Article

Impact of Firm Performance on Board Characteristics: Empirical Evidence from India

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Akshita Arora[1]
Chandan Sharma[2]

Abstract

This study attempts to examine the impact of prior and current firm performance on board composition as it is the least explored issue in the corporate governance area. For this purpose, our analysis covers a large sample of the Indian manufacturing firms for the period 2001–2010. We utilize a range of measures of firm performance such as return on assets, return on equity, net profit margin, adjusted Tobin's *q* and stock returns in the analysis. We also use a range of alternative measures of board characteristics like board size, independence and meetings in the estimation process. The results of the study show that firm performance has a negative impact on board characteristics. Findings of the study also indicate that the larger board, outside membership and more meetings are considered as expensive affairs in the firm. Our findings in this study are expected to generate further debate on the related issue and sensitize the scholars to reason further research in this area especially in context of developing countries.

Keywords

Corporate governance, firm performance, panel data, manufacturing industry

Introduction

During the last two decades, there has been a continuous debate on the importance of corporate governance in emerging and developed economies. The present globalized business environment and increased competitive pressure have changed the corporate management scenario in the emerging economies. Academicians and policy makers are increasingly grappling with the issue of corporate governance as they seek to reform the governance laws in their country. The success of corporate governance is based on complete transparency and integrity between owners and management. The conflicting objectives of managers and shareholders have given rise to many theories and models in this area. In corporate governance studies, the most recognized theoretical perspective is the agency theory (Dalton, Daily, Ellstrand & Johnson, 1998; Shleifer & Vishny, 1997) that was first discussed by Berle and Means (1932).

The agency problem arises in firms in which managers appointed to work in the best interests of the principals; use their power to expropriate shareholders' wealth by investing in projects that actually benefit the managers rather than shareholders. In order to better align agent's to principal's interest, earlier agency theory supporters (Demsetz & Lehn, 1985; Fama & Jensen, 1983; Jensen & Meckling, 1976) suggested that firms should have a governance system, which involves the appointment of an effective and efficient board of directors (henceforth board). It led to the emergence of board of directors, which ensures that managers discharge their duties in the best interest of shareholders. Another relevant theory is the stakeholder theory, which suggests that a corporate seeks to provide a balance between the interests of its diverse

[1] Assistant Professor, Banasthali Vidyapith, Rajasthan, India.
[2] Assistant Professor, Indian Institute of Management, Lucknow, India.

Corresponding author:
Chandan Sharma, Indian Institute of Management Lucknow, Noida Campus, Sector-62, Noida (UP). India.
E-mail: csharma@iiml.ac.in

stakeholders (Abrams, 1951). The theory argues for the presence of many parties with competing interests in the operations of the firm and emphasizes the role of non-market mechanisms such as board size, committee structure as relevant for firms' performance (see Dalton et al., 1998; Shleifer & Vishny, 1997).

In the case of India, the major corporate scandals and frauds, such as the Satyam Computers scandal, have given an impetus to the issue of corporate governance. Particularly, the issue of linkage between corporate governance and firm performance has become the much talked-about subject for both academicians and corporate executives. In this context, our study focuses on the effects of firm performance on board characteristics. There is a substantial body of literature, which examined the impact of corporate governance on firm performance (Bhagat & Bolton, 2008; Brown & Caylor, 2006; Dalton, Daily, Ellstrand & Johnson, 1999; Hermalin & Weisbach, 1991; Judge, Naoumova & Koutzevol, 2003; Prevost, Rao & Hossain, 2002). Some studies claim that better corporate governance enhances firm performance (Brickley, Coles & Terry, 1994; Brickley & James, 1987; Byrd & Hickman, 1992; Chung, Wright & Kedia, 2003; Hossain, Cahan & Adams, 2000; Lee, Rosenstein, Rangan & Davidson, 1992; Rosenstein & Wyatt, 1990; Weisbach, 1988). Studies using an aggregate score of governance found relationship between corporate governance and shareholder returns (Gompers, Ishii & Metrick, 2003; Bauer, Guenster & Otten, 2004). This concurred with the views of Jensen and Meckling (1976) that better governed firms might have more efficient operations, resulting in higher expected returns. Further, Daily and Dalton (1994) have shown that the likelihood of bankruptcy is related to poor corporate governance characteristics.

The effect of corporate governance on firm performance is the focus of extensive analysis in majority of the previous studies. However, with a few exceptions, the reverse linkage, that is, the impact of firm performance on board characteristics is mostly ignored in the empirical literature. Moreover, studies of Hermalin and Weisbach (2003), Dwivedi and Jain (2005), Garg (2007), Bhagat and Bolton (2008) and Jackling and Johl (2009) have shown that the relationship between board composition and firm performance is endogenous in nature. It implies that it is not only board characteristics influencing the performance of the firm but the reverse relationship is also true. Similarly, Hermalin and Weisbach (1998) found that poor performance of a firm can result in the replacement of inside directors with the outside directors. Consequently, the constantly poor-performing firm would have higher than average proportion of outside directors on the board. If such firms are a part of our sample, then there could be issues of presence of the endogeneity problem in the analysis. However, earlier researchers restricted themselves to focusing on the impact of board characteristics on firm performance. It is also required to examine the causal relationship between board characteristics and firm performance. Therefore, in this study, we focus on the impact of firm performance on board characteristics.

The studies providing empirical evidence on this issue are very scarce. Only a few studies have tested the impact of firm performance on board characteristics. For instance, Valenti, Luce and Mayfield (2011) conducted the empirical analysis for a data-set of 90 companies listed on National Association of Securities Dealers Automated Quotations (NASDAQ). They have investigated the effects of prior performance of firms on their board composition and governance structure. The study used both accounting measures (return on assets and return on equity) and market measures (return to shareholders and P/E ratio) as the firm performance indicators. They provided evidence that the performance effects on board composition are more dramatic when there is a downward change in the firm performance. The prior negative change in firm performance was found to be significantly related to a decrease in the overall number of directors and a decrease in the number of outside directors. One of the limitations pointed out by the authors themselves in the study is small sample size focusing only on small to medium-sized firms; therefore, the results might not apply to larger firms.

Garg (2007) analyzed the impact of firm performance on board size and independence for a sample of 164 Indian companies. To estimate this relationship, regressions were run with board size and independence as dependent variables and different performance measures like return on assets and Tobin's q as the explanatory variables. He also estimated the coefficients with lag values of performance measures as explanatory variables to see whether a bad performance of the previous year has led to a change in the board size and independence in the following year. His estimates indicate that firm performance had inversely influenced the board size and independence. This supports the argument of Hermalin and Weisbach (1988) that firm performance can alter the composition of the board. The studies did not make it clear whether a bad performance would increase or decrease the board size. The negative impact of firm performance on board independence was also somewhat supported by Hermalin and Weisbach (1988). However, these findings contradict with that of Agrawal and Knoeber (1996), which found that firms tend to increase independent directors in the board under adverse circumstances due to the pressure from the stakeholders. It is based on the belief that adding more independent directors will bring in diverse opinions and

new expertise for better decision making. Similarly, the problematic independent directors are weeded out at the times of good performance.

The issue of corporate governance and firm performance is mainly explored in developed economies (Barnhart, Marr & Rosenstein, 1994; Bauer et al., 2004; Bhagat & Bolton, 2008; Christopher, 2004; Gompers et al., 2003; Guest, 2008; Hermalin & Weisbach, 1991; Judge et al., 2003; Kang & Shivdasani, 1995). Empirical work on this issue is still at its infancy in developing countries like India, maybe due to the relatively opaque disclosure practices followed by Indian companies or data unavailability problem. Moreover, most of the previous studies were based on small samples with limited number of observations.

Against this backdrop, in this study, we examine the impact of prior and current firm performance on board characteristics for a representative sample of Indian manufacturing firms for a period of 10 years, that is, 2001–2010. For estimation purposes, we use board characteristics, that is, board size and independence and also add board meetings to it. We use five alternate measures for firm performance, that is, return on assets (henceforth ROA), return on equity (henceforth ROE), net profit margin (henceforth NPM), adjusted Tobin's *q* (henceforth TQ) and stock returns (henceforth SR). The lag values of performance measures are also used as explanatory variables to estimate the impact of prior firm performance on board composition.

The primary contribution of our study is that it examines the impact of current and prior firm performance on board characteristics for which existing literature is limited, especially in the Indian context. Second, the article contributes to the literature by providing a comprehensive analysis (in terms of sample size and time frame) of the relationship between board characteristics and firm performance. Our empirical analysis focuses on a large number of companies (around 2,000 firms) covering 20 important industries of the manufacturing sector. Third, instead of considering just a single measure of firm performance, we consider five alternate measures of performance covering both accounting (ROA, ROE, NPM) and market-based (adjusted Tobin's *q* and stock returns) measures. Fourth, we use more econometrically advanced techniques like Poisson and Pooled regression which have not been previously used in such studies. Finally, this study also proposes another governance measure; board meeting which is also related to firm performance.

The rest of this article is organized as follows. The second section discusses the sample selection, data sources and board characteristics. In the third section, we discuss the variables, empirical model specification and construct the hypotheses. The fourth section presents the empirical results of the impact of firm performance on board characteristics and discussion thereof. The final section concludes the study.

Data and Stylized Facts

This section discusses the data sources and sample selection for our empirical analysis. This section also highlights some stylized facts related to the changing patterns in board characteristics of the sample firms during the sample period.

Data and Sample

The data for empirical analysis is extracted from PROWESS[1] (Release 4.0), a research database widely used in India; and from the corporate governance and annual reports of companies. The firms in our sample are chosen from 20 important industries of the manufacturing sector, namely, food and beverages, textiles (cotton and synthetic), chemicals (drugs and pharmaceuticals, inorganic and organic chemicals, cosmetics, polymer, petroleum, plastic, rubber, tyres and tubes), machinery (electrical, non-electrical and electronics machinery), non-metallic mineral products, metal products, transport, leather and paper sector. The firm classification of these 20 sectors is given in Table 1. The total manufacturing firms listed under Bombay Stock Exchange in these 20 sectors are 2,431 firms. The firms with missing data are excluded from the sample and we are left with the final sample size of 1922 firms. This study covers the time period 2001–2010. We have taken 2001 as the beginning year as the corporate governance code was made mandatory for Indian listed firms following the Kumar Mangalam Birla Committee[2] in the same year.

For the estimation purposes, we use ROA, ROE, NPM, TQ and SR as the firm performance measures. We consider board characteristics like size, independence and annual meetings as the dependent variables in the analysis. The calculation of these variables has been shown in detail in Table 2.

Board Characteristics: Some Stylized Facts

Before performing the main analysis, we attempt to comprehend the changing patterns in board characteristics over the sample period, 2001–2010. Towards this end, we have divided the entire sample period into three parts:

Table 1. Firm Classification by Sectors

Industry	Number of Firms	Percentage of Firms
Drugs and pharmaceuticals	166	8.63
Food and beverages	263	13.68
Electrical machinery	117	6.08
Non-electrical machinery	117	6.08
Electronics machinery	91	4.73
Cotton textiles	157	8.16
Synthetic textiles	43	2.23
Metal and metals products	261	13.57
Non-metallic mineral products	167	8.68
Organic chemicals	56	2.91
Inorganic chemicals	29	1.50
Cosmetics	19	0.98
Polymer	24	1.24
Petroleum	18	0.93
Plastic	141	7.33
Rubber	18	0.93
Tyres and tubes	17	0.88
Transport	125	6.50
Leather	24	1.24
Paper	69	3.59
Total	**1,922**	**100.00**

Source: PROWESS

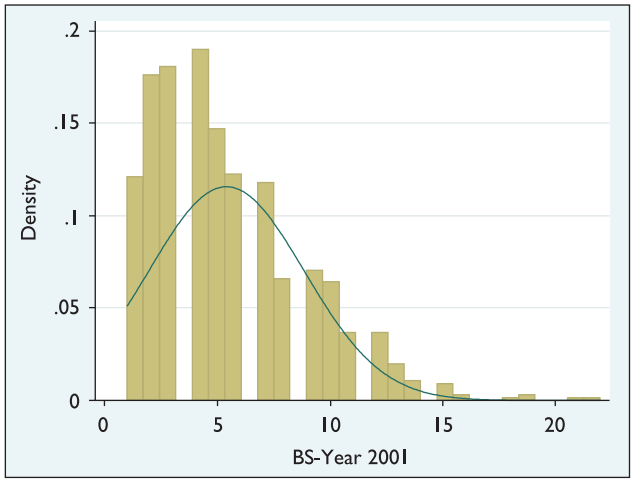
the beginning point, that is, 2001, the midpoint, 2005, and the endpoint, 2010. We have considered only three years as representative of beginning, mid and end periods and have not considered all years here, mainly to conserve the space. Nevertheless, it is expected that the considered points will effectively show the changing pattern of the Indian boards in India. We plot board size, independence and meetings at these three particular points to show the changing trends in the board characteristics over the period. Figure 1 shows the board characteristics in the beginning year of the sample; 2001, while Figure 2 shows the board characteristics in mid-year of sample, 2005. Finally, Figure 3 shows the board characteristics in the end-year, 2010. The board size is shown in part (a), the proportion of independent directors is shown in part (b) and board meetings are depicted in part (c) of these figures.

Figure 1 exhibits the distribution of board size, independence and meetings in the year 2001. It can be seen from Figure 1(a) that on an average, the board size of the Indian firms is four to five in 2001. Further, Figure 1(b) shows that most of the firms had no outside[3] director in their firms in 2001. A closer observation at the data also shows that many companies had no outside directors till the end of the years 2002 and 2003. This was the scenario even after the mandatory guidelines of having at least 50 per cent independent directors of Kumar Mangalam Committee.

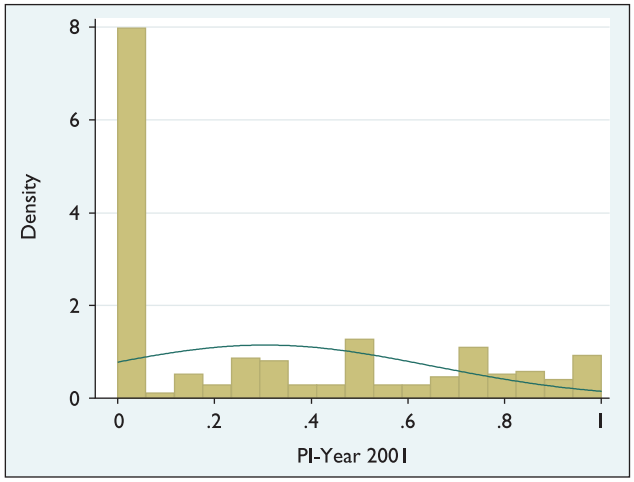
Table 2. Description of Variables

S. No.	Variable(s)	Full Form	Definition
Panel A: Corporate Governance Measures			
1.	BS	Board size	Number of directors serving on board
2.	BI	Board independence	Number of non-executive independent directors on board
3.	BM	Board meetings	Number of annual meetings
Panel B: Firm Performance Variables			
4.	ROA	Return on assets	PBDIT/Total Assets
5.	ROE	Return on equity	PBDIT/Paid–up Equity Capital + Reserves and funds
6.	NPM	Net profit margin	PBDIT/Net Sales
7.	TQ	Adjusted Tobin's *q*	(Total Assets + Market Capitalization – Book value of equity – Deferred tax liability)/Total Assets *where, Book value of equity is Paid–up Equity Capital + Reserves and funds*
8.	SR	Stock returns	Same as in PROWESS (Total Returns)
9.	$Perf_{t-1}$	Lag of firm performance	Firm Performance of the year $t - 1$
Panel C: Control Variables			
10.	Age	Firm age	Present year – Incorporation year
11.	Lev	Lever age	Borrowings/Total Assets
12.	Size	Natural log of sales	Sales is deflated using Wholesale Price Index, then natural log is taken
13.	Adv*Int*	Advertising intensity	Natural log of (Advertising Expenses/Sales)
14.	Dist*Int*	Distribution intensity	Natural log of (Distribution Expenses/Sales)
15.	Mkt*Int*	Marketing intensity	Natural log of (Marketing Expenses/Sales)
16.	RD*int*	Research and development intensity	Natural log of (Research and Development Expenses/Sales)

Source: PROWESS



(a)



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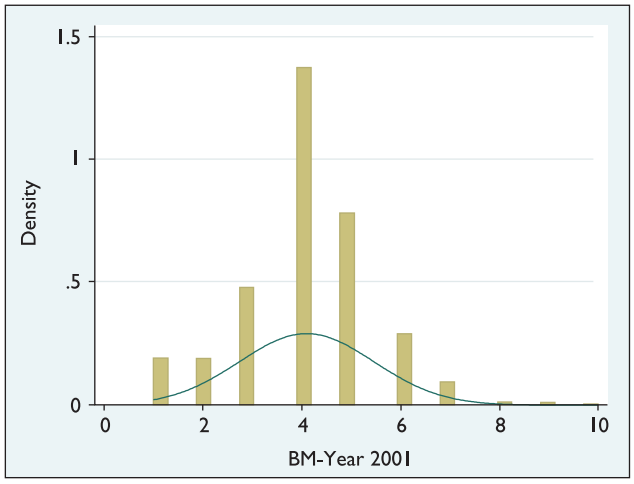


(c)

Figure 1. (a) Trends of the size of board at the end of the year 2001. (b) Trends of the outsiders' proportion at the end of the year 2001. (c) Trends of board meetings at the end of the year 2001

Source: Authors' own computation.

Note: BS refers to board size, PI stands for proportion of independent directors and BM stands for board meetings.

This shows that compliance with the guidelines or listing agreements left a lot of scope for improvement. The boards of Indian firms used to conduct 4 or 5 meetings, on an average, in the year 2001 (as shown in Figure 1(c)).

Figure 2 exhibits the distribution of board characteristics in the year 2005. More strict regulations were adopted in 2005 and companies were even threatened with delisting if they did not add independent directors to its board to meet the minimum stipulated norms. As a result, there was a remarkable increase in the proportion of outside directors of the companies. For most of the companies, this proportion was increased to 50 per cent and for some companies; it even reached up to 80 per cent. The independent directors were being added to the board under pressure from the stakeholders on the grounds of bringing in expert and diverse opinion so as to improve decision-making process. The average board membership also increased to seven or eight members along with the increase in the number of outside directors in the board. However, the annual number of meetings conducted by firms remained four to five for the year 2005.

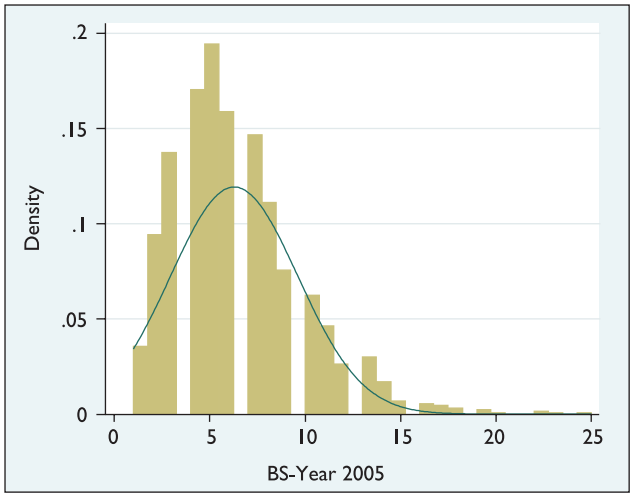
Figure 3 exhibits the distribution of board characteristics, that is, size, independence and meetings in 2010. Almost all the firms complied with the requirements of having at least 50 per cent outside directors by the end of 2010. But, this addition in the number of outside directors did not reflect in the reduction of directors in some other categories. As a result, both the board size and proportion of outside directors increased as can be seen in Figure 3(a) and (b). The average number of board meetings conducted is four or five meetings annually throughout the sample period.

Research Design and Methodology

This section provides discussion about dependent, explanatory and control variables and the expected relationship of each variable with firm performance.

Variables Construction

The board characteristics that we consider in our study include board size, independence and meetings. For firm performance measures, we use both accounting- and market-based measures, which include ROA, ROE, NPM, TQ and SR. The market firm performance measure, TQ is calculated similar to that of Gompers et al. (2003). The calculation of these variables is shown in detail in panels A and B of Table 2.



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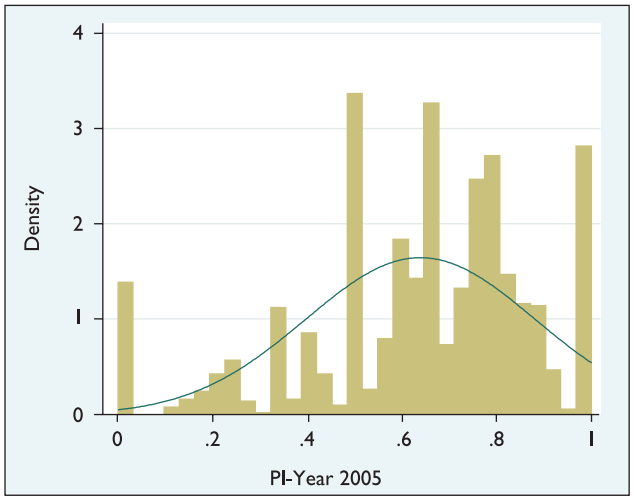

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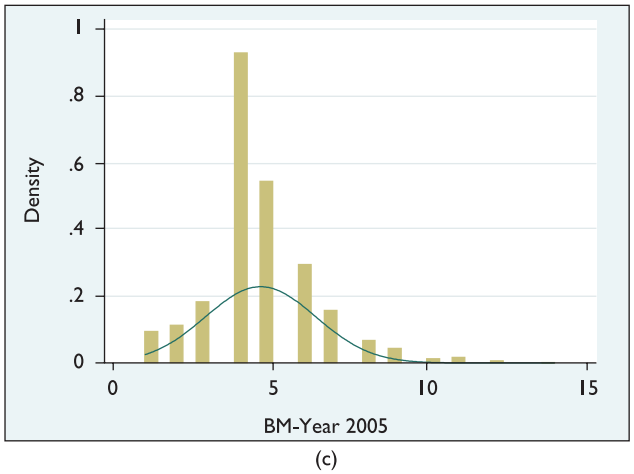
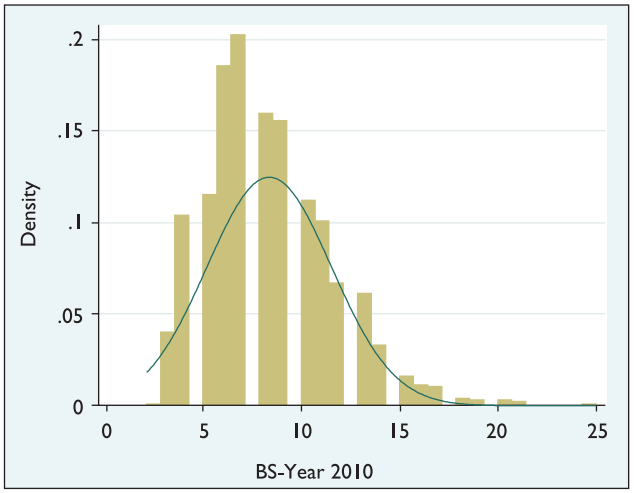


(c)

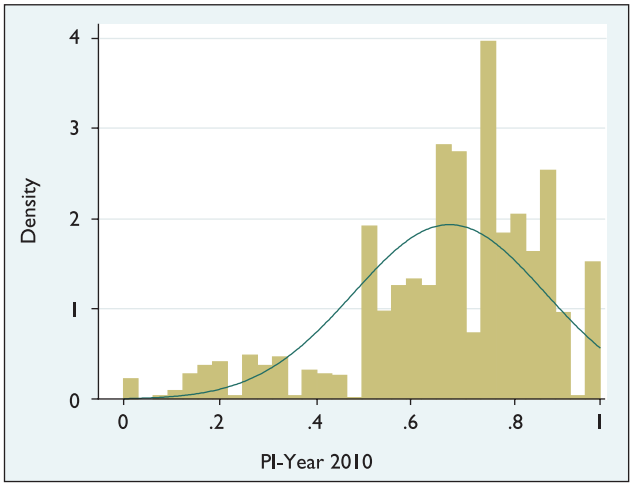
Figure 2. (a) Trends of the size of board at the end of the year 2005. (b) Trends of the outsiders' proportion at the end of the year 2005. (c) Trends of board meetings at the end of the year 2005

Source: Authors' own computation.

Note: BS refers to board size, PI stands for proportion of independent directors and BM stands for board meetings.



(a)



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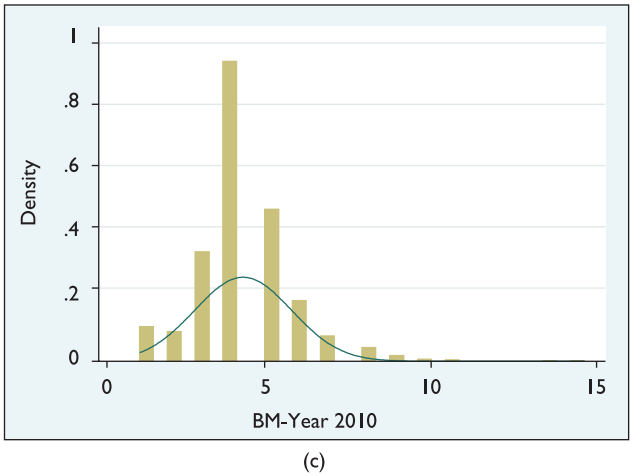

(c)

Figure 3. (a) Trends of the Size of Board at the end of the year 2010. (b) Trends of the outsiders' proportion at the end of the year 2010. (c) Trends of board meetings at the end of the year 2010 =

Source: Authors' own computation.

Note: BS refers to board size, PI stands for proportion of independent directors and BM stands for board meetings.

We also utilize some important firm-specific characteristics, which include firm size measured using the natural log of sales (size), leverage measured as the ratio of total debt to assets (lev), firm age measured number of years from the date of incorporation of the firm (age), institutional ownership measured by the percentage of shares held by institutions divided by the total number of shares with the company (IO), firm growth opportunities proxied by the natural log of advertising expenditure to total sales; (Adv*Int*) and research and development expenditure to total sales; (RD*int*), marketing expenditure to total sales; (Mkt*Int*) and distribution expenditure to total sales; (Dist*Int*). For calculations of these variables; see panel C of Table 2.

Hypotheses Development

The corporate governance literature is highly contradictory on how board size is linked with corporate performance (Garg, 2007). According to Shivdasani (2004), board composition of a firm is affected by the fall in financial performance because companies react to performance downturns by adding outside directors to the board for corrective actions and effective decision making. Valenti et al. (2011) pointed out that when there is some dispute regarding the effect of board size on performance in general (Alexander, Fennell & Halpern, 1993; Yermack, 1996), the evidence suggests that larger boards are preferable for smaller firms (Dalton et al., 1999). An alternative view suggests that if the performance of a firm declines, board membership will also decrease. Also, the firms having relatively better financial performance are in a better position to recruit outside directors. In case of declining firm performance, the number of outside directors is likely to fall as they are costlier for the firm because of their hefty fees and commissions (Yermack, 1996). In the previous literature, both smaller boards and larger boards have been favoured on different grounds. For instance, larger boards have been favoured on the grounds of greater monitoring and effective decision making (Adams & Mehran, 2003; Anderson & Reeb, 2003; Coles, Daniel & Naveen, 2008; Klein, 1998; Pfeffer, 1972). On the other hand, studies like Lipton and Lorsch (1992) supported small boards, suggesting that as board increases in size, free riding increases and efficiency of the board is reduced.

In addition, Pearce and Zahra's (1992) data showed that past poor performance is positively associated with smaller boards and fewer insiders. Further, the results of D'Aveni (1990) indicated that prominent managers may leave a firm shortly before bankruptcy in order to avoid damage to their career. The related research also suggests that outside directors seek to protect their reputation (Fama & Jensen, 1983); and they can accomplish this by identifying themselves with successful firms and avoid associations with firms that could harm their reputations. Valenti et al. (2011) proposed that when firms face the problem of potential loss of power due to continuous addition of outside directors or there is a threat of being fired due to poor firm performance, then, new appointments to the board of directors are minimized. Our study measures board size by the number of directors serving on boards. Against this backdrop, we intend to test the following hypothesis:

Hypothesis 1: Firm performance has a positive impact on board size.

Further, the inclusion of independent directors on corporate boards is an effective mechanism to reduce the potential divergence between management and shareholders. The independent directors are invited onto the board for oversight on behalf of shareholders (Baysinger & Butler, 1985). Rosenstein and Wyatt (1990) also suggested that higher proportion of independent directors is positively associated with excess returns. Similarly, Mak and Kusnadi (2005) revealed that a higher fraction of independent directors on the board is linked to greater firm value. Board independence is measured by the number of non-executive independent directors working on the board. Thus, to test the related issue, we examine the following hypothesis:

Hypothesis 2: Firm performance has a positive impact on board independence.

Next, we estimated the impact of firm performance on board meetings, which is measured by the frequency of meetings annually. According to Vafeas (1999), board meeting is an important board attribute; but the relationship between firm performance and board meetings is not clearly established. There are several costs associated with board meetings such as managerial time, travel expenses and directors' remuneration. If a firm is not performing well, it might be possible that it may reduce the number of board meetings to avoid the costs associated with them. Jensen (1993) also pointed out that the meeting time might not be utilized for a significant dialogue among directors. Hence, the company might try to save upon the meeting costs by reducing the number of board meets. On the contrary, it is also likely that for a relatively poor performing firms to conduct more meetings to discuss crucial issues like the reasons for their poor performance and setting strategies for improvement in performance.

When directors meet frequently, they are more prone to discuss the concerned issues and monitor the management effectively, thereby performing their duties with better coordination (Lipton & Lorsch, 1992). If a firm is reasonably efficient in setting the frequency of its board meetings, it will also likely to attain high efficiency in agency costs. Thus, the impact of firm performance on board meetings is a valid research question which should be examined empirically by following hypothesis.

Hypothesis 3: Firm performance has a negative impact on the frequency of annual board meetings.

Empirical Model and Estimation Techniques

To test the hypotheses 1–3, we adopt following empirical model:

$$\begin{aligned} X_{it} = {} & \beta_0 + \beta_1 * \mathrm{FP}_{it} + \beta_2 * \mathrm{FP}_{it-1} \\ & + \beta_3 * \mathrm{Age}_{it} + \beta_4 * \mathrm{Size}_{it} + \beta_5 * \mathrm{Lev}_{it} + \beta_6 \\ & * \mathrm{Adv}Int_{it} + \beta_7 * \mathrm{Mkt}Int_{it} + \beta_8 * \mathrm{Dist}Int_{it} \\ & + \beta_9 * \mathrm{RD}int_{it} + \varepsilon_{it} \end{aligned} \tag{1}$$

where, X_{it} is a vector of board characteristics, namely, board size, independence and meetings for firm *i* at time *t*. FP_{it} measures firm's performance indicators, that is, ROA, ROE, NPM, TQ and SR for firm *i* at time period *t*. FP_{it-1} measures lag of firm's performance indicators, that is, ROA, ROE, NPM, TQ and SR for firm *i* at time period $t - 1$. Age_{it}, Size_{it}, Lev_{it}, $\mathrm{Adv}Int_{it}$, $\mathrm{Mkt}int_{it}$, $\mathrm{Dist}int_{it}$ and $\mathrm{RD}int_{it}$ are used as control variables for firm age, size, leverage, advertising, marketing, distribution and research and development expenditure, respectively. βs are coefficients to be estimated. *i* is 1 to 1,922 firms, *t* is 2001 to 2010 and ε is the error term.

For estimating the impact of current and prior firm performance on board characteristics, more advanced econometric methods are used as our dependent variables (i.e., board characteristics, namely, size, outside directors and meetings) are count data variables with discrete and skewed distribution. Therefore, application of OLS estimator is not suitable as the relationship among variables is non-linear and model faces serious heteroskedasticity problem in the analysis (see Maddala, 1992, p. 382). For these reasons, we use panel and pooled Poisson regression methods with robust standard error for estimation purposes. The marginal effects and elasticity are also calculated for the pooled Poisson regression model. The marginal effects have the ability to study differences at different quartiles and elasticity gives directly comparable results.

Poisson Regression Model

The natural stochastic model for counts is a Poisson point process for the occurrence of the event of interest. This implies a Poisson distribution for the number of occurrences of the event, with density:

$$\Pr[Y = y] = \frac{e^{-\mu}\mu^{y}}{y!}, \qquad y = 0, 1, 2 \tag{2}$$

where μ is the intensity or rate parameter. The first two moments are:

$$\begin{aligned} \mathrm{E}[\mathrm{Y}] &= \mu \\ \mathrm{V}[\mathrm{Y}] &= \mu \end{aligned} \tag{3}$$

This shows the well-known equality of mean and variance property of the Poisson distribution. By introducing the observation subscript *id* to both *y* and μ, the framework is extended to non-*id* data. The Poisson regression model is derived from the Poisson distribution by parameterizing the relation between the mean parameter μ and covariates (repressors) *x*. The standard assumption is to use the exponential mean parameterization:

$$\mu_i = \exp(x_i'\beta), \qquad i = 1, \ldots, n \tag{4}$$

where, by assumption there are *k* linearly independent covariates, usually including a constant. Because $\mathrm{V}[y_i/x_i] = \exp(x'_i\beta)$, by (3) and (4), the Poisson regression is intrinsically heteroskedastic.

Given (3) and (4) and the assumption that the observations (y_i/x_i) are independent, the most natural estimator is maximum likelihood (ML). The Poisson regression model with exponential conditional mean and multiplicative individual-specific term:

$$y_{it}\,\mathrm{P}[\alpha_i \exp(x_{it}'\beta)], \qquad i = 1, \ldots, n, \quad t = 1, \ldots, T \tag{5}$$

where we consider a short panel with *T* small and $n \to \infty$. As in the linear case, both fixed effects and random effects models are possible.

The fixed effects model, lets α_i be an unknown parameter. This parameter can be eliminated by quasi-differencing and modelling the transformed random variable $y_{it} - (\lambda_{it}/\lambda_i)\,y_i$, where λ_i and y_i denote the individual-specific means of λ_{it} and y_{it}. By construction, this has zero mean, conditional on $\mathrm{x}_{i1}, \ldots, \mathrm{x}_{iT}$. A moments-based estimator of β then solves the sample moment condition $\sum_{i=1}^{n}\sum_{t=1}^{n} x_{it}\,(y_{it} - (\lambda_{it}/\lambda_i)\,\bar{y}_i) = 0$.

An alternative to the quasi-differencing approach is the conditional likelihood approach that was followed by Hausman, Hall and Griliches (1984). In this approach, the

fixed effects are eliminated by conditioning the distribution of counts on $\sum_{t=1}^{T} y_{it}$.

The random effects model, lets α_i be a random variable with specified distribution that depends on parameters, say δ. The random effects are integrated out to the unobserved heterogeneity and the parameters β and δ are estimated by maximum likelihood. In some cases, notably when α_i is gamma distributed, a closed form solution is obtained upon integrating out α_i. In other cases, such as normally distributed random effects, a closed form solution is not obtained, but ML estimation based on numerical integration is feasible.

The pooled Poisson regression with robust standard error gives more reliable results with suppressed standard error. Specify:

$$y_{it} \mid x_{it}, \beta \sim \text{Poisson}\,[exp(x'_{it}\beta)] \tag{6}$$

The pooled Poisson of y_{it} on intercept and x_{it} gives consistent β. It is noteworthy that obtaining a cluster of robust standard errors makes the results more reliable as in such cases there is a better control on over-dispersion, where the variance of the response variable is greater than the mean. Moreover, the default (a non-cluster-robust) *t*-statistics is 4 times as large as the *t*-statistics of a regression with a cluster of robust standard errors. The option to obtain robust standard errors for the parameter estimates is used as recommended by Cameron and Trivedi (2009) to control for mild violation of underlying assumptions.

Earlier research (Bhagat & Bolton, 2008; Hermalin & Weisbach, 2003) has highlighted endogenous relationship between board independence and firm performance. Endogeneity implies that causality runs both ways between firm performance and board composition. The procedure of Poisson pseudo-likelihood can also be employed to take care the potential endogeneity problem (see Windmeijer & Silva, 1997). Another method which could be useful here in the case of count dependent variables is the pooled regression with robust standard error. Considering the advantages of these estimation methods, we employ these estimators to analyze the empirical models. These models have previously been used in firm-level studies by Frome (1983), Wang, Puterman, Cockburn and Le (1996) and Zou (2004), but have not been used to understand corporate governance previously.

Estimation Results

The study utilizes the panel Poisson regression to examine the impact of firm performance on corporate governance measures and the results are reported in Tables 3 and 4. The results indicate that the impact of firm performance on board characteristics is not very strong.

Poisson Regression Results

The results of the empirical models reported in Table 3 perform very poorly. Nevertheless, regression results reported in Table 4 are somewhat encouraging. The results show that board independence of firms is negatively related to market performance measure, TQ, as the estimated coefficient is turned out to be −0.0004 and it is statistically significant at 5 per cent level (see column 9 of Table 4). This result is consistent with earlier Indian studies like Garg (2007). Furthermore, as expected the performance measure, SR has a positive influence on board size and the coefficient of SR is estimated to be 0.001 and it is statistical significant at 10 per cent level (column of 5 of the Table 4). This indicates that it has a positive association with board meetings implying that firms with higher stock returns have larger boards that meet more frequently. Also, the current and the prior year's ROE are negatively related to board size though the association is weak (see columns 2, 7 and 12 of Table 4). Importantly, our analysis failed to establish any relationship between other firm performance measures in the prior year and board characteristics as the coefficients are not found to be large enough at any level of significance.

The firm age and size are positively and significantly related with board characteristics, that is, size, meetings and independence (see Table 4). It implies that larger and older firms seem to have a larger board size as they need greater advice to monitor the management and they also conduct more annual meetings as compared to smaller and newer firms. The institutional shareholding seems to have negative impact on board characteristics implying that a change in board variables leads to decline in institutional ownership. Furthermore, the research and development intensity has a positive relationship with board size and meetings, that is, firms that undertake research and development activities, seem to have a better corporate governance structure. Overall, our findings indicate that the linkage between firm performance and corporate governance practices is weak. These results are somewhat in conformity with the findings of Valenti et al. (2011).[4]

Pooled Poisson Regression Results (Robust Standard Error)

Results regarding the impact of firm performance on corporate governance using pooled Poisson regression

Table 3. Impact of Firm Performance on Board Variables: Panel Poisson Regression for the Period 2001–2010

	A. Dependent Variable—BS					B. Dependent Variable—BI					C. Dependent Variable—BM				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Constant	1.915***	1.920***	1.924***	1.900***	1.976***	1.435***	1.435***	1.445***	1.420***	1.489***	1.483***	1.484***	1.489***	1.471***	1.510***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)	(0.011)	(0.011)	(0.010)	(0.011)	(0.011)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
ROA	0.006					0.005					0.006				
	(0.008)					(0.012)					(0.008)				
ROA_{t-1}	0.016					0.009					0.009				
	(0.008)					(0.010)					(0.008)				
ROE		−0.0004					−0.0002					−2E-05			
		(0.0003)					(0.0005)					(0.0003)			
ROE_{t-1}		−0.0002					−0.001					−7.5E-05			
		(0.0003)					(0.0005)					(0.0004)			
NPM			0.001					−0.0002					−0.0002		
			(0.001)					(0.001)					(0.001)		
NPM_{t-1}			0.0003					0.0003					0.0001		
			(0.001)					(0.001)					(0.001)		
TQ				6.22E-05					−4E-05					4.99E-05	
				(0.0001)					(0.0001)					(0.0001)	
TQ_{t-1}				−0.0001					0.0003					6.72E-05	
				(0.0002)					(0.0003)					(0.0002)	
SR					0.002***					0.0002					0.003***
					(0.001)					(0.001)					(0.001)
SR_{t-1}					0.001					0.0005					0.001***
					(0.001)					(0.001)					(0.001)
Obs.	13777	13022	13343	14704	9760	11307	10765	10961	11886	8217	13937	13093	13631	14363	10263

Source: Author's own analysis.

Notes: *, ** and *** indicate significance at 10, 5 and 1 per cent levels.
The figures in parentheses indicate standard error.

Table 4. Impact of Firm Performance on Board Variables (with Control Variables): Panel Poisson Regression for the Period 2001–2010

	A. Dependent Variable—BS					B. Dependent Variable—BI					C. Dependent Variable—BM				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Constant	1.242***	1.257***	1.225***	1.207***	1.307***	1.036***	1.039***	1.029***	1.014***	1.134***	1.267***	1.270***	1.250***	1.257***	1.331***
	(0.026)	(0.026)	(0.026)	(0.027)	(0.030)	(0.034)	(0.035)	(0.036)	(0.034)	(0.040)	(0.018)	(0.018)	(0.018)	(0.018)	(0.020)
ROA	−0.021					−0.011					−0.005				
	(0.016)					(0.019)					(0.014)				
ROA_{t-1}	0.002					−0.002					0.006				
	(0.012)					(0.015)					(0.012)				
ROE		−0.001*					−0.0002					−0.0004			
		(0.001)					(0.001)					(0.001)			
ROE_{t-1}		−0.001					−0.001					0.00003			
		(0.001)					(0.001)					(0.001)			
NPM			−0.001					−0.001					−0.001		
			(0.001)					(0.001)					(0.001)		
NPM_{t-1}			−0.001					−0.0004					−0.0004		
			(0.001)					(0.001)					(0.001)		
TQ				−0.0001					−0.0004**					−1.43E-05	
				(0.0002)					(0.0002)					(0.0002)	
TQ_{t-1}				0.0003					0.001*					−2.79E-06	
				(0.0004)					(0.0005)					(0.0003)	
SR					0.001*					−0.001					0.002***
					(0.001)					(0.001)					(0.001)
SR_{t-1}					0.0002					0.0001					0.001
					(0.001)					(0.001)					(0.001)
Size	0.084***	0.084***	0.085***	0.091***	0.087***	0.051***	0.052***	0.053***	0.053***	0.047***	0.036***	0.035***	0.037***	0.037***	0.029***
	(0.004)	(0.004)	90.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
IO	0.019	0.015	0.010	−0.017	0.018	0.016	−0.007	−0.006	0.016	−0.031	0.083*	0.085*	0.065	0.078*	0.148***
	(0.055)	(0.056)	(0.055)	(0.055)	(0.062)	(0.077)	(0.079)	(0.078)	(0.077)	(0.087)	(0.046)	(0.047)	(0.046)	(0.046)	(0.050)
Age	0.005***	0.005***	0.005***	0.005***	0.003***	0.003***	0.003***	0.003***	0.003***	0.002***	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Lev	−0.020***	−0.018**	−0.019***	−0.019**	−0.015	−0.014	−0.013	−0.014	−0.016	−0.007	−0.026***	−0.025***	−0.027***	−0.024***	−0.018**
	(0.008)	(0.008)	(0.008)	(0.008)	(0.010)	(0.011)	(0.011)	(0.011)	(0.010)	(0.013)	(0.007)	90.007)	(0.007)	(0.007)	(0.009)
Adv*Int*	0.007*	0.007*	0.007*	0.006	0.005	−0.001	−0.0005	−0.001	−0.001	−0.003	0.010***	0.012***	0.011***	0.011***	0.010***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Mkt*Int*	0.0003	−0.001	0.001	−0.001	−0.004	−0.003	−0.003	−0.003	−0.002	−0.009	0.001	−0.0001	0.0004	0.001	0.0001
	(0.005)	(0.006)	(0.005)	(0.006)	(0.006)	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Dist*Int*	−0.013***	−0.013***	−0.013***	−0.013***	−0.015***	−0.007*	−0.008*	−0.007*	−0.007*	−0.010**	0.004**	0.005***	0.004***	0.004**	0.003*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
RD*Int*	0.025***	0.025***	0.025***	0.024***	0.020***	0.018***	0.019***	0.017***	0.018***	0.010	0.003	0.003	0.003	0.003	−0.00002
	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.006)	(0.007)	(0.006)	(0.006)	(0.007)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)
Obs.	12,476	11,754	12,792	12,348	9,226	10,362	9,838	10,259	10,566	7,826	12,936	12,143	13,183	12,825	9,728

Source: Author's own analysis.

Notes: *, ** and *** indicate significance at 10, 5 and 1 per cent levels.
The figures in parentheses indicate standard error.

with robust standard error are reported in Tables 5, 6 and 7. The pooled Poisson regression results show that current year's accounting firm performance (ROA, ROE and NPM) is negatively related with board characteristics, although all coefficients are not turned out to be statistically significant (see Table 5). Overall, the linkage between board characteristics and prior firm performance is estimated to be very weak, regardless of the causality.

An important result obtained here is that the current and prior year's profitability ratio (NPM) has a negative impact on all the board variables, although the coefficients are not found to be statistical significant at the conventional level (see columns 3, 8 and 13 of Table 5). It perhaps indicates that larger board, outside membership and more frequent meetings are being seen as an expensive affair for the firm. The market performance measure, TQ has a negative relationship with board characteristics, namely, board size, independence and meetings. The other market performance measure, SR has a positive impact on board characteristics, though the coefficients are not estimated to be sizable. The results in column 5 of Table 5 show that if SR changes by 1 unit, board size changes by mere 0.002, which is not quite sizable.

The analysis of the marginal effects has the ability to study differences at different quantiles and elasticity gives directly comparable results. The coefficients obtained in Tables 5 and 6 are not directly comparable with each other but those obtained in Table 7 gives us directly comparable and more reliable results. The marginal effect coefficients give us the quantile change in explanatory variable if dependent variable changes by a unit.

The marginal effects coefficients in Table 6 show that when board size changes by a unit, accounting firm performance measure, ROA changes by a 0.172 unit, ROE changes by a 0.006 unit, and market firm performance measure, TQ by a 0.01 unit in the reverse direction, these results are reported in columns 1, 2 and 4 of the table, respectively. But a change in the number of directors has a positive impact on SR by 0.015. Further, results of column 9 of the table indicate that when the number of non-executive directors changes by a unit, TQ changes by a 0.001 unit in the reverse direction. The firm performance does not seem to have a significant impact on board meetings as shown by results of the pooled regression as well as the panel regression analyses.

The elasticity for the firm performance variables and control variables are reported in Table 7. The elasticity coefficient indicates that the percentage change in the explanatory variables with respect to a 1 per cent change in dependent variable. When the board size changes by 1 per cent, it has a negative impact on all the firm performance variables; for example, ROA changes by 0.003 per cent, ROE by 0.0003 per cent and SR by 0.002 per cent in the inverse direction (see columns 1, 2 and 5). The firm performance does not seem to have a significant impact on board meetings as shown by the pooled regression results that are consistent with the panel regression results. Moreover, when the number of non-executive directors changes, market performance measure, TQ changes in the inverse direction, although the coefficient is estimated to be small but statistically significant. In general, the impact of firm performance on board characteristics does not seem to be very sizable in the Indian context.

The empirical results also show that the firm size and age are positively and significantly related to board size and its independence. As a firm grows older and becomes larger in size, board membership is also likely to increase. The firm's age has a negative impact on board meetings; the reason might be that with increasing age, there are more matured and experienced directors requiring less time to take decisions. Furthermore, the debt–assets ratio has a negative association with the board variables. Finally, the firm's performance has a positive impact on the growth opportunities indicators, namely, advertising, marketing, distribution and research and distribution intensity, for a firm.

Overall, findings of our analysis, using alternative estimation techniques and specifications, show that the relationship between firm performance and board variables is not very strong in case of India and continues to follow the pattern established by Valenti et al. (2011). The results indicate that a larger board, outside membership and more annual meetings are being seen as an expensive affair for the firm. The firm age and size are positively related with board characteristics implying that larger and older firms have larger board size as they might seek advice from diversified board to monitor the management. Therefore, we conclude that our hypotheses are not true in the Indian case.

Conclusion

There is a substantial body of literature supporting the view that corporate governance and firm performance are inter-related, especially in companies where agency problems between shareholders and managers are most severe. This study has examined the impact of firm performance on the board characteristics and found a weak association between the two in the case of Indian firms. We also attempt to determine whether, current or prior firm performance has an impact on board characteristics like

Table 5. Impact of Firm Performance on Board Variables: Pooled Poisson Regression with Robust Standard Error for the Period 2001–2010

	A. Dependent Variable—BS					B. Dependent Variable—BI					C. Dependent Variable—BM				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Constant	1.306***	1.311***	1.283***	1.291***	1.358***	1.117***	1.116***	1.116***	1.096***	1.233***	1.272***	1.274***	1.263***	1.257***	1.332***
	(0.016)	(0.016)	(0.016)	(0.015)	(0.019)	(0.022)	(0.022)	(0.022)	(0.021)	(0.026)	(0.012)	(0.012)	(0.012)	(0.012)	(0.014)
ROA	−0.025*					−0.003					−0.006				
	(0.014)					(0.017)					(0.008)				
ROA_{t-1}	0.005					−0.001					0.006				
	(0.008)					(0.010)					(0.006)				
ROE		−0.001**					−3.9E-05					−0.0004			
		(0.000)					(0.001)					(0.0005)			
ROE_{t-1}		0.000					−0.001					0.00002			
		(0.000)					(0.001)					(0.0005)			
NPM			−0.002					−0.001					−0.001		
			(0.002)					(0.002)					(0.001)		
NPM_{t-1}			−0.001					0.000					−0.0004		
			(0.003)					(0.002)					(0.0005)		
TQ				−0.0002***					−0.0002***					−2.8E-05	
				(0.0000)					(0.0001)					(2.6E-05)	
TQ_{t-1}				0.0003***					0.001***					1.9E-05	
				(0.0001)					(0.0003)					(7.5E-05)	
SR					0.002***					3.6E-05					0.002***
					(0.001)					(0.001)					(0.001)
SR_{t-1}					0.001					0.0002					0.001
					(0.001)					(0.001)					(0.001)
Size	0.097***	0.096***	0.101***	0.098***	0.097***	0.051***	0.052***	0.051***	0.053***	0.042***	0.035***	0.035***	0.036**	0.037***	0.029***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
IO	−0.031	−0.056	−0.071*	−0.037	−0.044	−0.104*	−0.136**	−0.117**	−0.103*	−0.118*	0.083***	0.084***	0.078**	0.067**	0.149***
	(0.040)	(0.041)	(0.039)	(0.039)	(0.046)	(0.059)	(0.061)	(0.059)	(0.059)	(0.068)	(0.031)	0.032)	(0.032)	(0.032)	(0.035)
Age	0.001***	0.001***	0.001***	0.001***	0.0003	0.001***	0.001***	0.001***	0.001***	0.001**	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.0002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lev	−0.013**	−0.011*	−0.014**	−0.013**	0.0004	−0.016**	−0.017**	−0.015*	−0.017**	−0.010	−0.026***	−0.025***	−0.024***	−0.027***	−0.018***
	(0.005)	(0.006)	(0.007)	(0.006)	(0.006)	(0.008)	(0.008)	(0.008)	(0.007)	(0.009)	(0.006)	(0.006)	(0.005)	(0.005)	(0.006)
Adv*Int*	0.002	0.002	0.001	0.006**	−0.002	−0.0001	−0.002	−0.0001	0.0002	−0.004	0.010***	0.012***	0.011***	0.011***	0.010***
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)	(0.004)	(0.0002)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Mkt*Int*	−0.018***	−0.019***	−0.019***	−0.017***	−0.022***	−0.004	−0.003	−0.004	−0.003	−0.004	0.001	0.0001	0.001	0.001	0.0002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
Dist*Int*	−0.017***	−0.017***	−0.017***	−0.017***	−0.018***	−0.009***	−0.011***	−0.010***	−0.010***	−0.012***	0.004***	0.004***	0.004***	0.004***	0.003***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
RD*Int*	0.028***	0.026***	0.027***	0.028***	0.023***	0.018***	0.015***	0.017***	0.018***	0.012**	0.001	0.002	0.002	0.001	−0.0001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Obs.	12,476	11,754	12,348	12,792	9,226	10,362	9,838	10,259	10,566	7,826	12,936	12,143	12,825	13,183	9,728

Source: Author's own analysis.

Notes: *, ** and *** indicate significance at 10, 5 and 1 per cent levels.

The figures in parentheses indicate robust standard error.

Table 6. Marginal Effects of Firm Performance on Board Variables: Pooled Poisson Regression with Robust Standard Error for the Period 2001–2010

	A. Dependent Variable—BS					B. Dependent Variable—BI					C. Dependent Variable—BM				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
ROA	−0.172*					−0.015					−0.025				
	(0.096)					(0.075)					(0.036)				
ROA_{t-1}	−0.032					−0.006					0.025				
	(0.058)					(0.042)					(0.025)				
ROE		−0.006**					−0.0002					−0.002			
		(0.003)					(0.005)					(0.002)			
ROE_{t-1}		−0.002					−0.003					0.0001			
		(0.003)					(0.004)					(0.002)			
NPM			−0.017					−0.005					−0.004		
			(0.017)					(0.007)					(0.003)		
NPM_{t-1}			−0.008					0.0001					−0.002		
			(0.021)					(0.008)					(0.002)		
TQ				−0.001***					−0.001***					−0.0001	
				(0.0002)					(0.0002)					(0.0001)	
TQ_{t-1}				0.002***					0.003***					0.0001	
				(0.001)					(0.001)					(0.0003)	
SR					0.015***					0.0002					0.010***
					(0.006)					(0.005)					(0.003)
SR_{t-1}					0.004					0.001					0.003
					(0.005)					(0.005)					(0.002)
Size	0.674***	0.670***	0.705***	0.676***	0.718***	0.222***	0.225***	0.225***	0.230***	0.193***	0.157***	0.155***	0.163***	0.163***	0.134***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.021)	(0.014)	(0.015)	(0.015)	(0.014)	(0.018)	(0.007)	(0.008)	(0.008)	(0.008)	(0.009)
IO	−0.216	−0.388	−0.496*	−0.253	−0.327	−0.454*	−0.590**	−0.509**	−0.445**	−0.542*	0.373***	0.373***	0.351**	0.299**	0.682***
	(0.275)	(0.283)	(0.275)	(0.272)	(0.339)	(0.257)	(0.264)	(0.259)	(0.255)	(0.310)	(0.140)	(0.145)	(0.142)	(0.141)	(0.161)
Age	0.006***	0.006***	0.005***	0.006***	0.002	0.005***	0.005***	0.005***	0.005***	0.004**	−0.003***	−0.004***	−0.004***	−0.003***	−0.005***
	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Lev	−0.088**	−0.077*	−0.098**	−0.090**	0.003	−0.069**	−0.072**	−0.064*	−0.075**	−0.045	−0.114***	−0.110***	−0.106***	−0.119***	−0.084***
	(0.038)	(0.041)	(0.046)	(0.039)	(0.048)	(0.033)	(0.034)	(0.035)	(0.032)	(0.043)	(0.025)	(0.025)	(0.024)	(0.024)	(0.028)
Adv*Int*	0.011	0.012	0.010	0.011	−0.014	−0.0003	−0.007	−0.0003	0.001	−0.019	0.047***	0.054***	0.047***	0.047***	0.046***
	(0.017)	(0.017)	(0.017)	(0.017)	(0.020)	(0.015)	(0.016)	(0.015)	(0.015)	(0.018)	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)
Mkt*Int*	−0.124***	−0.129***	−0.132***	−0.119***	−0.159***	−0.015	−0.014	−0.017	−0.012	−0.017	0.005	0.0005	0.003	0.002	0.001
	(0.029)	(0.030)	(0.029)	(0.029)	(0.035)	(0.025)	(0.026)	(0.025)	(0.025)	(0.029)	(0.015)	(0.016)	(0.015)	(0.015)	(0.018)
Dist*Int*	−0.120***	−0.118***	−0.121***	−0.117***	−0.135***	−0.041***	−0.046***	−0.042***	−0.041***	−0.057***	0.018***	0.020***	0.018***	0.019***	0.016***
	(0.013)	(0.012)	(0.013)	(0.013)	(0.014)	(0.010)	(0.010)	(0.010)	(0.010)	(0.011)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)
RD*Int*	0.192***	0.183***	0.186***	0.191***	0.169***	0.077***	0.067***	0.076***	0.076***	0.056**	0.012	0.011	0.011	0.012	−0.0004
	(0.023)	(0.024)	(0.023)	(0.023)	(0.026)	(0.023)	(0.023)	(0.023)	(0.023)	(0.026)	(0.012)	(0.013)	(0.012)	(0.012)	(0.014)

Source: Author's own analysis.

Notes: *, ** and *** indicate significance at 10, 5 and 1 per cent levels.
The figures in parentheses indicate robust standard error.

Table 7. Elasticity of Firm Performance on Board Variables: Pooled Poisson Regression with Robust Standard Error for the Period 2001–2010

	A. Dependent Variable—BS					B. Dependent Variable—BI					C. Dependent Variable—BM				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
ROA	−0.003*					−0.0004					−0.001				
	(0.002)					(0.002)					(0.001)				
ROA_{t-1}	−0.001					−0.0002					0.001				
	(0.001)					(0.001)					(0.001)				
ROE		−0.0003**					−1.2E-05					−0.0001			
		(0.0001)					(0.0004)					(0.0002)			
ROE_{t-1}		−0.0001					−0.0002					0.00001			
		(0.0001)					(0.0003)					(0.0002)			
NPM			−7.4E-05					−6.2E-05					−6.18E-06		
			(0.00007)					(0.00008)					(0.000)		
NPM_{t-1}			−0.0001					1.70E-06					−3.2E-05		
			(0.0003)					(0.0002)					(0.00004)		
TQ				−1.8E-05***					1.95E-05***					−5.17E-06	
				(0.000)					(0.00001)					(0.000)	
TQ_{t-1}				0.0002***					0.0003**					1.09E-05	
				(0.00004)					(0.0001)					(0.00004)	
SR					0.002***					5.07E-05					0.002***
					(0.001)					(0.002)					(0.001)
SR_{t-1}					0.001					0.0003					0.001
					(0.001)					(0.001)					(0.001)
Size	0.642***	0.638	0.675***	0.645***	0.673***	0.344***	0.349***	0.349***	0.357***	0.296***	0.233***	0.231***	0.244	0.243***	0.203***
	(0.015)	(0.016)	(0.016)	(0.015)	(0.020)	(0.022)	(0.023)	(0.023)	(0.022)	(0.027)	(0.011)	(0.011)	(0.012)	(0.011)	(0.013)
IO	−0.002	−0.004	−0.005*	−0.003	−0.003	−0.007*	−0.010**	−0.008**	−0.007*	−0.009	0.006***	0.006***	0.006	0.005**	0.011***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Age	0.026***	0.024	0.023***	0.026***	0.009	0.032***	0.031***	0.031***	0.032***	0.023**	−0.022***	−0.023***	−0.023	−0.021***	−0.035***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)
Lev	−0.006**	−0.005	−0.006**	−0.006**	0.0002	−0.007**	−0.007**	−0.007**	−0.008**	−0.004	−0.011***	−0.011***	−0.011	−0.012***	−0.007***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
Adv*Int*	0.002	0.002	0.002	0.002**	−0.002	−0.0001	−0.002	−0.0001	0.0002	−0.005	0.012***	0.013***	0.012	0.012***	0.011***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Mkt*Int*	0.017***	−0.018	−0.019***	−0.017***	−0.021***	−0.003	−0.003	−0.004	−0.003	−0.004	0.001	0.0001	0.001	0.001	0.0002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Dist*Int*	0.022***	−0.022	−0.022***	−0.022***	−0.025***	-0.012***	−0.014***	−0.012***	−0.012***	−0.017***	0.005***	0.006***	0.005	0.006***	0.005***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
RD*Int*	0.012***	0.011	0.011***	0.011***	0.011***	0.008***	0.007***	0.008***	0.008***	0.006**	0.001	0.001	0.001	0.002	−0.00004
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)

Source: Author's own analysis.

Notes: *, ** and *** indicate significance at 10, 5 and 1 per cent levels.
The figures in parentheses indicate robust standard error.

size, independence and meetings. Alternate specifications and estimation techniques are used to check the robustness of estimation results.

Specifically, the impact of firm performance on board characteristics is estimated using Panel Poisson regression method. For robustness tests, we utilize the pooled Poisson regression with robust standard error. The marginal effects and elasticity of the effects are also estimated using the pooled Poisson regression model.

The findings of our study show that relationship between firm performance and board variables is not very strong and continues to follow the pattern established by Valenti et al. (2011). The results show that all current years' firm performance measures except stock returns have negative influence on board structure. The market performance measure, stock return, has a positive impact on board characteristics implying that higher stock returns lead to better governance structure. Findings of this study also indicate that a larger board, outside membership in the boards and more frequent meetings are expensive affairs for the firms. It seems that when a firm does not perform well, they add more independent directors to the board, expecting that they would improve the performance. This addition in outside directors is not accompanied by the removal of directors in any other category. Consequently, both board size and number of outside directors increase. The outside directors were continually added to the board under stakeholder's pressure during mid-2000s after Clause 49 of Listing Agreement made the inclusion of outside directors mandatory. The companies added outside directors in case of its non-performance but this actually added to further costs of the company. The results are in conformity with the prior studies like Garg (2007) and Valenti et al. (2011). These studies have overwhelmingly shown that the impact of firm performance on board characteristics is not very strong for Indian firms.

In this study, we attempt to examine the impact of firm performance on board characteristics as it is a less explored theme in corporate governance research. There are many factors which influence size of the board and outside membership in a firm but not all of them could be used in this study because of unavailability of data. Future researchers can work further on this issue by using a broader spectrum of variables like director remuneration, directors' shareholding which could have bearing on board characteristics like size and independence. It can also be augmented by using qualitative aspects of the board such as board decision-making process or director's perception on the role of board, presence of women directors on board etc. Our study falls short of measuring the impact of different sizes of board and different levels of board independence so as to measure the extent of impact of these on firm performance to arrive at increasing and decreasing trends thereof. We encourage future researchers to focus on these issues. Findings of this study are expected to generate further debate on the issue and sensitize scholars to reason further research in the area.

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Notes

1. The PROWESS database is maintained by CMIE and is broadly similar to Compustat database of US firms. It is increasingly being employed in the literature for firm-level analysis of Indian industry and contains financial information on around 27,000 companies, either listed on stock exchanges or the major unlisted companies.
2. Kumar Mangalam Birla Committee was set up by SEBI in the year 2000 to suggest suitable amendments to the listing agreement executed by stock exchanges with the companies and any other measures to improve the standards of corporate governance in the Indian listed companies.
3. In this study, the terms 'outside directors', 'independent directors' and 'non-executive directors' have been used interchangeably.
4. It is noteworthy that we have also employed Poisson pseudo-likelihood estimator for the analysis, and results are not significantly different from that of Poisson estimator. These results are not reported because of space constraint. However, they can be provided on request.

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