



Board Diversity, Firm Risk-taking and Firm Performance: Empirical Evidence from India

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ABSTRACT

The study examines the impact of board diversity on the firm risk-taking and firm performance of Indian firms. A subset of Nifty 200 Index companies has been analysed over the period of five years using Panel Regression (fixed-effects) and Dynamic Panel Regression. After controlling for several firms and governance variables, the results showed that board education diversity played significant positive role in influencing firm risk-taking ability whereas board experience diversity found to have no link. With respect to impact of board diversity on firm performance, board educational and board experience diversity had a significant negative influence on stock-based measure of firm performance whereas no relationship in case of accounting-based measure. This research is a novel attempt to study the impact of education and experience attributes of board and recognizes various board-level characteristics on the firm-risk and firm performance, particularly in the wake of the implementation of the Companies Act 2013 in India

Introduction

Globalization has had a notable impact on the makeup of boards of directors in publicly traded corporations globally (Harjoto et al., 2018). The growing focus on board diversity as a novel concept in good governance practices has drawn attention from policy makers and corporations alike with an idea to leverage diverse

knowledge, skills, and expertise within boards of directors. As a result, numerous empirical studies have been conducted to investigate the link between board diversity and firms' financial performance, yielding mixed evidence (Adams & Ferreira, 2009; Carter et al., 2003; Đặng et al., 2020; Duppati et al., 2020).

The diversity in educational background among board members brings distinct perspectives on corpo-

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rate objectives into board discussions, decision-making processes, differing views on whether the ultimate goal of a corporation is to solely maximize shareholders' interests or to also consider the broader interests of stakeholders (Harjoto et al., 2018). Board education diversity is often considered alongside other dimensions of diversity, such as gender, race, ethnicity, age, and experience, as part of efforts to create more inclusive and effective boards. By having a diverse mix of educational qualifications among directors, organizations may benefit from a broader range of expertise, insights, and innovation, leading to better decision-making and organizational performance (Ararat et al., 2015).

Directors with more experience better understand the firm's operations, thus can effectively take firm-risk taking and performance improvement decisions (Daily et al., 2003), networks may enhance their resource capabilities (Dalton et al., 1999), thus, leading to better monitoring (Finkelstein & Hambrick, 1996). In terms of risk-taking, according to Bernile et al. (2018), greater diversity within a board of directors has been associated with reduced risk and improved performance, as diverse companies tend to adopt investment policies that are more consistent and less risky.

Although the relationship between board diversity and financial performance has been extensively studied, there has been a notable gap in research examining the impact of board diversity on firm risk-taking, specifically in relation to educational qualifications and experience. Despite some emerging studies on board diversity (Ozdemir et al., 2022; Yeh & Trejos, 2015), our understanding of how board diversity influences risk-taking in Indian companies remains limited. Thus, the study focuses on the Indian companies and examines the impact of board diversity on both firms risk-taking and firm performance.

This study makes several contributions to the existing literature. Firstly, it tests the mixed predictions of theories that explain the impact of workgroup diversity on team performance, specifically in the context of Indian boardrooms. The findings provide valuable insights into the role of diversity in the group decision-making process and its outcomes. Secondly, by using both board educational background and experience diversity as measures of diversity to get more useful insights on board diversity rather than

gender as an attribute which is the most researched attribute of board diversity. This study captures the different cultural perspectives and value systems that directors bring to the team, offering a more comprehensive understanding compared to using board educational diversity alone. Lastly, the findings suggest that enhancing directors' experience and educational background diversity could benefit as well as bring costs too to the companies with a stakeholder view of firm performance, as well as those seeking to reduce firm-risk.

Literature Review And Hypotheses Development

Board Diversity (Education and Experience) and Firm Risk

The concept of board education diversity suggests that a diverse educational composition of a board can enhance the board's ability to effectively oversee an organization's strategic direction, financial performance, risk management, and corporate governance. Board members with diverse educational backgrounds may approach problems and opportunities from different angles, challenge assumptions, and bring fresh perspectives to the table (Harjoto et al., 2018) which can help in reducing the variation and volatility in earnings and profitability, thereby reducing firm-risk.

(Adams & Ferreira, 2009) discovered that firms with more diverse boards were inclined to take risks. Based on these perspectives, the study hypothesizes that board diversity, including educational and experience diversity, enhances the effectiveness of boards through improved management oversight and decision-making skills attributed to greater knowledge, skills, and abilities (Carter et al., 2010). Diversity in educational backgrounds among board members has the potential to yield benefits for stakeholders and contribute to the overall stability of the domestic financial system (Schwizer et al., 2012). According to Nielsen and Huse (2010), a diverse educational background, combined with expertise in a specialized field, can enhance the depth of diversity within a board, which in turn can potentially reduce firm risk.

The impact of board experience or tenure on firm risk-taking has been a subject of academic research with mixed findings. Some studies suggest that longer board tenure or greater board experience may lead to more conservative risk-taking behavior, while others propose that it can result in increased risk-taking suggesting that longer board tenure or greater board experience may lead to conservative risk-taking behavior. This argument is based on the notion that directors with longer tenure are more familiar with the firm's history, industry, and operations, and may prioritize stability and preservation of the status quo over taking risks (Baysinger & Hoskisson, 1990). Such directors may be less inclined to endorse risky decisions due to concerns about potential negative impacts on the firm's performance and reputation (Y. Zhang & Rajagopalan, 2010).

On the other hand, some studies propose that longer board tenure or greater board experience can lead to increased risk-taking behavior. Directors with longer tenure or more experience may possess greater knowledge, skills, and insights, which could enable them to better understand and manage risks (Daily et al., 2003). Additionally, experienced directors may have established relationships and networks that can provide access to valuable information and resources, allowing them to pursue riskier opportunities (Dalton et al., 1999).

Hypothesis 1: The board education diversity significantly influences firms risk-taking (STD(ROA) and ln(ROA)).

Hypothesis 2: The board experience diversity significantly influences firms risk-taking (STD(ROA) and ln(ROA)).

Board Diversity (Education and Experience) and Firm Performance

According to the diversity literature, there are two types of diversity: observable diversity, which includes characteristics such as race, age, and gender, and non-observable diversity, which encompasses factors like educational background, functional expertise, and personality traits (Milliken and Martins, 1996).

Different theories present mixed predictions regarding the impact of board diversity on board performance in overseeing managers' response to stakeholder concerns and expectations, aligning with the company's values and strategic priorities. Four diversity theories, namely social categorization, similarity/attraction, cognitive resource diversity, and intergroup contact theory, form the theoretical framework for the study.

Limited research has been conducted on the relationship between the educational backgrounds of board members and firm outcomes, with only a few studies, such as those conducted by M. Ali et al. (2014) and Mahadeo et al. (2012), exploring this area. Education diversity can be assessed in two ways: by measuring the level of education, such as school level, below school level, graduation, and post-graduation, as done by Ararat et al. (2015); or by measuring the subject stream or nature of education, such as science, engineering, arts, commerce, etc., (Hart, 1995; Rose, 2007). The educational level of board members is believed to impact a board's cognition and decision-making process. However, empirical findings on the effects of board education diversity on firm performance are mixed, with contrasting results reported. For instance, Murray (1989) found that a homogeneous board with an engineering education background may perform better in the oil industry compared to a heterogeneous one in terms of both performance and risk.

The educational background of board members is a significant factor to consider in the recruitment process, as it determines their cognitive capacity to perform highly skilled tasks (Darmadi, 2013). However, the results of studies on education as a board attribute have been inconclusive (Kagzi & Guha, 2018). Board education diversity has also been found to potentially impact firm performance, as evidenced by Kang et al. (2007), who found that education diversity among directors can affect firm performance. Haniffa & Cooke (2002) argued that highly educated directors may be more effective in monitoring and advisory activities, leading to improved corporate integrity and Research and Development, ultimately influencing a company's strategic decision-making ability. This efficiency can have an impact on firm performance (Gottesman & Morey, 2010).

Workgroup diversity has been viewed as a double-edged sword, as suggested by Milliken and

Martins (1996) and Webber and Donahue (2001). On one hand, diversity may lead to more creative problem solving and solutions, consistent with intergroup contact theory and cognitive resource diversity perspective. On the other hand, diversity may also lead to reduced teamwork cohesion, affecting the group decision-making process, as predicted by social categorization theory and similarity/attraction paradigm.

The impact of board experience or tenure on firm performance has been a subject of extensive research, and the findings are diverse and context-dependent. Some studies suggest that longer board tenure or greater board experience may positively impact firm performance, while others propose that it can have negative or neutral effects. Directors with longer tenure or more experience may have a better understanding of the firm's operations, strategies, and industry dynamics, which can enable them to make more informed and effective decisions (Daily et al., 2003). Additionally, experienced directors may exhibit greater monitoring and advisory capabilities, which can positively influence firm performance (Finkelstein & Hambrick, 1996). However, some studies propose that longer board tenure or greater board experience can have negative or neutral effects on firm performance. For instance, long-tenured directors may become entrenched or overly familiar with the status quo, leading to resistance to change or innovation, and potentially hindering firm performance (Zajac & Westphal, 1998). Furthermore, excessively long board tenure may lead to complacency which can limit the effectiveness of board decision-making and negatively impact firm performance (Boyd, 1995).

Hypothesis 3: The board education diversity significantly influences firm performance (Tobin's Q and ROA).

Hypothesis 4: The board experience diversity significantly influences firm performance (Tobin's Q and ROA).

Data And Research Methodology

Sample and Data Sources

The present research focused on a subset of companies listed on the National Stock Exchange (NSE) 200 (Nifty 200) Index as of March 31, 2022, spanning a period of five years from April 1, 2013 to March 31, 2018. The

study employed specific criteria, as summarized in Table 2, to select the final usable sample. Firstly, all banking and other financial services companies were excluded as they are not subject to The Companies Act 2013 (Gill & Kaur, 2015). Secondly, government-owned companies at both the central and state levels were also excluded (Jatana, 2022). Thirdly, companies that were not listed on the Nifty 200 Index throughout the entire study period were removed to ensure better comparability (Kohli, 2018). Fourthly, companies with fiscal year-end dates other than March 31 were excluded. Lastly, companies with missing data or unavailable annual reports were also excluded (Arora & Bodhanwala, 2018). Following these criteria, a final usable sample of 102 companies, resulting in a balanced panel data set of 510 firm-year observations (102 companies x 5 years). The data have been collected from annual reports, CMIE Prowess database and NSE Infobase database.

Table 1: Sample Selection

CRITERION	Companies
Nifty 200 Index companies	200
Less:	
Banking & other financial services companies	(41)
PSUs (government owned companies)	(18)
Companies not listed during the study period on NIFTY 200 Index	(33)
Companies with different FY (Fiscal Year)	(10)
Companies for which database was missing or whose annual reports were not available	(0)
Final Usable Sample	102
Final firm-year observations (102*5)	510

Variable Description

Dependent Variable

Risk-Taking

The measurement of corporate risk-taking is often done using the standard deviation of return on assets (STD(ROA)) (Bruna et al., 2019; Faccio et al., 2016; Mohsni et al., 2021). This metric quantifies the level of risk associated with a firm's operations by assessing the volatility of its earnings. The underlying assumption is

that riskier operations tend to result in greater fluctuations in returns, leading to higher standard deviation of ROA.

Previous studies have argued that volatility of returns is commonly used as a proxy for risk in financial economics literature, (Bruna et al., 2019). Therefore, STD(ROA) reflects the riskiness of investment decisions and the level of risk-taking in a firm's operations (Faccio et al., 2016; (John et al., 2008). H. Zhang (2009) also stated that riskier corporate decisions tend to result in higher earnings volatility. Secondly, income stream variance, as captured by STD(ROA), has been identified as the measure that best represents the level of risk taken by a company (Kim, 2008). Thirdly, using accounting-based or risk-based measures, such as STD(ROA), is often considered more appropriate in governance research than market-based measures. STD(ROA) is typically calculated over a period of 5 years using overlapping windows, such as (2014-2018), (2015-2019), (2016-2020), (2017-2021), and (2018-2022) (Bruna et al., 2019; Faccio et al., 2016), and data has been collected until 31st March, 2022. Further log of STD(ROA) has been taken to correct skewness.

Firm Performance

Return on Assets (ROA) (accounting-based measure) and Tobin's Q (stock-based measure) are widely used measures in board diversity related studies (Carter et al., 2003, 2010; Erhardt, 2003; Fernández-Temprano & Tejerina-Gaite, 2020; García-Meca et al., 2015; Gregory-Smith et al., 2014; Haslam et al., 2010; Pathan & Faff, 2013). ROA has been defined as EBIT/Total Assets (Gill and Kaur, 2015; Van Peteghem et al., 2018) and Tobin's Q is measured as sum of market value of common stock and book value of preference stock, borrowings and current liabilities) scaled by sum of Fixed assets, investments and current assets (Chung and Pruitt, 1994).

Independent Variable

Board Diversity

The research focuses on two key aspects of board diversity: education and experience. Board education diversity (B_ED) has been measured using Blau's Index to

see differentiation in qualification of the directors with two categories (Aggarwal et al., 2019). Two measures of diversity, referred to as "variety" and "balance", is used to measure heterogeneity. These measures, namely the Blau index (Blau, 1977) and the Shannon Index, are commonly used in the literature. The Blau index, also known as Blau's segregation index, ranges from 0 to 1, with 0 indicating integration and 1 indicating segregation. Blau index (Blau, 1977) calculated as Blau

Index = $1 - \sum_{i=1}^p x_i^2$, where P_i represents the proportion

of directors in each category and n is the number of categories. Another measure, the Shannon Index, is calculated as

$1 - \sum_{i=1}^p p_i \ln p_i$, where p_i and n are defined in

the same way as in the Blau Index. It also ranges from 0 to 1, with 1 indicating maximum diversity when both groups are equally represented. However, due to the logarithmic nature of the Shannon index, it is more sensitive to small differences in group proportions. Therefore, only the Blau index was used in the current study. And Board experience diversity (B_EXD) is taken as the coefficient of variation of years served on board (Aggarwal et al., 2019; Fernández-Temprano & Tejerina-Gaite, 2020).

Control Variables

In order to examine the impact of board education and experience diversity on firm risk-taking and firm performance, it is essential to control for other factors as well.

At the firm-level, firstly, firm size, which is measured as the log of total assets of the firm, has been considered (Carter et al., 2003; Liu et al., 2014). This is because smaller firms tend to be more risk-averse compared to larger firms (Bruna et al., 2019). Secondly, firm leverage (F_LEV), which is the ratio of total debt to total assets (Bernile et al., 2018; Bhat et al., 2020). The argument by Bruna et al. (2019) is that as a firm's leverage increases, its level of risk also increases, which may lead to higher earnings volatility. Firm age (F_AGE) has been included as a control variable, to account for the effect of firm age on earnings volatility and measured as the log of the number of years since the firm's inception (Majumdar, 1997).

At corporate governance variables such as board size (BSIZE), has been controlled for by considering the number of directors on the board (Gill and Kaur, 2015; Aggarwal et al., 2019) and Board independence (B_ID) as the percentage of independent directors on the board (Gill and Kaur, 2015; Ozdemir et al., 2022). Board size may have an impact on the risk-taking behavior and decision-making of the firm; hence it has been included as a control variable. Moreover, board activity as the number of meetings held in a year and ownership has been controlled in terms of promoter and non-promoter shareholding (Aggarwal et al., 2019).

The descriptions of the variables used in the study are summarized in Table 2.

Estimation Models

The panel data regression model given by Eq. (1) and Eq. (2) for studying the direct effect of board diversity (education and demographic) on STD(ROA) and Ln(ROA) as proxy for firm risk-taking:

$$STD(ROA)_{i,(t,t-4)} = \alpha_0 + \beta_1 B_ED_{it} + \beta_2 B_EXD_{it} + \beta_3 F_SIZE_{it} + \beta_4 F_AGE_{it} + \beta_5 FLEV_{it} + \beta_6 B_SIZE_{it} + \beta_7 B_ID_{it} + \beta_8 B_ACT_{it} + \beta_9 PO_{it} + \beta_{10} NPO_{it} + \beta_{it} \quad \text{Eq. (1)}$$

$$\ln ROA_{i,(t,t-4)} = \alpha_0 + \beta_1 B_ED_{it} + \beta_2 B_EXD_{it} + \beta_3 F_SIZE_{it} + \beta_4 F_AGE_{it} + \beta_5 FLEV_{it} + \beta_6 B_SIZE_{it} + \beta_7 B_ID_{it} + \beta_8 B_ACT_{it} + \beta_9 PO_{it} + \beta_{10} NPO_{it} + \beta_{it} \quad \text{Eq. (2)}$$

To study the impact on firm performance variables, Panel Data Regression Model Equations has been used as in Eq. (3) and Eq. (4). All control variables in equation (1) are also included in the following models.

$$ROA_{i,t} = \alpha_0 + \beta_1 B_ED_{it} + \beta_2 B_EXD_{it} + \beta_3 F_SIZE_{it} + \beta_4 F_AGE_{it} + \beta_5 FLEV_{it} + \beta_6 B_SIZE_{it} + \beta_7 B_ID_{it} + \beta_8 B_ACT_{it} + \beta_9 PO_{it} + \beta_{10} NPO_{it} + \beta_{it} \quad \text{Eq. (3)}$$

$$TQ_{i,t} = \alpha_0 + \beta_1 B_ED_{it} + \beta_2 B_EXD_{it} + \beta_3 F_SIZE_{it} + \beta_4 F_AGE_{it} + \beta_5 FLEV_{it} + \beta_6 B_SIZE_{it} + \beta_7 B_ID_{it} + \beta_8 B_ACT_{it} + \beta_9 PO_{it} + \beta_{10} NPO_{it} + \beta_{it} \quad \text{Eq. (4)}$$

Where,

STD(ROA), lnROA, TQ and ROA are the dependent variables,

Table 2: Variables Definitions

VARIABLES	DESCRIPTION
DEPENDENT VARIABLES	
STD(ROA)	Standard Deviation of ROA (EBIT divided by total assets) by 5-year overlapping windows
LnROA	Log of STD(ROA)
ROA	EBIT/Total Assets
TQ	Tobin's Q as (Market value of common stock + Book value of preference stock, borrowings and current liabilities)/ (Fixed assets + Investments + Current Assets)
INDEPENDENT VARIABLES	
B_ED	Board education diversity- Blau's Index with number of categories as two viz., "Metric and Graduation" and "Post-graduation"
B_EXD	Coefficient of variation of years served on board of particular company
CONTROL VARIABLES	
B_SIZE	Total number of board of directors in a firm
B_ID	Board Independence measured as the percentage of independent directors on the board.
B_ACT	Board meetings held in a year
F_LEV	Firm Leverage is measured the ratio of total debt to total assets
F_SIZE	Firm size measured as natural log of the firm's total assets
F_AGE	Firm's Age computed from the date of incorporation
PO	Percentage of shareholding with the promoters
NPO	Percentage of shareholding with the non-promoters

B_ED and B_EXD are the independent variables,

Control variables = Board Size (B_SIZE), Board Independence (B_ID), Board Activity (B_ACT), Firm Size, (F_SIZE), Firm Age (F_AGE), Firm Leverage (F_LEV), Promoter Ownership (PO), Non-promoter ownership (NPO)

The study used STD(ROA) and ln(ROA) as measure of firm risk-taking. The explanatory variables, B_ED and B_EXD, represent the education and experience board diversity, respectively. Most of control variables have been taken from previous studies (Ozdemir et al., 2021; Bruna et al., 2019; Aggarwal et al., 2019; Gill and Kaur, 2015).

Data Analysis

Using panel data regression, a fixed-effects panel model was used to assess the relationship between board (education and experience) diversity and firm risk-taking as well as on firm performance. Likelihood Ratio test was used to compare the performance of the fixed effect model and pooled OLS regression. The null hypothesis that the fixed effects were redundant was rejected by the relevant p-values being non-significant. As a result, the Hausman specification test was used to further decide whether the fixed-effect or random-effect model was more appropriate. A substantial coefficient on the diversity variables is found when estimating the random-effect models in a number of specifications, usually those for which the fixed-effects estimates were also significant. The random-effects estimator is inconsistent, as indicated by the Hausman test which rejects the majority of the cases for random-effect estimations. Furthermore, Breusch and Pagan's Lagrangian multiplier test for random effects suggested that the random-effects estimator was inconsistent with the likelihood test. Therefore, the analysis emphasizes on the fixed-effects estimation results.

Empirical Results

Descriptive Statistics and Correlations

Table 3 presents the descriptive statistics of the Nifty 200 Index companies and includes data regarding

STD(ROA), Ln(ROA), Tobin's Q (TQ), ROA, board education diversity, board experience diversity and control variables used in the study. The mean STD(ROA) of the sample companies was 0.0461 but there was a wide difference between the minimum and maximum values.

With respect to firm performance variables, Tobin's Q has a maximum value of 86.4719 with a mean value of 10.5657, ROA with maximum value of 0.5716 and mean score of 0.1388. With reference to the board education diversity measure, it is observed that due to no metric or under-graduate individual appointed on board, education diversity has not been found in few companies and has a minimum score of 0 and is as high as 0.50 for few with mean score of 0.3863 stating that companies are having directors who all are highly skilled and has expertise knowledge.

On an average, in terms of board independence companies has appointed independent directors with a percentage as high as 83.33% of the board with a mean of 0.54.

Table 3 also provides the summary statistics of the control variables used in the study. Board size of sampled firms ranges from 5-20 with a mean of 10.26. Other control variables including size of the firm, age of the firm, return on assets, firm leverage show notable variations for explaining factors in the main analyses and were within the prescribed limits.

Table 4 shows the correlations for the sample chosen to examine the relationship between variables of study. The degree of both board education and experience diversity correlates negatively and significantly with STD(ROA), ln(ROA), TQ (p-value < 0.01). Further, board education diversity has negative but insignificant correlation with ROA whereas board experience diversity has positive and significant correlation with ROA (p-value < 0.05). Control variables including a (B_SIZE), (F_SIZE), (B_ACT), (F_LEV) shows a negative and significant correlation and (B_ID) as well as (F_AGE) showed a positive correlation with the dependent variable, TQ. In other words, the impact of board diversity and STD(ROA) and other performance measures is still marginally influenced by control variables. Moreover, none of the variables' correlation coefficients were higher than 0.7, indicating that multicollinearity problems do not exist in the vari-

ables, further the study subsequently proposes variance inflation components, the values for which were much lower than the critical value of 10.

Regression Results

The study estimates the panel regression Eq. (1) and Eq. (2) with STD(ROA) and ln(ROA) as the measures of risk-taking proxy, the dependent variables. Table 5 presents the panel regression results for board diversity (education and experience) on STD(ROA) and ln(ROA), there is a positive and significant relationship between board education diversity and firm risk-taking for both the proxies i.e., STD(ROA) as well as with ln(ROA), accepting H1. This indicates that educational qualification of board does add up to the firm risk positively which makes an argument that knowledge may lead to more effective and informed risk-taking decisions due to increased creativity and innovation, improved decision making, enhanced reputation, better risk assessment. This indicates that firms having educationally diverse boards that is, on average, a unit increase in board educational diversity leads to 0.0737 increase in STD(ROA) and 0.5123 increase in ln(ROA) (p-value < 0.01). For control variables, Board size (BSIZE) and Firm leverage (FLEV)

have a significant negative impact on STD(ROA) whereas Firm Size (F_SIZE) showed a significant positive association with STD(ROA) showing that as the size of firm increases, firm risk also increases. Next, the impact of board experience diversity had no significant impact on firm-risk for any of the measures of the study, thereby, rejecting H2. Such relation may be due to stringent Risk Management Policies, Board Dynamics and Decision-Making Processes and other factors at play that influence firm risk-taking independently of board diversity, such as CEO characteristics, organizational culture, external market conditions, and regulatory environment.

Next, the study analysed the impact of board diversity on firm performance using Eq. (3) and Eq. (4) (Table-5). This analysis intends to reveal there is a negative and significant relationship between board education diversity and Tobin's Q as stock-based measure of firm performance but showed no link with ROA, partially accepting H3 with regards to stock-based measure. Thus, an increase in board education diversity will lead to decrease in TQ (b=-5.4146, p-value < 0.05). And board experience diversity has a negative and significant impact on TQ (b = -3.01374, p < 0.01), whereas it had no link with ROA, again partially accepting H3 with regards to stock-based measure.

Table-3 Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
STDROA	510	0.0461	0.1058	0.0019	1.0924
LnROA	510	-1.5425	0.3520	-2.7072	0.0384
TQ	510	10.5657	11.1127	1.0308	86.4719
ROA	510	0.1388	0.1525	-2.3312	0.5716
B_ED	510	0.3863	0.1312	0	0.5
B_EXD	510	3.1703	0.3324	2.1567	4.5082
B_SIZE	510	10.2607	2.7115	5	20
B_ID	510	0.5361	0.0933	0.1111	0.8333
B_ACT	510	5.7784	1.6608	2	13
F_SIZE	510	4.8674	0.5879	3.6787	6.7384
F_AGE	510	1.5427	0.2568	0.8450	2.0644
F_LEV	510	12.1189	25.3842	0	202.2891
PO	510	51.4305	16.6513	0	75
NPO	510	48.5695	16.651	25	100

Table 4: Correlation

VARIABLES	STDROA	LnROA	TQ	ROA	B_EDIV	B_EXD	B_SIZE	B_ID	B_ACT	F_SIZE	F_AGE	F_LEV	PO	NPO
STD(ROA)	1													
Ln(ROA)	0.645***	1												
TQ	-0.036	0.051	1											
ROA	-0.382***	-0.129***	0.337***	1										
B_ED	-0.204***	-0.115***	-0.283***	-0.018	1									
B_EXD	-0.194***	-0.173***	-0.110**	0.090**	0.159***	1								
B_SIZE	-0.123***	-0.155***	-0.141***	0.058	0.138***	0.783***	1							
B_ID	-0.046	-0.089**	0.114***	0.077*	-0.049	-0.164***	-0.076*	1						
B_ACTIVITY	-0.014	-0.074*	-0.074*	-0.087**	-0.087**	0.057	0.063	-0.066	1					
F_SIZE	0.033	-0.076*	-0.284***	-0.063	0.057	0.251***	0.335***	-0.014	0.024	1				
F_AGE	-0.079	-0.067	0.042	0.101**	0.279***	0.106**	0.167***	0.086*	0.159***	0.072	1			
F_LEV	-0.036	-0.027	-0.253***	-0.206***	0.213***	0.131***	0.168***	-0.022	-0.014	0.227***	0.108***	1		
PO	0.160***	0.204***	0.025	-0.039	0.007	-0.200***	-0.241***	-0.214***	-0.255***	-0.035***	-0.241***	-0.061	1	
NPO	-0.160***	-0.204***	-0.025	0.039	-0.007	0.200***	0.241***	0.214***	0.256***	0.035***	0.241***	0.061	-1	1

Note(s): ***, ** and * indicate significance at the 1, 5 and 10 per cent levels, respectively

Source(s): Authors' analysis

Table 5: Regression results with STD(ROA), Ln(ROA), TQ, ROA as dependent variable.

MODELS	STDROA	Ln(ROA)	TQ	ROA
	Coef. (t-value)	Coef. (t-value)	Coef. (t-value)	Coef. (t-value)
B_ED	0.0737*** (4.22)	0.5123*** (3.03)	-5.4146** (-1.98)	0.0777 (0.84)
B_EXD	-0.0067 (-0.94)	-0.0871 (-1.24)	-3.0137*** (-2.67)	0.0575 (1.51)
B_SIZE	-0.0017* (-1.7)	0.0024 (0.24)	-0.1538 (-0.94)	0.0169** (3.08)
B_ACT	-0.0012 (-1.29)	-0.0153 (-1.61)	-0.0793 (-0.52)	0.0077 (1.5)
B_ID	0.0247 (1)	0.2620 (1.09)	-6.2950 (-1.62)	0.0413 (0.32)
F_SIZE	0.0215* (1.65)	0.1062 (0.84)	-21.3*** (-10.42)	-0.0853 (-1.24)
F_AGE	-0.0757 (-1.48)	-0.2245 (-0.45)	-13.2943* (-1.67)	0.0078 (0.03)
F_LEV	-0.0002* (-1.76)	-0.0012 (-0.91)	-7.7E-05 (0)	-0.0009 (-1.24)
PO	0.3399 (0.79)	6.8799* (1.66)	-36.1488 (-0.54)	1.6447 (0.73)
NPO	0.3399 (0.79)	6.8843* (1.66)	-36.2721 (-0.54)	1.6454 (0.73)
_cons	-33.9267 (-0.79)	-689.904* (-1.66)	3772.68 (0.56)	-164.409 (-0.73)
No. of Observations	510	510	510	510
Overall R ²	27%	24.9%	70%	25.3%
Wald Statistics	105.46	9.28	39.13	39.13
Prob>chi-square	0.000	0.000	0.000	0.000

Note(s): ***, ** and * indicate significance at the 1, 5 and 10 per cent levels, respectively

Source(s): Authors' analysis

Robustness And Endogeneity Tests

For robustness, an additional diagnostic test has been performed by taking Alternative definition of both independent (Shannon Index for board educational diversity) and dependent variable was used and the results were similar as reported under the taken variables. The study addressed the issue of endogeneity by incorporating lagged independent variables by conducting an Arellano-Bond test to examine the presence of autocorrelation in the error

term of the model, using GMM estimation, which is consistent with prior studies (e.g., Carter et al., 2010; Jackling & Johl, 2009). A p-value of less than 1% was obtained, which is consistent with the fixed effects model (Table-5), indicating that the lagged dependent variable used in the GMM estimation is a valid instrument. This is in line with previous research (Ozdemir, 2022; Flannery and Hankins, 2013; Wintoki et al., 2012) and confirms that the lagged instruments employed in the dynamic panel estimation are valid for model estimation.

Table- 5 Arellano-Bond dynamic panel-data estimation (Regression) results with STD(ROA). Ln(ROA), TQ, ROA as dependent variable

	STDROA	LnROA	TQ	ROA
	Coef. (z-value)	Coef. (z-value)	Coef. (z-value)	Coef. (z-value)
STD(ROA)	-0.295			
L1.	(-1.06)			
LnROA		0.8362***		
L1.		(4.6)		
TQ			0.7611***	
L1.			(13.94)	
ROA				0.5995*
L1.				(1.89)
B_ED	0.0501*	-0.1320		
	(1.74)	(-0.51)		
B_EXD	-0.0067	0.0487	8.6115***	0.1604
	(-0.74)	(0.46)	(3)	(1.13)
B_SIZE	-0.0010	-0.0194	0.6169	0.0436
	(-0.95)	(-1.38)	(0.53)	(0.82)
B_ACT	-0.0001	0.0086	-0.1100	0.0010
	(-0.11)	(0.71)	(-0.73)	(0.14)
B_ID	0.0800***	0.8969**	0.0440	-0.0018
	(2.59)	(2.47)	(0.33)	(-0.29)
F_SIZE	0.0132	0.3885**	-0.2649	-0.4496**
	(0.78)	(2.03)	(-0.07)	(-2.4)
F_AGE	-0.0099	0.4190	10.1889***	0.0693
	(-0.15)	(0.56)	(3.87)	(0.65)
F_LEV	-8E-05	0.0015	-21.0553**	-0.6276
	(-0.46)	(0.75)	(-2.51)	(-1.52)
PO	-0.0001	-0.0293**	-0.0236	-0.0009
	(-0.015)	(-2.52)	(-1.04)	(-0.92)
NPO	-0.0002	-0.0359***	-0.1931	0.0055
	(-0.17)	(-3.41)	(-1.18)	(0.93)
_cons	0	0	-0.2062	0.0093*
			(-1.18)	(1.72)
No. of Observations	306	306	306	306
Prob > chi2	0.0000	0.0000	0.0000	0.0000

Note(s): ***, ** and * indicate significance at the 1, 5 and 10 per cent levels, respectively

Source(s): Authors' analysis

Discussion

Theoretical and Practical Contributions

The relationship between board diversity and firm risk-taking has significant theoretical and practical implications for organizations and policymakers in terms of understanding the role of diversity in corporate governance and its impact on firm behavior and performance.

Having education and experience diversity on corporate boards can help mitigate groupthink and promote more inclusive decision-making processes as diverse range of perspectives enables to evaluate a wider range of options, consider alternative viewpoints, and reduce biases, ultimately leading to better-informed and more creative decision-making. This, in turn, can result in more effective risk management.

Another diversity on corporate boards can foster greater accountability and transparency, which can enhance firm performance and reduce the likelihood of excessive risk-taking. These theoretical implications, in turn, can inform practical implications for organizations and policymakers in promoting diversity in corporate boards as a means to enhance risk management and improve overall firm performance, positive impacts on the reputation and legitimacy of organizations, especially considering the growing demand for diversity and inclusion in the workplace.

However, it's important to note that some theories suggest diversity on corporate boards may also be associated with increased conflict and reduced cohesion, which could potentially result in slower decision-making and higher levels of risk-taking. Another practical implication is that achieving diversity on corporate boards may require changes to existing governance structures and practices. This could involve revising nomination and selection processes, enhancing training and development and making necessary adjustments.

Limitations and Directions for Future Research

There are several limitations in this study, as is common in empirical research in the social sciences. Firstly, the sample size is small, consisting only of NIFTY 200

companies, which may limit the generalizability of the findings. A larger sample size would increase the robustness of the results. Additionally, the study only considers two attributes of board diversity, namely education and experience, while there are many other factors that can influence board diversity such as gender, race, ethnicity, culture, and cognitive diversity would provide a more comprehensive understanding.

Furthermore, there are other factors that have received less attention in the literature, such as intellectual capital, capital structure, audit fees, corporate social responsibility (CSR), firm reputation, earnings management, coalitions, remuneration of directors, and the impact of diversity on environmental or social performance and innovation. Considering these factors could provide a more comprehensive analysis of the relationship between board diversity and firm performance.

In future research, it would be valuable to investigate the mediating and moderating factors such as CEO-duality, board independence, free-cash flows (Ozdemir et al., 2022), innovation, reputation, ownership structure, family ownership, CEO traits, agency costs, group affiliation, corporate tax aggressiveness, corporate ethics, and corporate social responsibility (CSR) that play a critical role in understanding such relationship for Indian firms.

The study's limitations include the lack of data on additional forms of diversity, such as international diversity, and the potential to broaden the definition of board demographic diversity (gender, race, ethnicity, culture, and age). Future research could address this by incorporating a more comprehensive set of diversity variables in the context of India or other countries with sufficiently large populations. Furthermore, most studies on board diversity tend to generalize their findings across industries, which may not be reliable given the existence of different industry characteristics. Therefore, there is a need for industry-specific studies to provide a more precise understanding of the effects of board diversity within specific sectors.

Conclusion

The study investigates the relationship between board diversity, firm risk-taking, and firm performance in Indian firms using Panel Regression (fixed-effects) and

Dynamic Panel Regression. After controlling for various firm and governance variables, the findings reveal that board education diversity has a significant positive influence on firm risk-taking ability, while board experience diversity does not show any significant link. In terms of firm performance, board education diversity and board experience diversity both have a significant negative impact on stock-based measures of firm performance, but no significant relationship is found in the case of accounting-based measures. This research is unique in its examination of the impact of education and experience attributes of the board and considers various board-level characteristics in relation to firm risk-taking and firm performance.

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