



Impact of Board Traits and Ownership form on Investment Efficiency: A study on Pakistan's Food Sector

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Abstract

The motive behind this study was to assess the link of board traits and ownership form with investment efficiency of corporations. Fourteen firms were selected from food sector and their annual data for the time period 2009 to 2018 was collected from the annual reports. Richardson (2006) model was used to measure investment efficiency. Moreover, fixed effects panel data regression was employed to analyze data. Results indicate that investment efficiency improves with large board size, high proportion of managerial ownership, low proportion of block holder ownership and high proportion of institutional ownership. Overall results suggest that board traits and ownership form influences investment efficiency. This study is unique as it investigated the link of board traits and ownership form with investment efficiency in respect of Pakistan's food sector firms. Results of this paper are valuable for investors as they desire to own firms that make efficient investment decisions. Thus, investors can ascertain the level of investment efficiency of corporations by considering the findings documented in this paper. This study focused on only food sector of Pakistan, so the link of board traits and ownership form with investment efficiency can be investigated for other financial and non-financial sectors of Pakistan in future.

Keywords: *Ownership form, board characteristics, investment efficiency, corporate governance, Pakistan.*

Introduction

One of the primary responsibilities of firm's management is to make investment decisions. These decisions are critical as they affect firm's profitability, cash flows and growth prospects

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(Liu et al., 2015; Lai and Liu, 2018). Consistent with the goal of firm, managers are expected to make such investment decisions that maximize firm value. However, it is often observed that these managerial decisions actually result in reduction of firm value. Prior studies recognized difference in the goals of agents and principals as well as imbalance in the level of information possessed by these parties as the reasons for sub-optimal investment decisions, which further causes decline in corporate value (Jensen and Meckling, 1976; Myers and Majluf, 1984). Difference in the goals arises due to segregation of management and ownership, which enables managers to make unfair use of their managerial discretion so as to maximize their personal benefits. This self-maximizing behavior of managers results in overinvestment (Jensen, 1986). This behavior induces managers to undertake even those investments that are not good for the owners.

Information asymmetry is the situation whereby firms' managers hold more information than outside capital providers. Unlike managers, capital providers do not possess accurate information regarding the projected profitability of corporate's investment decisions. Moreover, it is tough for capital providers to precisely evaluate the profitability of firm's investment decisions by merely observing them. This information asymmetry creates uncertainty among outside capital providers regarding the future prospects of firm's investments. As a result of this uncertainty, cost of capital increases that restricts firm's borrowing ability in turn. Firms leave several investment opportunities due to this financial constraint, which results in underinvestment (Myers and Majluf, 1984).

Both overinvestment and underinvestment represent investment inefficiency, which threatens the long term existence of firms (Liu et al., 2015). Therefore, a number of researchers studied the factors that affect investment efficiency. Firms' investment efficiency level improves with higher quality of financial reporting (Biddle et al., 2009; Shahzad et al., 2019); high disclosure level (Lai et al., 2014); absence of managerial overconfidence (Xia et al., 2009; Chen and Hu, 2019); better team management characteristics (Lai and Liu, 2017); high managerial abilities (Sanchez and Meca, 2017; Gan, 2019); disclosure of CSR actions (Zhong and Gao, 2017; Liu & Tian, 2019); superior CSR performance (Shahzad et al., 2018); higher quality of accounting (Cho and Kang, 2019); and low foreign ownership (Tran, 2020).

In addition to above factors, various studies tested the link of corporate governance with investment efficiency based on the fact that this system is made for alleviating agency problem. According to these studies, investment efficiency of firms improves with presence of active owners (Richardson, 2006); board independence (Chen and Chen, 2017); absence of CEO duality (Aktas et al., 2019); high proportion of managerial ownership (Gao et al., 2017); high proportion of institutional ownership (Chen and Chen, 2017; Lei and Chen, 2019; Cao et al., 2020); inclusion of female directors in the board (Shin et al., 2020; Mirza et al., 2020); diversity of board (Ullah et al., 2020). These studies persuade to probe the link of board traits and ownership form with investment efficiency in the context of Pakistan.

Non-financial business sector of Pakistan is comprised of 14 economic groups. As of year 2018, a total of 369 firms existed within these groups. Food is one of the distinguishable economic groups because of its incredible financial performance and growth in size. This group consistently earned a positive return on assets in between 11.26 to 23.81 percent in five years period from year 2012 to 2017 (SBP, 2017). Moreover, this economic group exhibited a growth of 31 percent in the same time period. The growth of this economic group point towards the new investments made by these firms and further necessitates questioning the investment efficiency of these firms.

Research Questions

The objective of this study was to scrutinize the impact of board traits and ownership form on investment efficiency of food sector firms of Pakistan. Therefore, this paper endeavored to obtain answers against following research questions:

Q1: What is the impact of board size on investment efficiency?

Q2: What is the impact of board independence on investment efficiency?

Q3: What is the impact of CEO duality on investment efficiency?

Q4: What is the impact of managerial ownership on investment efficiency?

Q5: What is the impact of block holder ownership on investment efficiency?

Q6: What is the impact of institutional ownership on investment efficiency?

Significance of current study

This paper is a key addition to literature as it examines the link of board traits and ownership form with investment efficiency of firms representing food sector of Pakistan. The findings of this study are useful for investors as it provides insights about the factors that can be used to ascertain the extent of investment efficiency.

Literature Review

Formerly, numerous studies endeavored to identify the factors that affect investment efficiency. Richardson (2006) investigated the impact of free cash flow on investment efficiency and reported that free cash flows have ruinous effect on investment efficiency. Author noticed that firms overinvest funds when they possess large free cash flows. Lai et al., (2014) examined the association of disclosure level with investment efficiency and found positive relationship among them. They observed that when firms increase their disclosure level, information asymmetry decreases and causes increase in investment efficiency. Moreover, decrease in information asymmetry motivates managers to make decisions that are beneficial for shareholders and precludes them from undertaking inefficient investments. Gao et al., (2017) investigated the association of certainty with investment efficiency and found negative relationship between them. It was observed that uncertainty drives firms to make inefficient investments. Moreover, this study



reported that presence of family CEO condenses the unfavorable impact of uncertainty on investment efficiency.

Zhong and Gao (2017) questioned the link among investment efficiency and disclosure of corporate social responsibility (CSR). They found positive relationship between these variables and documented that disclosure of CSR enhances investment efficiency. Shahzad et al., (2018) investigated the association of CSR performance with investment efficiency and reported positive relationship between them. Moreover, it was observed that the strength of this relationship depends upon the extent of family ownership. High proportion of family ownership magnifies the positive effects of CSR performance on investment efficiency. Lai and Liu (2018) questioned the influence of top management team characteristics on investment efficiency and found that superior characteristics enhance investment efficiency. These characteristics include large number of managers, high proportion of managers with relevant experience, academic qualification and parallel responsibilities on boards of other organizations. Cho and Kang (2019) probed the effect of accounting quality and found positive influence of accounting quality on investment efficiency. It was observed that firms having high extent of accounting quality generally make efficient investment decisions.

Shahzad et al., (2019) probed the association of family ownership and quality of financial reporting with investment efficiency and discovered that both these variables have positive relationship with investment efficiency. Higher family ownership and quality of financial reporting impedes under and overinvestment of funds, which improves investment efficiency. Li et al., (2019) investigated the association of risk disclosure with investment efficiency and found positive relationship between them. It was observed that frequent disclosure of risk enhances the investment efficiency of firms. Bhuiyan and Hooks (2019) tested relationship of cash holdings with investment efficiency and found negative relationship between them. This study reported that high level of cash holdings results in overinvestment.

Gan (2019) tested the association of managerial abilities of CEO with investment efficiency and found positive relationship among them. Superior managerial abilities aid managers in making efficient investment decisions. On the other hand, inferior abilities lead managers to inefficient investment decisions that cause either overinvestment or underinvestment. He et al., (2019) scrutinized the impact of managerial overconfidence on investment efficiency. They found negative relationship between these variables. They observed that managerial overconfidence results in overinvestment of funds. Dinh et al., (2019) investigated the relationship of ability to capitalize intangible costs with investment efficiency and found positive relationship. It was observed that investment efficiency improves as a result of firm's ability to capitalize intangible costs. Absence of this ability causes overinvestment of funds, whereas presence of this ability precludes overinvestment.

Vo (2019) probed the association of residual government ownership (RGO) with investment efficiency and found negative relationship among them. Firms with low RGO were found to have

high level of investment efficiency. This study documented that private ownership is more beneficial for firms as compared to government ownership. Tran (2020) studied the association of foreign ownership with investment efficiency and found negative relationship between them. This study reported that the intensity of this relationship depends upon the presence of financial constraints. Strong relationship was noted in respect of financially unconstrained firms. Dao et al., (2020) investigated the link between firms' public-private partnering decision and investment efficiency and found that investment inefficiency induces firms to enter public-private partnerships (PPP). When firms face problem of under or over investment, they enter PPP to alleviate this problem. In other words, embracing PPP enhances the extent of investment efficiency. Quah et al., (2020) investigated the link among investment efficiency and stock liquidity. They observed positive relationship between them and reported that high extent of stock liquidity enhances investment efficiency. However, such positive influence was found to be more prominent for businesses facing problems of information asymmetry and financial constraints.

The effectiveness of firm's corporate governance system depends upon its various aspects such as ownership form, traits of board, quality of audit committee and CEO compensation (Chen and Chen, 2017). Effective governance system is essential for firms as it yields many benefits. Improved financial performance is one among these benefits. Firms can attain better financial performance by attaining particular board traits such as large board size (Jackling and Johl, 2009; Gaur et al., 2015); high level of board independence (Bhagat and Bolton, 2013); and no CEO duality in leadership form (Assenga et al., 2018). Moreover, financial performance improves as a result of specific ownership form such as high managerial ownership (Li et al., 2007); high blockholder ownership (Ng, 2015); and high institutional ownership (Elyasiani and Jia, 2010; Panda and Leepsa, 2019).

Another benefit of effective corporate governance is rise in firm value. Firm value increases when firms embrace board traits such as large board size (Allam, 2018); high level of board independence (Vintilă et al., 2015); and absence of CEO duality (Carter et al., 2003). Firm value also increases in response to particular ownership form such as low blockholder ownership (Maury and Pajuste, 2005); high managerial ownership (Carter et al., 2003); and high institutional ownership (Jafarinejad et al., 2015). One additional benefit of effective governance is high cost efficiency, which ensues for firms having large board size, high board independence and no duality in leadership form (Titova, 2016).

Beside above stated facets, various aspects of corporate governance also impact the investment efficiency. In respect of board traits, various researchers examined the influence of board size on investment efficiency. Some studies reported insignificant relationship between both variables (Chen et al., 2017; Shin et al., 2020). However, Bzeouich et al., (2019) observed positive effect of board size on investment efficiency. The hypothesis developed on the basis of literature is given below:

H1: A significant relationship exists among board size and investment efficiency.

The link among board independence and investment efficiency has been examined by many researchers in the past. However, the findings of these studies are not identical. Chen et al., (2017) reported that no significant relationship exists between these variables. However, Gao et al., (2017), observed negative effect of board independence on investment efficiency and reported that board independence leads to investment inefficiency. On the other hand, some other studies reported positive impact of board independence on investment efficiency (Chen and Chen, 2017; Lai and Liu, 2018; Bzeouich et al., 2019; Rajkovic, 2020). These studies stated that the inclusion of independent directors on the firm's board boosts investment efficiency. Likewise, firms can improve their investment efficiency by increasing the ratio of independent directors. The hypothesis developed on the basis of literature is given below:

H2: A significant relationship exists among board independence and investment efficiency.

Few researchers probed the link between CEO duality and investment efficiency. Some studies documented that no significant relationship exists between these variables (Chen and Chen, 2017; Chen, Sung and Yang, 2017). However, Aktas et al. (2019) found negative association between these variables. More investment in low growth business segments was observed in respect of firms with CEO duality. Moreover, it was noticed that such investments results in investment inefficiency. The hypothesis developed on the basis of literature is given below:

H3: A significant relationship exists among CEO duality and investment efficiency.

In recent years, a small number of studies questioned the link of ownership form with investment efficiency. Gao et al., (2017) observed a positive impact of managerial ownership on investment efficiency. This indicates that firms can increase investment efficiency by raising the proportion of managerial ownership. Moreover, Chen and Chen (2017) found insignificant relationship of blockholder ownership with investment efficiency and positive relationship of institutional ownership with investment efficiency. Similarly, Cao et al., (2020) found the positive relationship among institutional ownership and investment efficiency. Additionally, they reported that investment efficiency increases with pressure-resistant institutional ownership as it precludes underinvestment and overinvestment. Likewise, Ward et al., (2020) also described the positive relationship between these variables and documented that motivated monitoring by institutional investors raises the investment efficiency level. The hypothesis developed on the basis of literature is given below:

H4: A significant relationship exists among managerial ownership and investment efficiency.

H5: A significant relationship exists among blockholder ownership and investment efficiency.

H6: A significant relationship exists among institutional ownership and investment efficiency.

Methodology

Research model

In current study, investment efficiency is treated as the response variable. It is measured through the method specified by Richardson (2006). According to this method, investment is measured in the manner given below:

$$INV_{Total,i,t} = INV_{Maintenance,i,t} + INV_{New,i,t} \quad (1)$$

In above equation, $INV_{Total,i,t}$ represents total investment, $INV_{Maintenance,i,t}$ represents investment amount required to maintain assets, and $INV_{New,i,t}$ represents new investment expenditure. Equation (1) is used to split total investment of a firm into two components. Total investment and its components are measured as follow:

$$INV_{Total,i,t} = CAPEX_{i,t} + ACQ_{i,t} + R\&D_{i,t} - SalePPE_{i,t} \quad (2)$$

$$INV_{Maintenance,i,t} = DEP_{i,t} + AMOR_{i,t} \quad (3)$$

$$INV_{New,i,t} = INV_{Total,i,t} - INV_{Maintenance,i,t} \quad (4)$$

Equation (2) is used to measure total investment of a firm on an annual basis. In equation (2), $CAPEX_{i,t}$ represents capital expenditure; $ACQ_{i,t}$ represents acquisitions amount; $R\&D_{i,t}$ represents expenditures on research and development; and $SalePPE_{i,t}$ represents sale proceeds from property, plant and equipment. Equation (3) is used to measure amount a firm is required to invest each year in respect of maintenance of assets. In equation (3), $DEP_{i,t}$ represents amount of depreciation and $AMOR_{i,t}$ represents amount of amortization. Equation (4) is used to measure new investment of a firm on an annual basis. After determining new investment, it is further broken down into two components as follows:

$$INV_{New,i,t} = INV^*_{New,i,t} + INV^e_{New,i,t} \quad (5)$$

Equation (5) is used to divide new investment of a firm into expected investment and abnormal investment. In equation (5), $INV^*_{New,i,t}$ denotes expected investment expenditures and $INV^e_{New,i,t}$ denotes unexpected (abnormal) investment expenditures. Regression equation used to split new investment into these components is as follows:

$$INV_{New,i,t} = \alpha_0 + \alpha_1 BM_{i,t-1} + \alpha_2 LV_{i,t-1} + \alpha_3 CP_{i,t-1} + \alpha_4 AG_{i,t-1} + \alpha_5 SZ_{i,t-1} + \alpha_6 SR_{i,t-1} + \alpha_7 INV_{New,i,t-1} \quad (6)$$

In equation (6), $BM_{i,t-1}$ represents book-to-market ratio; $LV_{i,t-1}$ represents leverage; $CP_{i,t-1}$ represents cash proportion; $AG_{i,t-1}$ represents age of firm age; $SZ_{i,t-1}$ represents firm size; $SR_{i,t-1}$ represents stock return; and $INV_{new,i,t-1}$ represents new investment expenditures. Leverage is measured by dividing debt with total assets. Cash proportion is measured by dividing cash balance with total assets. Age is worked out by taking log of the number of years from the date of Corporate's incorporation. Size of corporation is determined by taking log of corporate's total assets. Stock return is determined using total return measure.

Equation (6) is further used to obtain predicted (INV_{New}^*) and residual value (INV_{New}^e). Residuals have both positive and negative values. Negative value indicates underinvestment and positive value indicates overinvestment. As both types of values point towards investment inefficiency, therefore, absolute value of residuals is used in this study to denote investment efficiency. Chen et al., (2017) also used absolute values of residuals. A high absolute value indicates investment inefficiency, whereas, a low absolute value (close to zero) indicates a high level of investment efficiency. Therefore, negative influence of predictor variable on investment efficiency is inferred on the basis of significant positive coefficient value obtained from regression analysis. More precisely, positive coefficient value means that absolute value of residual becomes higher in response to rise in the value of predictor variable. This indicates that rise in the value of predictor variable leads to investment inefficiency. Moreover, positive influence of predictor variable on investment efficiency is inferred on the basis of significant negative coefficient value, which means that absolute value of residual becomes lower in response to rise in the value of predictor variable. Putting it differently, rise in the value of predictor variable leads to investment efficiency in this case.

To investigate the link of board traits with investment efficiency, three variables are used that include size of board, board independence and duality. Size of board is attained by taking the count of all directors on corporate's board. Board independence is determined by scaling number of independent directors with total number of directors on the corporate's board. Duality is a dummy variable that receives value of zero when board's chairman does not hold the position of CEO, and one otherwise. Managerial ownership, blockholder ownership and institutional ownership are used to assess the link of ownership form with investment efficiency. Managerial ownership represents the ratio of shares owned by firm's directors and officers. Blockholder ownership indicates the fraction of shares owned by the blockholders. Blockholder is basically a shareholder that possesses five percent or more shares of the firm. Institutional ownership indicates the fraction of shares owned by the institutions.

In addition to ownership form and board traits, some other financial variables are added as these variables also affect investment efficiency. These variables include operating cash flow, leverage, growth and size. Operating cash flows are divided by total assets to bring it in final form. Leverage is determined by measuring a ratio between debt and total assets. Growth is determined by working out the growth rate of sales and size is determined by taking the log of the total assets. The equation used to examine the link of board traits and ownership form with investment efficiency is given below:

$$IE_{i,t} = \alpha_0 + \alpha_1 BS_{i,t} + \alpha_2 BI_{i,t} + \alpha_3 DU_{i,t} + \alpha_4 MO_{i,t} + \alpha_5 BO_{i,t} + \alpha_6 IO_{i,t} + \alpha_7 OC_{i,t} + \alpha_8 LV_{i,t} + \alpha_9 GR_{i,t} + \alpha_{10} SZ_{i,t} \quad (7)$$

In equation (7), $IE_{i,t}$ represents investment efficiency of company i in period t ; $BS_{i,t}$ represents board size of company i in period t ; $BI_{i,t}$ represents board independence of company i in period t ; $DU_{i,t}$ represents duality of company i in period t ; $MO_{i,t}$ represents managerial ownership of company i

in period t ; $BO_{i,t}$ represents blockholder ownership of company i in period t ; $IO_{i,t}$ represents institutional ownership of company i in period t ; $OC_{i,t}$ represents operating cash flow of company i in period t ; $LV_{i,t}$ represents leverage of company i in period t ; $GR_{i,t}$ represents growth of company i in period t ; and $SZ_{i,t}$ represents size of company i in period t ;

Estimation approach

At first, correlations among regressors and variance inflation factors (VIF) are calculated with the aim of detecting the nature of multicollinearity. Then, unit root test is conducted in order to examine whether data is stationary or not. For data analysis, panel data regression technique is selected by taking in account the nature of data. As three different models exist with respect to panel data regression, two tests are performed to select one model. Redundant fixed effects test is performed first for selection between common and fixed effects model. In the event of selection of fixed effects model, Hausman test is then performed for selection between random and fixed effects model.

Afterwards, various values are considered in order to examine the fulfillment of regression assumptions relevant to the residuals. These values include mean value of residuals, p-value of Jarque-Bera statistic, Breush Pagan LM statistic and Durbin-Watson statistic. These values are considered so as to ensure that mean value of residuals equals zero, residuals are normally distributed, have constant variance and are independent.

Data collection

As of year 2018, the food products sector of Pakistan contained 16 firms. 14 firms were included in the sample of the study because data of these firms exist for 10 years' time period (2009-2018). Annual reports of sample firms and website of Pakistan stock exchange was used to collect relevant data. As the measurement of some values required lag data, the 8 years data of variables over time period 2011-2018 is used in data analysis.

Results

Descriptive Statistics

Descriptive statistics of response and explanatory variables are shown in table I.

TABLE I: Descriptive statistics

	IE	BS	BI	DU	MO	BO	IO	OC	LV	GR	SZ
Mean	0.06	8.26	0.12	0.07	0.26	0.69	0.06	0.10	0.51	0.16	15.00
Median	0.04	8.00	0.11	0.00	0.22	0.73	0.03	0.10	0.56	0.12	14.83
MAX.	0.65	12.00	0.40	1.00	0.99	0.95	0.40	0.76	1.24	3.89	17.88
MIN.	0.00	7.00	0.00	0.00	0.00	0.24	0.00	-0.73	0.00	-0.98	10.87

S.D	0.07	1.53	0.11	0.26	0.28	0.17	0.08	0.19	0.26	0.46	1.47
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Correlation Analysis

The values of correlation coefficients and VIFs are reported in table II as follows:

TABLE II: Correlation and VIFs

CORRELATIONS											VIF
	BS	BI	DU	MO	BO	IO	OC	LV	GR	SZ	
BS	1										1.40
BI	0.21	1									1.29
DU	-0.23	-0.22	1								1.19
MO	-0.09	-0.19	0.23	1							1.32
BO	0.36	0.09	-0.05	0.20	1						2.05
IO	-0.18	-0.04	-0.06	0.10	-0.46	1					1.43
OC	0.17	-0.02	-0.08	-0.14	0.17	-0.18	1				1.42
LV	0.21	-0.12	0.09	0.31	0.42	-0.06	0.00	1			1.47
GR	0.17	0.03	0.03	0.03	0.01	-0.02	-0.13	0.24	1		1.15
SZ	0.45	0.33	-0.21	-0.02	0.48	-0.31	0.45	0.15	0.08	1	2.09

As per table II, all correlation coefficients are below ± 0.5 . Moreover, all VIF values are well below 10. These values suggest that there is no issue of problematic multi collinearity.

Tests of data stationarity

For examination of data stationarity, test statistics and related p-values are reported in table III as follows:

TABLE III: Results of data stationarity

Variable	IE	BS	BI	DU	MO	BO	IO	OC	LV	GR	SZ
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Levin, Lin & Chu t	-11.1	-2.1	-5.3	-2.1	-4.9	-65.1	-9.2	-8.6	-27.5	-3.0	-19.2
p-value	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Values reported in above table shows that data is stationary at level.

Results of OLS regression

At first, choice between common and fixed effects model is made on the basis of redundant fixed effects test. Result of this test is reported in table IV as follows:

TABLE IV: Result of Redundant Fixed Effects Test- Likelihood ratio

Test of Effects	Test Stat.	P-value
Cross-section F	2.21	0.02

P-value of test statistic reported in table IV served as a base for selecting the fixed effects model. Next, choice between fixed and random effects model is made using the results of Hausman test. Result of this test is reported in table V as follows:

TABLE V: Result of Hausman Test

Summary of Test	Test Stat.	P-value
Cross-section random	27.51	0.00

P-value of test statistic reported in table V served as a base for selecting the fixed effects model. Results of fixed effects panel data regression are reported in table VI given below:

TABLE VI: Results of Fixed Effects Panel Data Regression

Response variable: Investment Efficiency

Variable	Coefficient	S.E	Test Stat.	P-value
Constant	0.49	0.08	5.98	0.00
Board size	-0.07	0.03	-2.23	0.03
Board independence	0.01	0.02	0.50	0.62
Duality	-0.01	0.00	-1.64	0.10

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Managerial ownership	-0.24	0.04	-5.75	0.00
Blockholder ownership	0.12	0.02	6.71	0.00
Institutional ownership	-0.18	0.07	-2.70	0.01
Operating cash flow	0.02	0.04	0.63	0.53
Leverage	0.04	0.02	1.60	0.11
Growth	0.02	0.01	2.24	0.03
Size	-0.03	0.01	-4.03	0.00
R ²	0.522	F-stat.		4.176
Adj. R ²	0.397	P-value (F-stat.)		0.000
S.E.	0.055	D.W stat.		2.013

Results reported in table VI shows significant relationship of board size with investment efficiency, which leads to acceptance of H1. The negative coefficient value indicates positive influence of board size on investment efficiency, which is in agreement with the earlier finding of Bzeouich et al., (2019). This finding implies that large board size results in investment efficiency, whereas small board size results in investment inefficiency. Further, insignificant relationship is found between board independence and investment efficiency, which results in rejection of H2. Similarly, insignificant relationship is also found between duality and investment efficiency, which results in rejection of H3. Moreover, results indicate significant relationship of managerial ownership with investment efficiency, which leads to acceptance of H4. The negative coefficient value shows positive link of managerial ownership with investment efficiency. Moreover, this finding is in agreement with the earlier results reported by Gao et al., (2017). This finding implies that high proportion of managerial ownership results in investment efficiency, whereas small proportion of managerial ownership results in investment inefficiency.

Further results indicate significant relationship of blockholder ownership with investment efficiency, which results in acceptance of H5. However, the positive coefficient value shows negative influence of blockholder ownership on investment efficiency. This association suggests that more blockholder ownership causes investment inefficiency, while less blockholder ownership causes investment efficiency. Furthermore, results indicate significant relationship of institutional ownership with investment efficiency, which leads to acceptance of H6. The negative coefficient value indicates positive influence of institutional ownership on investment efficiency. This finding matches with the earlier findings of Cao et al., (2020) and Ward et al., (2020). This

finding implies that high fraction of institutional ownership causes investment efficiency, whereas small fraction of institutional ownership causes investment inefficiency.

Moreover, insignificant relationship is found between operating cash flow and investment efficiency. Likewise, insignificant relationship is also found between leverage and investment efficiency. Further results indicate significant relationship between growth and investment efficiency. But, the positive coefficient value shows negative effect of growth on investment efficiency. This relationship indicates that high growth causes investment inefficiency, whereas low growth causes investment efficiency. Finally, significant relationship is observed between firm size and investment efficiency. The negative coefficient value shows positive influence of firm size on investment efficiency. This finding suggests that large size firms have high level of investment efficiency, whereas small size firms have high level of investment inefficiency. Moreover, relevant information in respect of different tests of residual is reported in table VII as follows:

TABLE VII: Tests of Residuals

Values related to Residuals		Bruesh-Pagan test result	
Mean	0.00	LM statistic	95.007
Jarque Bera	4.733	<i>p</i> -value	0.366
<i>p</i> -value	0.094		

Mean value of residuals is equal to zero according to table VII. Furthermore, *p*-value of Jarque-Bera statistic ratifies the normal distribution of residuals. Moreover, *p*-value of LM statistic confirms the presence of homoscedasticity in residuals. Finally, Durbin-Watson statistic reported in table VI is approximately 2 that point towards the nonexistence of serial correlation.

Conclusion

The motive behind this study was to identify the specific effects of board traits and ownership form on investment efficiency. Results show that one among the three board traits affect the investment efficiency of the firms. Investment efficiency improves as a result of increase in the board size. However, board independence and CEO duality has no significant association with investment efficiency of the firms. Results further evidenced the link of ownership form with investment efficiency. Investment efficiency improves with increase in proportion of managerial ownership, decrease in proportion of blockholder ownership and increase in proportion of institutional ownership. More precisely, firms with large board size, high proportion of managerial ownership, low proportion of blockholder ownership and high proportion of institutional ownership are expected to have high level of investment efficiency. It is evident from the overall results that board traits and ownership form have an affect on investment efficiency.

Findings of the present study are valuable for investors. Rational investors desire to own firms that make efficient investment decisions because such decisions maximize the wealth of the investors. Thus, investors can ascertain the investment efficiency level of firms on the basis of the findings of this paper. This study examined the link of board traits and ownership form with investment efficiency in respect of food sector firms of Pakistan. Therefore, the link of board traits and ownership form with investment efficiency can be examined for other sectors of Pakistan in future.

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