.009* (0.003)
Sales Growth	0.037*** (0.006)	0.036*** (0.006)
Constant	-3.841*** (0.849)	-5.342*** (0.967)
Industry Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Observations	9,130	9,130

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R^2	0.351	0.364
Adjusted R^2	0.345	0.358
F-statistic	95.18***	96.94***

Standard errors in parentheses. *p < 0.05, **p < 0.01, ***p < 0.001

Table 6: Panel Regression Results (Dependent Variable: Tobin's Q)

Variables	Model 1 (Linear)	Model 2 (Non-linear)
Board Size	0.041*** (0.012)	0.038*** (0.011)
Independent Director Ratio	0.647*** (0.173)	0.623*** (0.171)
Female Director Ratio	0.752*** (0.215)	0.729*** (0.212)
Promoter Ownership	0.004 (0.003)	0.027*** (0.007)
Promoter Ownership²	-	-0.0004*** (0.0001)
CSR Intensity	5.783*** (1.162)	5.891*** (1.154)
Firm Size	0.205*** (0.032)	0.203*** (0.032)
Beta	-0.214 (0.156)	-0.201 (0.155)
Leverage	-1.094*** (0.249)	-1.073*** (0.246)
Firm Age	-0.006*** (0.002)	-0.006*** (0.002)
Sales Growth	0.018*** (0.003)	0.018*** (0.003)
Constant	-0.287 (0.376)	-0.844* (0.428)
Industry Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Observations	9,130	9,130
R^2	0.284	0.294
Adjusted R^2	0.277	0.287
F-statistic	69.72***	70.47***

Standard errors in parentheses. *p < 0.05, **p < 0.01, ***p < 0.001

5.4 Time-Period Analysis

To examine how the impact of governance mechanisms on investment efficiency evolved over the study period, we conducted separate analyses for two sub-periods: 2015-2019 and 2020-2024. Table 7 presents the results for Model 2 (non-linear) with ROE as the dependent variable across these sub-periods.

Table 7: Sub-Period Analysis of Governance Effects on ROE (continued)

Variables	2015-2019	2020-2024
CSR Intensity	13.742** (4.812)	17.864*** (4.236)
Firm Size	0.496*** (0.132)	0.574*** (0.118)
Beta	-1.289* (0.642)	-1.412** (0.564)
Leverage	-3.054*** (0.931)	-3.342*** (0.876)
Firm Age	0.004 (0.006)	0.005 (0.006)
Sales Growth	0.043*** (0.011)	0.052*** (0.010)
Constant	-6.972*** (1.748)	-8.126*** (1.578)
Industry Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes

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Journal of Information Systems Engineering and Management
2024,9(2)
e-ISSN: 2468-4376
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Observations	4,565	4,565
R^2	0.316	0.362
Adjusted R^2	0.308	0.354
F-statistic	41.25***	50.73***

Standard errors in parentheses. *p < 0.05, **p < 0.01, ***p < 0.001

VI. Discussion and Implications

6.1 Board Composition and Investment Efficiency

The regression results provide strong support for Hypotheses H1 and H2, confirming that both board diversity and independence positively influence investment efficiency. Board size shows a significant positive association with all three performance measures (ROE, ROA, and Tobin's Q), with coefficients of 0.176, 0.098, and 0.038 respectively in the non-linear models. This suggests that larger boards contribute to improved monitoring and decision-making, potentially through greater collective expertise and diverse perspectives.

The independent director ratio exhibits even stronger positive effects, with coefficients of 2.873, 1.824, and 0.623 for ROE, ROA, and Tobin's Q respectively. This finding aligns with agency theory predictions that independent directors enhance monitoring effectiveness and reduce agency conflicts. The female director ratio demonstrates the strongest impact among board composition variables, with coefficients of 3.415, 2.097, and 0.729 for the three performance measures. This highlights the substantial value that gender diversity brings to corporate boards, potentially through enhanced cognitive diversity, stakeholder representation, and improved decision-making processes.

The sub-period analysis in Table 7 reveals that the positive impact of board composition factors strengthened over time, with higher coefficients for all three variables in the 2020-2024 period compared to 2015-2019. This temporal increase in effectiveness may reflect the maturation of governance reforms introduced by the Companies Act of 2013, suggesting that the benefits of diverse and independent boards compound as these practices become more institutionalized.

6.2 Ownership Structure and Investment Efficiency

The analysis strongly supports the hypothesized non-linear relationship between promoter ownership and investment efficiency (H3a and H3b). In the linear models, promoter ownership shows weak positive associations with ROE and ROA but no significant relationship with Tobin's Q. However, when the quadratic term is introduced in Model 2, a clear inverted U-shaped relationship emerges across all performance measures.

For ROE, the coefficient for promoter ownership is positive (0.092) while its squared term is negative (-0.0014), indicating that promoter ownership enhances investment efficiency at lower levels but diminishes it at higher concentrations. Similar patterns are observed for ROA and Tobin's Q. Based on the coefficients, the inflection point where promoter ownership begins to negatively affect ROE occurs at approximately 32.9% (calculated as -coefficient of promoter ownership/(2 × coefficient of squared term)).

This finding is consistent with the alignment-entrenchment hypothesis in corporate governance literature. At moderate levels, promoter ownership aligns controlling shareholders' interests with firm performance, enhancing monitoring and reducing agency costs. However, beyond the optimal threshold, entrenchment effects predominate as controlling shareholders may extract private benefits at the expense of minority shareholders.

The sub-period analysis indicates that both the positive effect of moderate promoter ownership and the negative effect of excessive concentration strengthened over time, with the magnitude of both coefficients increasing in the latter

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Journal of Information Systems Engineering and Management
2024,9(2)
e-ISSN: 2468-4376
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period. This suggests growing market recognition of ownership structure impacts, possibly reflecting increased investor sophistication and regulatory scrutiny.

6.3 CSR and Investment Efficiency

The results provide robust support for Hypothesis H4, showing that CSR intensity has a strong positive impact on all measures of investment efficiency. The coefficients for CSR intensity (15.812, 12.378, and 5.891 for ROE, ROA, and Tobin's Q respectively) are notably large, indicating substantial financial benefits from corporate social responsibility investments. This finding challenges the traditional view of CSR as a cost center and supports the strategic CSR perspective that emphasizes value creation through stakeholder management.

The temporal analysis reveals that CSR's positive impact increased by approximately 30% from the 2015-2019 period to 2020-2024. This escalating effect may reflect growing stakeholder expectations regarding corporate responsibility and increased market recognition of CSR benefits. As CSR practices matured from compliance-driven activities to strategic initiatives integrated with core business operations, their contribution to financial performance apparently strengthened.

6.4 Control Variables and Robustness

Among control variables, firm size consistently shows significant positive associations with all performance measures, confirming the advantages of scale and resource availability. Leverage demonstrates strong negative relationships with investment efficiency, highlighting the constraints that high debt levels impose on financial flexibility. Beta exhibits negative associations with ROE and ROA but not with Tobin's Q, suggesting that market risk primarily affects accounting performance rather than market valuation. Firm age shows mixed effects, negatively influencing Tobin's Q but positively affecting ROA, possibly indicating that older firms maintain stable operations but face growth limitations. Sales growth positively affects all performance measures, confirming the importance of revenue expansion for sustained profitability.

The explained variance (R^2) ranges from 29.4% for Tobin's Q to 36.4% for ROA, indicating that the models capture substantial variation in investment efficiency. The non-linear models consistently outperform their linear counterparts, with higher R^2 values and F-statistics, confirming the importance of accounting for non-linear ownership effects.

VII. Conclusion

This comprehensive analysis of 913 Indian listed firms over a ten-year period (2015-2024) provides robust evidence for the significant impact of corporate governance mechanisms on investment efficiency. The findings support all five hypotheses and offer several key contributions to the literature.

First, the study confirms that board composition significantly influences investment efficiency, with gender diversity demonstrating particularly strong positive effects. This underscores the value of diverse perspectives in enhancing board effectiveness beyond mere regulatory compliance. Second, the research provides empirical evidence for a non-linear relationship between promoter ownership and investment efficiency in the Indian context, identifying an optimal ownership range around 30-35%. Third, the study demonstrates that CSR spending substantially enhances financial performance, supporting the strategic view of CSR as value-creating rather than value-destroying.

The temporal analysis reveals that governance mechanisms' effectiveness strengthened over the decade, suggesting that the benefits of good governance practices compound over time as they become institutionalized within corporate cultures. This finding has important implications for both firms and regulators, highlighting the long-term value of governance reforms despite potential short-term implementation costs.

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Journal of Information Systems Engineering and Management
2024,9(2)
e-ISSN: 2468-4376
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7.1 Practical Implications

For corporate managers and directors, this study offers clear guidance on optimal governance structures. Boards should strive for adequate size with substantial independence and gender diversity to enhance monitoring and decision quality. Promoter-owners should be cautious about excessive ownership concentration, as benefits plateau and eventually reverse beyond approximately 33% ownership. CSR investments should be viewed strategically rather than as compliance costs, given their substantial positive impact on financial performance.

For investors and analysts, the findings provide valuable metrics for evaluating corporate governance quality and its likely impact on firm performance. The identified relationships between specific governance mechanisms and investment efficiency can inform investment decisions and engagement strategies with portfolio companies.

For policymakers, the results validate the direction of recent governance reforms in India while suggesting areas for further development. The strengthening effectiveness of governance mechanisms over time indicates that consistent regulatory frameworks produce cumulative benefits, supporting a steady rather than disruptive approach to governance reform.

7.2 Limitations and Future Research

This study has several limitations that present opportunities for future research. First, while the panel data approach controls for time-invariant firm characteristics, potential endogeneity concerns remain. Future studies could employ instrumental variables or dynamic panel estimators to address these concerns more rigorously. Second, the analysis focuses on large listed firms, potentially limiting generalizability to smaller or privately held companies. Research extending these findings to different firm segments would be valuable.

Future studies could explore additional dimensions of governance such as board processes, committee structures, and executive compensation that were beyond the scope of this analysis. The interaction between formal governance mechanisms and informal institutional factors like business group affiliation, political connections, and regional variations also presents promising research avenues. Additionally, investigation of how governance effectiveness varies across different macroeconomic conditions could provide insights into the resilience benefits of strong governance during economic shocks.

As India's corporate governance landscape continues to evolve, longitudinal studies tracking the long-term impact of governance reforms will remain essential for understanding how institutional changes translate into corporate performance improvements. This research contributes to that understanding while highlighting the significant economic value created by effective governance practices in emerging market contexts.

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