CEO Age and Corporate Investment Decisions in Bangladesh

Md. Imran Hossain[1]
Fateha Momotaz Moni[2]

Abstract:

In this study, the first of its kind in Bangladesh, we investigate whether CEO age influences the investment decisions of Bangladeshi firms. Using a manually collected panel dataset of 119 non-financial companies listed in Dhaka Stock Exchange during 2009-2021, we employ Feasible Generalized Least Square (FGLS) regression model and find that there is a significant positive association between CEO age and corporate investment. Furthermore, we find that older CEOs invest more than younger CEOs. Finally, we find that the positive effect of CEO age on corporate investment is more pronounced for the firms with higher managerial ownership, leverage and firm age. These findings have important policy implications for various stakeholders (e.g., shareholders, board of directors and regulators) of firms in Bangladesh.

Keywords: Chief Executive Officer, CEO, CEO Age, Investment, Capital Expenditure, Bangladesh.

DOI: https://www.doi.org/10.61607/JFB.V21N1-2.A2

Article Info: *Submission Date:* November 14, 2023; *Acceptance Date:* June 04, 2024.

1.0 Introduction

Investment decision is considered as one of the most crucial decisions taken by a firm because this decision substantially influences the firm's value, growth and stability (Pettus, 2001; and Stein, 2003). According to the Upper Echelons theory (Hambrick & Mason, 1984), a firm's investment decisions are influenced by the personal characteristics (e.g., age, origin, gender, tenure, relevant experience, education etc.) of top executives such as Chief Executive Officer (CEO), Managing Director (MD) etc. A growing body of literature, emphasizing on CEO age as a vital personal characteristic of CEOs, finds that CEO age significantly affects the investment decisions of a firm.

[1] Corresponding Author and Associate Professor, Department of Finance, Faculty of Business Studies, University of Dhaka, Dhaka, Bangladesh, E-mail: imran@du.ac.bd & PhD Candidate, The University of Queensland, Queensland, Australia, E-mail: mdimran.hossain@uq.edu.au.

[2] MSc In Finance and Investment Management, University of Aberdeen, UK, Email: fatehamoni.du@gmail.com

However, the findings of extant literature regarding the impacts of CEO age on corporate investment are inconclusive. Some studies find a negative association between CEO age and corporate investment because older CEOs have lower risk-taking behavior and a preference for a peaceful state of mind (Bertrand & Schoar, 2003; Serfling, 2014; Li et al., 2017; and Gupta et al., 2018). Contrarily, some studies find that CEO age is positively associated with investment because older CEOs have more expertise and success in executing investment decisions than younger CEOs, and the latter are afraid of being scrutinized in the labor market for any loss occurred from investments (Scharfstein & Stein, 1990; Holmström, 1999; and Ali et al., 2022). On the other hand, Setiawan and Gestanti (2022) claim that there is no significant relationship between CEO age and corporate investment.[3] Therefore, it still remains an open empirical question about how CEO age actually affects investment decisions of firms.

Moreover, existing literature on this topic is highly concentrated on the developed and developing markets. Very little is known from the perspectives of emerging economies where the regulations, institutional developments and market structure are distinct from developed and developing markets.[4] Most importantly, the relationship between CEO age and corporate investment is still unexplored in the case of emerging economies like Bangladesh. We fill this research gap by investigating whether the ages of CEOs influence the investment decisions of listed firms in Bangladesh.

Ex-ante, we predict two competing hypotheses indicating the association between CEO age and corporate investment based on the upper echelon theory. Under this theory, there are two schools of thought that provide guidance on the expected relationship between CEO age and investment. On one hand, we expect a negative association between CEO age and corporate investment as younger CEOs have greater risk-taking behavior and investment tendency than their older counterparts (Hambrick & Mason, 1984; Bertrand & Schoar, 2003; Li et al., 2017; and Serfling, 2014). On the other hand, another school of thought argues that older CEOs can undertake more successful investment decisions based on their accumulated

[3] This insignificant relationship may primarily be attributed to the methodological differences. For instance, the authors run pooled OLS regressions without controlling for firm, industry, or year fixed effects, which implies that their results are likely to be confounded by the time-invariant unique characteristics of firms and/or industries.

[4] A few exceptions are Ali et al. (2022), Setiawan and Gestanti (2022) and Gupta et al. (2018) that are based on Pakistani, Indonesian and Indian firms, respectively. Albeit, their findings are inconclusive, which justifies the necessity for further research from the contexts of other emerging economies like Bangladesh.

experience, whereas younger CEOs have a fear of labor market punishment due to losses arising from investments (Scharfstein & Stein, 1990; Holmström, 1999). Therefore, we predict a positive association between CEO age and corporate investment.

To empirically test these two competing hypotheses, we construct a panel dataset of 119 non-financial companies listed in Dhaka Stock Exchange in Bangladesh during the period 2009-2021. [5] We manually collect data on CEO age and firm characteristics from the firms' annual reports and websites, and DSE library. In some cases, we also use social media platforms (e.g., LinkedIn) and search engines (e.g., Google) to get some data on CEO characteristics that are not available from firms and DSE.

To investigate the relationship between CEO age and investment, we employ the Feasible Generalized Least Squares (FGLS) regression model that automatically resolves the problems of heteroscedasticity and autocorrelation in the dataset. In our model, we use investment as the dependent variable measured by capital expenditure as a ratio of total assets of a firm. Contrarily, CEO age, measured by the natural logarithm of a CEO's age, is the key variable of interest that captures the linear relationship with investment. Furthermore, to distinguish between the effects of younger and older CEOs on investment, we construct a dummy variable CEO age dummy that takes the value of one (zero) if a CEO's age is above (below) the median CEO age value.

Additionally, following standard literature, we control for other variables (e.g., Managerial Ownership, Firm Size, Firm Age, Sales Growth Rate, Leverage, Cash Holding, Net Working Capital, Return on Assets, and Tobin's Q) that may influence corporate investment. We also control for year fixed effects and firm fixed effects in our regression models to capture the effects of macroeconomic changes over time and time-invariant unobservable unique firm characteristics, respectively.

The results of FGLS regression analysis show that there is a significant positive association between CEO age and corporate investment. To be specific, an additional 1% growth in CEO age is associated with a 4.2% increase, on average, in the corporate investment, keeping everything else unchanged. We also find that older CEOs invest more than younger CEOs, ceteris paribus. This finding is consistent with Scharfstein and Stein (1990), Holmström (1999), and Ali et al. (2022). Furthermore, we delve into cross-sectional heterogeneity analyses to identify the

[5] Please see section 3.1 for detailed sample construction procedures.

subgroups of firms for which the impact of CEO age on corporate investment is more or less pronounced. We find that the positive effect of CEO age on corporate investment is more pronounced for the firms with higher managerial ownership, higher leverage and higher firm age.

The study contributes towards the literature in two ways. First, it contributes to the literature on CEO characteristics, particularly CEO age. Prior studies find that CEO age influences firms' risk-taking behavior (Serfling, 2014), performance, growth and value (Zhang, 2010; Bhabra & Zhang, 2016), financial reporting quality (Huang et al., 2012), stock price crash risk (Andreou et al., 2017) and acquisition behavior (Yim, 2013). While some studies show that CEO age affects corporate investment (Scharfstein & Stein, 1990; Holmström, 1999; Bertrand & Schoar, 2003; Li et al., 2017; and Serfling, 2014), most of these studies are highly concentrated on the developed and developing markets. However, to the best of our knowledge, no research has been conducted to investigate the relationship between CEO age and corporate investment in emerging economies like Bangladesh. Thus, we contribute to the literature by showing that CEO age positively influences corporate investment in Bangladesh.

Second, this study also contributes to the literature on corporate investment. Extant literature shows that some of the important determinants of corporate investment are firm size, firm age, cash flow, leverage, sales growth, profitability, fixed capital intensity, financial constraints, and corporate governance, CEO characteristics (Kadapakkam et al., 1998; Gugler, 2003; Aivazian, 2005; Malmendier & Tate, 2005; Li, 2011; Chaney et al., 2012; Driver & Muñoz-Bugarin, 2019). We augment this literature by documenting that CEO age is a significant determinant of corporate investment in an emerging country like Bangladesh.

The remainder of the study is arranged as follows. We critically review prior literature and develop hypotheses in Section 2. We present our research design and methodology in Section 3. We report our data analysis and findings in Section 4. Finally, we conclude with some important policy implications in Section 5.

2.0 Literature Review and Hypothesis Development

2.1 Theoretical Discussion: Upper Echelon Theory

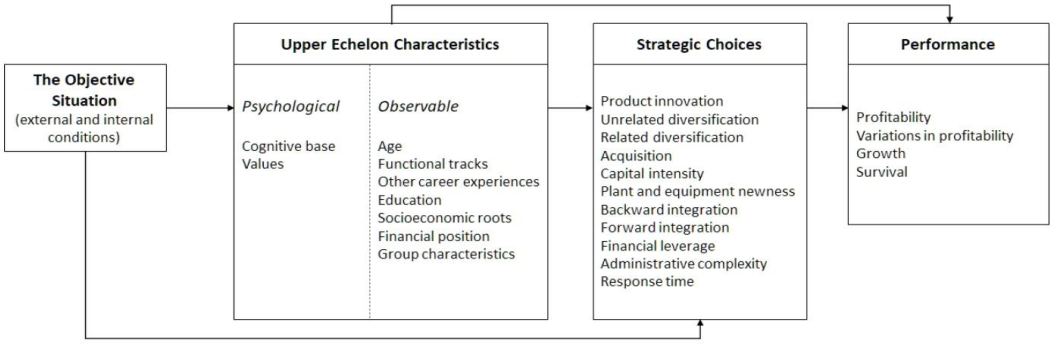
In a seminal paper, Hambrick and Mason (1984) propose the upper echelon theory which posits that the managerial traits shape organizational results, possible ways of action and the extent of performance. The theory states that different characteristics of executives (e.g., age, gender, tenure, education etc.) impact their choices on

structure and strategy, and thus, it will directly influence a firm's strategic actions, policies and performance (Nielsen, 2010). It suggests that distinct characteristics of the top executives are more crucial in the periods of more difficult situations that have far reaching impacts on the firm value, performance and policies.

The foundations of upper echelon theory are rooted within the behavioural theory of the firm which posits that top management decisions are not continually influenced by rational motives, rather by the mangers' human nature. Therefore, behavioural factors-induced strategic decisions taken by top executives affect firm performance. Upper echelon theory is shaped by the notion of bounded rationality, i.e., the inability of the top executives to comprehend and systematically process the complex tasks of making a strategic choice such as investment decisions (Plockinger et al., 2016). In that case, the resulting decisions and outcomes are the reflections of top executives' age, personality, experience, education and other characteristics (Hambrick & Mason, 1984; Hambrick, 2007).[6]

As shown in Figure 1, the upper echelon theory can be illustrated as a conceptual model depicting the inter-relationships among four key components such as-strategic situations, upper echelon (or, top managers) characteristics, strategic choices, and firm performance. The central proposition of this theory is that top executives' psychological characteristics (e.g., cognitive base and values) and observable characteristics (e.g., age, education, experiences etc.) influence their interpretation and response to strategic choices (e.g., innovation, acquisition, leverage etc.), which ultimately affect firm performance (Hambrick & Mason, 1984).

Figure-1: The conceptual model of upper echelon theory



Source: Hambrick and Mason (1984) and Bekos and Chari (2024)

[6] For detailed discussions on the Upper Echelon Theory, see Shen (2021), Ismail et al. (2022), Bekos and Chari (2024), among others.

This theory has subsequently been applied to various contexts including innovation, initial public offering, corporate social responsibility, international diversification, mergers and acquisitions, capital structure, firm productivity and performance (e.g. Bantel & Jackson, 1989; Finkelstein & Hambrick, 1990; Lyon & Ferrier, 2002; Olson et al., 2006; Krug et al., 2014; Chen et al., 2010; and Petrenko et al., 2016).

2.2 CEO Age and Investment: Theoretical Expectations and Empirical Findings

CEO age is a vital personal characteristic of a CEO as the approachability to changes and inclination to risk-taking by a CEO is mainly driven by his/her age (Hambrick & Mason, 1984). How CEO age may affect corporate investment can be guided by the propositions of two schools of thought from the perspective of upper echelon theory. The first school of thought opines that there is a negative relationship between CEO age and corporate investment, implying older (younger) CEOs invest less (more) in a firm (Hambrick & Mason, 1984). This is because compared to the conservative tendencies and risk-averse behaviour of older CEOs, younger CEOs are portrayed as leaning more towards risk-taking behaviour, undertaking riskier investments and innovations that can plausibly boost firm performance. Thus, the dynamism and fresh perspectives of younger CEOs may lead to higher risk-taking and greater returns on investments.

Empirical research also supports this negative association based on the upper echelon theory. For instance, Serfling (2014) finds that older CEOs prefer to make less risky investment as they are concerned of losing the reputation earned through years of experience. Additionally, older executives intend to reflect their outdated policies while making investment decisions which push the amount of investment down and thus, reduce value and profitability for firms (Bertrand & Schoar, 2003). Moreover, older CEOs are more concerned about losing control, financial rewards, and wealth, and therefore, they can abandon profitable projects with greater risks (Barker & Mueller, 2002; Serfling, 2014). Furthermore, a preference for a peaceful state of mind also influences the older CEO to invest less aggressively and thus reduce the overall investment amount (Li et al., 2011).

Additionally, there are several studies that explain why the young CEOs can enhance firms' value by executing profitable investment decisions. Hambrick and Fukutomi (1991) find that young CEOs exhibit a risk-taking nature more often as they may lack experience of predicting strategic risks associated with investment alternatives, where the older counterparts can evaluate the same alternatives based on their expertise and success in projecting the same types of investments. Prendergast and

Stole (1996) claim that CEOs at an earlier age make more bold, aggressive and superior investment decisions to indicate their prime qualities to the outer edge. Furthermore, young CEOs intend to invest more in the acquisition of companies to enhance compensation and benefits in the earlier stages of their career and to reflect their competitive ability in the labor market (Yim, 2013). Recently, Gupta et al. (2018) find a negative association between CEO age and investment by analyzing the manufacturing firms in India, suggesting that younger CEOs invest more than their older counterparts. Therefore, we hypothesize an inverse association between CEO age and corporate investment.

H_{1a}: There is a negative relationship between CEO age and investment.

On the other hand, another school of thought of upper echelon theory claims that there is a positive association between CEO age and corporate investment (Holmström, 1999); and Scharfstein & Stein, 1990). This is because older CEOs can make rational investment decisions based on their accumulated knowledge and corporate experience, whereas younger CEOs pursue less aggressive strategies, depressing the levels of corporate investment, with the fear of being scrutinized in the labor market for any losses that occurred from aggressive investments. Furthermore, younger CEOs, with inadequate experience and knowledge of business operations, may undertake more cautious strategies to circumvent risky activities that may potentially damage corporate performance (Peni, 2014; and Putri & Rushmanto, 2019). Recently, Ali et al. (2022) find a positive association between CEO age and investment by analyzing the non-financial firms in Pakistan, implying that older CEOs invest more than their younger counterparts. Therefore, we predict a competing hypothesis indicating a positive association between CEO age and corporate investment.

H_{1b}: There is a positive relationship between CEO age and investment.

Importantly, most of the existing literature on CEO age is based on the developed and developing economies like the US, UK, Europe, Australia, China etc. However, there is a dearth of research on the impacts of CEO age on investment decisions of firms in emerging economies, where the regulations, institutional developments and market structure are distinct from those of developed and developing markets.[7] Unfortunately, the relationship between CEO age and corporate investment remains unexplored in the case of Bangladesh, an emerging economy in South Asia. We fill

[7] Ali et al. (2022) and Gupta et al. (2018) are the exceptions that focus on Pakistan and India, respectively.

this void in literature by investigating how the ages of CEOs influence the investment decisions of Bangladeshi companies.

3.0 Research Design and Methodology

3.1 Sample

The sample used for our study is constructed based on the non-financial companies listed in Dhaka Stock Exchange (DSE) in Bangladesh for the period of 2009-2021.[8] Initially, we start with the universe of all public firms listed in DSE. Then, following standard literature (Serfling, 2014; Hossain & Hossain, 2015; Hossain, 2016; and Lima & Hossain, 2018), we apply several screening criteria. First, we exclude banks, insurance and other financial institutions as they are highly regulated and their financial statements are different in many aspects from those of non-financial companies. Second, we require that all our sample firms have available financial statement data for all years from 2009 to 2021 to make a balanced panel dataset to run the FGLS regression model (Lima & Hossain, 2018). Finally, we drop any missing values from all variables, which finally results in 923 firm-year observations from 119 unique companies under 13 sectors during the sample period 2009-2021.

We manually collect the secondary data on CEO age and firm-specific characteristics from the respective firms' annual reports and websites, DSE library, social media platforms (e.g., LinkedIn) and search engines (e.g., Google). All continuous variables are winsorized at the 5^{th} and 95^{th} percentiles to avoid extreme outliers in the dataset (Hossain et al., 2023).

3.2 Measurement of Dependent and Independent Variables

In our study, we use CAPEX as the dependent variable to proxy corporate investment of firms. Following standard literature, we measure CAPEX as a ratio of annual capital expenditure to total assets of a firm (Kalmenovitz, 2023). Contrarily, we employ two different measures for the key independent variable of our study i.e., CEO age. First, we use a continuous variable- CEO Age (Log) that takes the natural logarithm of the age of a CEO of a firm to capture the linear relation between CEO age and corporate investment (Serfling, 2014).[9]

---

[8] Our sample period starts from 2009 because this is the earliest year till which we could collect CEO characteristics data from several sources. Finally, we conclude our sample in 2021 as this is the latest year all firms' financial statements are available at the time of preparing the first draft of this working paper.

[9] We take the natural logarithm of CEO Age to reduce the heteroscedasticity problem.

Second, to capture the differential effects of younger and older CEOs on corporate investment, we construct a discrete variable- CEO Age Dummy- where we categorize the CEO Age variable into two subgroups based on the median every year and then, we assign one (zero) to CEO Age Dummy if a CEO's age is above (below) the median value (Jenter & Lewellen, 2015; Belenzon et al., 2019).

3.3 Control Variables

Following standard literature, we control for a wide variety of firm characteristics that might affect corporate investment such as managerial ownership (including CEO stock ownership), firm size, firm age, sales growth rate, leverage, cash holdings, net working capital, return on assets, and Tobin's Q.[10] There are several research which link the effects of these control variables with investment decisions in a firm. For instance, CEOs with higher stock ownership invest more in their firms (Renneboog & Zhao, 2011). In addition, firm size is expected to have a positive association with investment decision as larger firms have higher access to external financing and lower transaction cost of financing compared to smaller firms (Zarzeski, 1996). Evidently, firms with higher age invest less gradually (Loderer & Waelchli, 2010). Furthermore, investment decisions of firms are negatively influenced by higher working capital and leverage, whereas positively influenced by higher growth, cash holding, profitability and Tobin's Q (Fazzari & Petersen, 1993; Aivazian et al., 2005; and Umutlu, 2010).

3.4 Econometric Model

To determine the impact of CEO age on corporate investment, we employ Feasible Generalized Least Square (FGLS) regression model in our study since FGLS automatically solves the problems of heteroscedasticity and autocorrelation in the dataset (Greene, 2012). Specifically, we run the following two regression equations based on the two measures of CEO age. In Equation (1), we investigate the linear relation between CEO age and corporate investment as follows:

$$CAPEX_{it} = \alpha + \beta.\ CEO\ Age\ (Log)_{it} + \gamma.\ Controls_{it} + \eta_i + \lambda_t + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where, $CAPEX_{it}$ is the ratio of annual capital expenditure to total assets of a firm i in year t, $CEO\ Age\ (Log)_{it}$ is the natural logarithm of the age of a CEO, $Controls_{it}$ is a vector of firm-specific control variables including managerial ownership, firm size,

[10] Since many Bangladeshi firms do not distinctively report their CEO's stock ownership in their annual reports, we control for *Managerial Ownership* variable that includes CEO's stock ownership. All variables are defined in Appendix.

firm age, sales growth rate, leverage, cash holdings, net working capital, return on asset, and Tobin's Q. All these variables are defined in Appendix. In this equation, we also control for firm fixed effects (η_i) to capture the firms' unobserved time-invariant unique characteristics. Furthermore, we control for year fixed effects (λ_t) to capture the macroeconomic effects over time that are common to all firms. Finally, $\mathcal{E}_{it}$ is the error term.

In addition, one might argue that the relationship between CEO age and corporate investment may not be like the marginal changes in investment due to an additional one-year change in CEO age. Instead, the investment decisions of older CEOs may be different from younger CEOs. To address this concern, we run the following Equation (2):

$$\boldsymbol{CAPEX_{it} = \alpha + \beta.\ CEO\ Age\ Dummy_{it} + \gamma.\ Controls_{it} + \eta_i + \lambda_t + \mathcal{E}_{it}} \ldots\ldots\ldots\ldots \textbf{(2)}$$

where, *CEO Age Dummy*$_{it}$ is the dummy variable that takes the value of one (zero) if the age of a CEO in a year falls above (below) the median CEO age. We assume that CEOs above (below) the median value of CEO age are considered as older (younger) CEOs (Jenter & Lewellen, 2015; Belenzon et al., 2019). All other variables are the same as Equation (1).[11]

4.0 Data Analysis and Results

4.1 Descriptive Statistics

Table 1 depicts the summary statistics of all variables used in the study. The mean (median) capital expenditure of our sample firms during 2009-2021 is about 5.2% (2.8%) of total assets. The lowest and highest capital expenditure of firms are 0 and 23.9%, respectively. The mean (median) age of the CEOs is 55 (55) years old, whereas the youngest and oldest CEOs in our sample are 37 and 76 years old, respectively. Since the standard deviation of CEO age is high (12), we take the natural logarithm of CEO age to reduce the problem of heteroscedasticity. About 47.6% of CEOs are more than 55 years old (i.e., median CEO age). In addition, on average, our sample firms have managerial ownership of 6.4%, cash holding of 5.8%, leverage of 67.3%, net working capital of 11.7%, return on assets of 7.9%, sales

[11] In an unstipulated analysis, we also test if there is any non-linear relationship between CEO age and investment. Specifically, we include the square of *CEO Age (Log)* to the baseline regression equation (1) and run it. However, the coefficient of the square of *CEO Age (Log)* is not statistically different from zero, suggesting no non-linear relationship between CEO age and investment. We thank the reviewer for suggesting this approach for testing non-linear relationship.

growth rate of 9.8% and Tobin's Q of 2.5. Furthermore, the average firm size (i.e., total assets) is 5310 million BDT and the average firm age is 32 years.

Table-1: Descriptive Statistics

This table presents the summary statistics of the main variables considered in this study covering 119 non-financial companies listed in DSE, Bangladesh during 2009-2021. All variables are defined in the Appendix.

	Mean	Median	SD	Min	Max
CAPEX	.052	.028	0.062	0	.239
CEO Age	55.103	55	11.585	37	76
CEO Age (Log)	4.005	4.025	0.210	3.638	4.344
CEO Age Dummy	.476	0	0.500	0	1
Managerial Ownership	.064	.034	0.078	0	.292
Cash Holding	.058	.025	0.080	.001	.305
Leverage	.673	.551	0.437	.071	1.607
Net Working Capital	.117	.136	0.245	-.384	.536
Return on Assets	.079	.062	0.082	-.039	.262
Firm size	5310.184	1730.737	9190.561	133.931	38434.74
Firm Size (Log)	7.474	7.457	1.515	4.905	10.557
Firm Age	31.952	31	13.450	10	56
Firm Age (Log)	3.402	3.466	0.447	2.398	4.043
Sales Growth Rate	.098	.079	0.273	-.388	.817
Tobin's Q	2.503	1.507	2.782	.038	10.58

4.2 Preliminary Tests: Multicollinearity, Heteroscedasticity, and Autocorrelation

We conduct three preliminary tests (e.g., multicollinearity, heteroscedasticity, and auto-correlation tests) on our sample data to find whether the assumptions of multiple regression analysis are violated or not. First, we employ Pearson's correlation matrix and Variance Inflation Factor (VIF) approaches to detect multicollinearity (i.e., high correlations among the independent variables). The findings of these tests are presented in Table 2. In Panel-A, no variables have a correlation coefficient of 0.80 or more and in Panel- B, no variable has a VIF value greater than 10, which testifies that there is no multicollinearity problem in our dataset (Lin, 2008).

Second, we run the Modified Wald test to check for heteroscedasticity in our dataset whether the residuals have a constant variance or not. The results in Panel A of Table 3 show that the probability of the Chi-square statistic is less than 0.05 and therefore, our dataset has heteroscedasticity problem. Finally, we find that our dataset suffers from autocorrelation problem (i.e., the residuals over time are not independent from each other) since the Wooldridge test in Panel B of Table 3 shows that the probability of the F-statistic is less than 0.05.

Since our dataset suffers from both heteroscedasticity and autocorrelation problems, we employ the Feasible Generalized Least Square (FGLS) regression model that automatically solves these problems and provides efficient estimates (Greene, 2012). While running the FGLS model in Stata software, we use AR(1) to take care of first-order autocorrelation, and heteroscedastic and correlated error structure across the panels to take care of heteroscedasticity.

Table-2: Multicollinearity Tests

This table presents the results of two tests for multicollinearity- Pearson's Correlation Matrix in Panel-A and Variance Inflation Factor (VIF) in Panel- B. All variables are defined in the Appendix.

Panel A: Pearson's Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) CEO Age (Log)	1.00									
(2) Managerial Own.	0.08	1.00								
(3) Cash Holding	0.04	-0.05	1.00							
(4) Leverage	-0.07	-0.13	-0.12	1.00						
(5) NWC	0.10	-0.02	0.26	-0.36	1.00					
(6) Return on Assets	-0.14	-0.09	0.20	0.06	0.27	1.00				
(7) Firm Size (Log)	0.03	-0.15	0.07	-0.10	0.18	0.20	1.00			
(8) Firm Age (Log)	0.11	-0.18	0.10	0.21	-0.07	0.02	0.03	1.00		
(9) Sales Growth	0.01	-0.04	0.08	0.01	0.02	0.21	0.07	-0.04	1.00	
(10) Tobin's Q	-0.04	-0.04	0.16	-0.20	-0.02	0.20	-0.15	0.03	0.05	1.00

Panel B: Variance Inflation Factor (VIF)

Variables	VIF
Net Working Capital	1.57
Return on Assets	1.44
Tobin's Q	1.36
Leverage	1.34
Firm Size (Log)	1.29
Cash Holding	1.14
Managerial Ownership	1.13
Firm Age (Log)	1.1
Sales Growth Rate	1.07
CEO Age (Log)	1.05

Table-3: Heteroscedasticity and Autocorrelation Tests

This table presents the results of Modified Wald test for heteroskedasticity in Panel- A and Wooldridge test for autocorrelation in Panel- B. All variables are defined in the Appendix.

Panel A: Modified Wald test for heteroskedasticity
H_0: sigma(i)^2 =
sigma^2 for all i chi2
chi2 (98)=2.6e+35
Prob>chi2 = 0.0000

Panel B: Wooldridge test for autocorrelation
H_0: no first-order autocorrelation
F(1, 93) = 16.239
Prob > F = 0.0001

4.3 Results of Feasible Generalized Least Square (FGLS) Regression Analysis

The results of the FGLS regression analysis are presented in Table 4. In Panel A, we capture the linear relationship between CEO age and investment through the key variable of interest CEO Age (Log) – natural logarithm of the age of a CEO of a

firm, whereas CEO Age Dummy - taking the value of one (zero) if a firm's CEO age is above (below) the median CEO age - is used to capture the differential effects of younger and older CEOs on investment in Panel B. Both specifications include firm and year fixed effects to control for the unobserved heterogeneity across firms and over time.

It is evident from both Panels A and B that CEO age is positively and significantly associated with corporate investment. To be specific, in Panel A, an additional 1% growth in CEO age leads to an average increase of 4.2% in capital expenditure, keeping all other variables unchanged. This result epitomizes great economic significance. Additionally, this result is statistically significant at 1% level. Furthermore, the coefficient of CEO Age Dummy in Panel B implies that on average, older CEOs invest about 0.5% higher in capital expenditure compared to their younger counterparts. This finding is statistically significant at 10% level. Overall, these findings corroborate our expected hypothesis H1b that CEO age is positively associated with corporate investment. In other words, older CEOs invest more than younger CEOs. These findings are consistent with those of Scharfstein and Stein (1990), Holmström (1999) and Ali et al. (2022).

Additionally, most of the control variables are consistent with the standard literature (Aivazian et al., 2005; Oddit & Chitto, 2008; Loderer & Waelchli, 2010; and Umutlu, 2010). For instance, older firms and firms with higher net working capital invest less in capital expenditure, whereas firms with higher sales growth and profitability invest more in capital expenditure. Finally, the 1% level statistical significance of the Wald Chi-Squared Test Statistic demonstrates that the regression models, as a whole, are valid in both specifications.

Table-4: FGLS Regression Results

This table presents the results of Feasible Generalized Least Square (FGLS) regression based on a strongly balanced panel data set of 119 non-financial companies listed in DSE from 2009 to 2021. Here, capital expenditure (CAPEX) is the dependent variable. Two variables of interest are- (1) *CEO Age (Log)* – natural logarithm of the age of a CEO of a firm (see Panel A), and (2) *CEO Age Dummy*- taking the value of one (zero) if a firm's CEO age is above (below) the median CEO age (see Panel B). All variables are defined in the Appendix. Each regression specification includes firm and year fixed effects. Standard errors are shown in parentheses. Here, *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Variables	**Dependent Variable: CAPEX**	
	Panel-A	**Panel-B**
CEO Age (Log)	0.042***	
	(0.014)	
CEO Age Dummy		0.005*
		(0.003)
Managerial Ownership	-0.004	-0.011
	(0.017)	(0.016)
Firm Size (Log)	0.001	-0.000
	(0.002)	(0.002)
Firm Age (Log)	-0.042***	-0.045***
	(0.006)	(0.006)
Sales Growth Rate	0.033***	0.028***
	(0.007)	(0.007)
Leverage	0.001	-0.002
	(0.005)	(0.005)
Cash Holding	0.007	0.010
	(0.021)	(0.020)
Net Working Capital	-0.028***	-0.022***
	(0.007)	(0.007)
Return on Assets	0.335***	0.319***
	(0.023)	(0.023)
Tobin's Q	-0.000	-0.001
	(0.001)	(0.001)
Constant	-0.004	0.078***
	(0.030)	(0.016)
Firm Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Observations[12]	910	923
Wald Chi-Squared Test Statistic	422.62***	407.74***

[12] Despite a strongly balanced dataset of 119 firms for 2009-2021 period, our final firm-year observations in the regression models reduce to 923 because of the missing values of some variables.

4.4 Cross-sectional Heterogeneity Analyses

Having established the fact that CEO age is positively associated with corporate investment, now we delve into the cross-sectional heterogeneity analyses to identify the subgroups of firms for which the impact of CEO age on corporate investment is more or less pronounced. To do so, we divide the whole sample into two subgroups (i.e., High and Low) based on the median value of three firm-specific characteristics such as managerial ownership, leverage and firm age. That is, a firm above (below) the median value of managerial ownership, leverage and firm age is categorized into High (Low) subgroup in Panel A, B and C of Table 5, respectively.

In Panel A, CEO age is positively and significantly associated with corporate investment in the case of higher managerial ownership firms. This implies that CEOs having more ownership in their firms invest more in capital expenditure. Additionally, in Panel B, the effect of CEO age on corporate investment is positive (negative) for high (low) leverage firms and the result is significant for both cases. This finding demonstrates that the CEOs in highly levered firms take aggressive investment strategies. Finally, in Panel C, CEO age is positively and significantly associated with corporate investment in the case of older firms, implying that older CEOs of older firms invest more in capital expenditure than their counterparts.

Table-5: Cross-sectional Heterogeneity Analysis

This table presents the results of cross-sectional heterogeneity analysis using the FGLS regression model. Here, capital expenditure (CAPEX) is the dependent variable. The key independent variable, *CEO Age (Log),* is the natural logarithm of the age of a CEO of a firm. In each of Panel A, B and C, the whole sample is divided into two groups- High and Low, where High (Low) group represents the firms above (below) the median value of managerial ownership, leverage and firm age, respectively. All variables are defined in the Appendix. Each regression specification includes firm and year fixed effects. Standard errors are shown in parentheses. Here, *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Panel A: Managerial Ownership			**Panel B: Leverage**		**Panel C: Firm Age**	
	High	**Low**	**High**	**Low**	**High**	**Low**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
CEO Age (Log)	.0764***	.0033	.093***	-.0547***	.0885***	.0147
	(.0211)	(.0182)	(.0202)	(.0203)	(.0196)	(.024)
Managerial Ownership			.0416	.0127	-.0116	.0531**
			(.0264)	(.0191)	(.0255)	(.0247)
Leverage	-.0026	.0049			.006	-.0011
	(.0069)	(.0069)			(.0073)	(.0081)
Firm Age (Log)	-.045***	-.028***	-.041***	-.040***		
	(.0092)	(.0098)	(.0096)	(.0073)		
Sales Growth Rate	.009	.0377***	.0703***	-.0026	.0282***	.0309**
	(.011)	(.0087)	(.0095)	(.0094)	(.0089)	(.0123)
Return on Assets	.392***	.290***	.420***	.237***	.378***	.337***
	(.0409)	(.0313)	(.0358)	(.0304)	(.0295)	(.0439)
Tobin's Q	-.0004	.0003	-.0038***	.0047***	-.0026***	.0026*
	(.001)	(.0009)	(.0007)	(.0011)	(.0009)	(.0014)
Cash Holding	.0448*	-.0177	.065*	-.029	-.075***	.0408
	(.0268)	(.0339)	(.0338)	(.024)	(.0266)	(.0328)
Net Working Capital	-.040***	-.002	-.074***	-.009	-.016	-.040***
	(.0102)	(.0112)	(.0113)	(.0085)	(.0099)	(.0132)
Firm Size (Log)	.0044	-.0022	.0005	.0052	-.0093***	.014***
	(.0041)	(.0033)	(.0026)	(.0035)	(.0028)	(.0049)
Constant	-.0576	.0392	-.1185***	.1424***	-.1009**	-.0735
	(.0412)	(.041)	(.0414)	(.0361)	(.0399)	(.0475)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	508	412	364	539	438	467
Wald Chi^2 test statistic	233***	254***	372***	254***	332***	193***

5.0 Conclusion

This study, for the first time in Bangladesh, attempts to investigate whether CEO age, a vital personal characteristic of a CEO, has an impact on the corporate investment decisions of the firms listed in DSE. We conduct our analysis based on a hand-collected panel dataset of 119 non-financial companies listed in DSE during the period 2009-2021. We employ the Feasible Generalized Least Squares (FGLS) regression model that automatically resolves the problems of heteroscedasticity and autocorrelation.

The major finding of our paper is that there is a significant positive association between CEO age and corporate investment. To be specific, an additional 1% growth in CEO age is associated with a 4.2% increase, on average, in corporate investment, ceteris paribus. We also find that older CEOs undertake about 0.5% higher investment than younger CEOs. Furthermore, the cross-sectional heterogeneity analyses show that the positive effect of CEO age on corporate investment is more pronounced for the firms with higher managerial ownership, leverage and firm age.

These findings have important policy implications for different stakeholders of a firm including shareholders, board of directors, regulators and policy makers. For instance, shareholders can consider the age of firms' CEOs while taking investment decisions whether to buy or sell the stocks of a firm. Additionally, while appointing a CEO for a firm, the board of directors of that firm can take the age of the CEO into consideration. Finally, the regulators and policymakers may also keep the CEOs' age in mind while formulating rules and regulations for the firms.

This study can be extended by further research where future researchers can attempt to investigate whether CEO age is associated with firms' performance, risk-taking behavior, stock price crash risk, corporate governance and so on.

References

Aivazian, V. A., Ge, Y., & Qiu, J. (2005). The impact of leverage on firm investment: Canadian evidence. *Journal of corporate finance*, *11*(1-2), 277-291.

Ali, R., Rehman, R. U., Suleman, S., & Ntim, C. G. (2022). CEO attributes, investment decisions, and firm performance: New insights from upper echelons theory. *Managerial and Decision Economics*, *43*(2), 398-417.

Al Mamun, M., Balachandran, B., & Duong, H. N. (2020). Powerful CEOs and stock price crash risk. *Journal of Corporate Finance*, *62*, 101582.

Andreou, P. C., Louca, C., & Petrou, A. P. (2017). CEO age and stock price crash risk. *Review of Finance*, *21*(3), 1287-1325.

Bantel, K. A., & Jackson, S. E. (1989). Top management and innovations in banking: does the composition of the top team make a difference?. *Strategic management journal*, *10*(S1), 107-124.

Barker III, V. L., & Mueller, G. C. (2002). CEO characteristics and firm R&D spending. *Management science*, *48*(6), 782-801.

Bekos, G.& Chari, S. (2024). *Upper Echelons Theory: A review*. In S. Papagiannidis (Ed), TheoryHub Book. Available at https://open.ncl.ac.uk / ISBN: 9781739604400

Belenzon, S., Shamshur, A., & Zarutskie, R. (2019). CEO's age and the performance of closely held firms. *Strategic Management Journal*, *40*(6), 917-944.

Bennedsen, M., Pérez-González, F., & Wolfenzon, D. (2020). Do CEOs matter? Evidence from hospitalization events. *The Journal of Finance*, *75*(4), 1877-1911.

Bertrand, M., & Schoar, A. (2003). Managing with style: The effect of managers on firm policies. *The Quarterly journal of economics*, *118*(4), 1169-1208.

Bhabra, H. S., & Zhang, Y. (2016). CEO age and firm performance. In *annual meeting of the European Financial Management Association, Basel, Switzerland*.

Bouaziz, D., Salhi, B., & Jarboui, A. (2020). CEO characteristics and earnings management: empirical evidence from France. *Journal of Financial Reporting and Accounting*, *18*(1), 77-110.

Brown, R., & Sarma, N. (2007). CEO overconfidence, CEO dominance and corporate acquisitions. *Journal of Economics and business*, *59*(5), 358-379.

Chaney, T., Sraer, D., & Thesmar, D. (2012). The collateral channel: How real estate shocks affect corporate investment. *American Economic Review*, *102*(6), 2381-2409.

Chen, H. L., Hsu, W. T., & Huang, Y. S. (2010). Top management team characteristics, R&D investment and capital structure in the IT industry. *Small Business Economics*, *35*, 319- 333.

Driver, C., & Muñoz-Bugarin, J. (2019). Financial constraints on investment: Effects of firm size and the financial crisis. *Research in International Business and Finance*, *47*, 441-457.

Fazzari, S. M., & Petersen, B. C. (1993). Working capital and fixed investment: new evidence on financing constraints. *The RAND Journal of Economics*, 328-342.

Finkelstein, S., & Hambrick, D. C. (1990). Top-management-team tenure and organizational outcomes: The moderating role of managerial discretion. *Administrative science quarterly*, 484-503.

Francis, J., Huang, A. H., Rajgopal, S., & Zang, A. Y. (2008). CEO reputation and earnings quality. *Contemporary Accounting Research*, *25*(1), 109-147.

Greene, W. H. (2012), "*Econometric Analysis*", 7th ed. Upper Saddle River, NJ: Prentice Hall.

Gugler, K., Mueller, D. C., & Burcin Yurtoglu, B. (2003). The impact of corporate governance on investment returns in developed and developing countries. *The Economic Journal*, *113*(491), F511-F539.

Gupta, G., Mahakud, J., & Debata, B. (2018). Impact of CEO's characteristics on investment decisions of Indian listed firms: Does crisis make any difference?. *Cogent Economics & Finance*, *6*(1), 1439258.

Hambrick, D. C. (2007). Upper echelons theory: An update. *Academy of management review*, *32*(2), 334-343.

Hambrick, D. C., & Fukutomi, G. D. (1991). The seasons of a CEO's tenure. *Academy of management review*, *16*(4), 719-742.

Hambrick, D. C., & Mason, P. A. (1984). Upper echelons: The organization as a reflection of its top managers. *Academy of management review*, *9*(2), 193-206.

Holmström, B. (1999). Managerial incentive problems: A dynamic perspective. *The review of Economic studies*, *66*(1), 169-182.

Hossain, M. I. (2016). Effects of capital structure and managerial ownership on profitability: Experience from Bangladesh. *International journal of Business and Management*, *11*(9), 218.

Hossain, M. I., Duong, H. N., Al Mamun, M., & Docherty, P. (2023). Collateral shocks and M&A decisions. *Journal of Corporate Finance*, 102433.

Hossain, M. I., & Hossain, M. A. (2015). Determinants of capital structure and testing of theories: A study on the listed manufacturing companies in Bangladesh. *International Journal of Economics and Finance*, *7*(4), 176-190.

Huang, H. W., Rose-Green, E., & Lee, C. C. (2012). CEO age and financial reporting quality. *Accounting horizons*, *26*(4), 725-740.

Ismail, M., Mohamad, N., & Ahamat, A. (2023). Managerial capabilities, learning orientation and performance of international halal industry using upper echelon theory. *International Journal of Business and Society*, *24*(1), 119-140.

Jenter, D., & Lewellen, K. (2015). CEO preferences and acquisitions. *The Journal of Finance*, *70*(6), 2813-2852.

Jian, M., & Lee, K. W. (2011). Does CEO reputation matter for capital investments?. *Journal of Corporate Finance*, *17*(4), 929-946.

Kadapakkam, P. R., Kumar, P., & Riddick, L. A. (1998). The impact of cash flows and firm size on investment: The international evidence. *Journal of banking & Finance*, *22*(3), 293-320.

Kalmenovitz, J. (2023). Regulatory intensity and firm-specific exposure. *The Review of Financial Studies*, *36*(8), 3311-3347.

Kaplan, S. N., Klebanov, M. M., & Sorensen, M. (2012). Which CEO characteristics and abilities matter?. *The journal of finance*, *67*(3), 973-1007.

Krug, J. A., Wright, P., & Kroll, M. J. (2014). Top management turnover following mergers and acquisitions: Solid research to date but still much to be learned. *Academy of Management Perspectives*, *28*(2), 147-163.

Li, D. (2011). Financial constraints, R&D investment, and stock returns. *The Review of Financial Studies*, *24*(9), 2974-3007.

Li, X., Low, A., & Makhija, A. K. (2017). Career concerns and the busy life of the young CEO. *Journal of Corporate Finance*, *47*, 88-109.

Lima, M. M., & Hossain, M. I. (2018). Ownership structure and firm performance: Testing monitoring and expropriation hypotheses for Bangladeshi companies. *Journal of Finance and Banking*, *14*(1-2), 1-21.

Lin, F. J. (2008). Solving multicollinearity in the process of fitting regression model using the nested estimate procedure. *Quality & Quantity*, *42*, 417-426.

Loderer, C. F., & Waelchli, U. (2010). Firm age and performance. *Available at SSRN 1342248*.

Lyon, D. W., & Ferrier, W. J. (2002). Enhancing performance with product-market innovation: the influence of the top management team. *Journal of managerial Issues*, 452-469.

Malmendier, U., & Tate, G. (2005). CEO overconfidence and corporate investment. *Journal of Finance*, *60*(6), 2661-2700.

Malmendier, U., & Tate, G. (2008). Who makes acquisitions? CEO overconfidence and the market's reaction. *Journal of financial Economics*, *89*(1), 20-43.

Muttakin, M. B., Khan, A., & Mihret, D. G. (2018). The effect of board capital and CEO power on corporate social responsibility disclosures. *Journal of Business Ethics*, *150*, 41-56.

Nielsen, S. (2010). Top management team diversity: A review of theories and methodologies. *International Journal of Management Reviews*, *12*(3), 301-316.

Olson, B. J., Parayitam, S., & Twigg, N. W. (2006). Mediating role of strategic choice between top management team diversity and firm performance: Upper echelons theory revisited. *Journal of Business and Management*, *12*(2), 111-126.

Orens, R., & Reheul, A. M. (2013). Do CEO demographics explain cash holdings in SMEs?. *European Management Journal*, *31*(6), 549-563.

Pan, Y., Wang, T. Y., & Weisbach, M. S. (2016). CEO investment cycles. *The Review of Financial Studies*, *29*(11), 2955-2999.

Peni, E. (2014). CEO and Chairperson characteristics and firm performance. *Journal of Management & Governance*, *18*, 185-205.

Petrenko, O. V., Aime, F., Ridge, J., & Hill, A. (2016). Corporate social responsibility or CEO narcissism? CSR motivations and organizational performance. *Strategic management journal*, *37*(2), 262-279.

Pettus, M. L. (2001). The resource-based view as a developmental growth process: Evidence from the deregulated trucking industry. *Academy of Management Journal*, *44*(4), 878-896.

Plöckinger, M., Aschauer, E., Hiebl, M. R., & Rohatschek, R. (2016). The influence of individual executives on corporate financial reporting: A review and outlook from the perspective of upper echelons theory. *Journal of Accounting Literature*, *37*(1), 55-75.

Prendergast, C., & Stole, L. (1996). Impetuous youngsters and jaded old-timers: Acquiring a reputation for learning. *Journal of political Economy*, *104*(6), 1105-1134.

Putri, E. A., & Rusmanto, T. (2019). The impact of CEO characteristics on earnings per share and earnings management. *International Journal of Scientific and Technology Research*, *8*(10), 925-929.

Renneboog, L., & Zhao, Y. (2011). Us knows us in the UK: On director networks and CEO compensation. *Journal of Corporate Finance*, *17*(4), 1132-1157.

Scharfstein, D. S., & Stein, J. C. (1990). Herd behavior and investment. *The American economic review*, 465-479.

Serfling, M. A. (2014). CEO age and the riskiness of corporate policies. *Journal of corporate finance*, *25*, 251-273.

Setiawan, R., & Gestanti, L. (2022). CEO characteristics, firm policy, and firm performance. *International Journal of Business and Society*, *23*(1), 371-389.

Shen, Y. (2021). CEO characteristics: a review of influential publications and a research agenda. *Accounting & Finance*, *61*(1), 361-385.

Stein, J. C. (2003). Agency, information and corporate investment. *Handbook of the Economics of Finance*, *1*, 111-165.

Ting, I. W. K., Azizan, N. A. B., & Kweh, Q. L. (2015). Upper echelon theory revisited: The relationship between CEO personal characteristics and financial leverage decision. *Procedia-Social and Behavioral Sciences*, *195*, 686-694.

Umutlu, M. (2010). Firm leverage and investment decisions in an emerging market. *Quality & Quantity*, *44*, 1005-1013.

Yim, S. (2013). The acquisitiveness of youth: CEO age and acquisition behavior. *Journal of financial economics*, *108*(1), 250-273.

Zarzeski, M. T. (1996). Spontaneous harmonization effects of culture and market forces on accounting disclosure practices. *Accounting horizons*, *10*(1), 18.

Zhang, Y. (2010). *CEO age and firm performance* (Doctoral dissertation, Concordia University). Available at https://spectrum.library.concordia.ca/id/eprint/979459/

Appendix: Definitions of Variables

Variable	Definition
Dependent Variable:	
CAPEX	Capital expenditure / Total assets
Key Independent Variables:	
CEO Age (Log)	Natural logarithm of the age of a CEO of a firm
CEO Age Dummy	An indicator variable taking the value of one (zero) if a CEO's age is above (below) the median CEO age value of the sample in every year
Control Variables:	
Cash Holding	Total Cash / Total Assets
Firm Age (Log)	Natural logarithm of a firm's age in years since its establishment
Firm Size (Log)	Natural logarithm of Total Assets
Leverage	Total Debt / Total Equity
Managerial Ownership	Percentage of shareholdings by sponsors, directors, CEOs and managers of a firm
Net Working Capital	(Current Assets – Current Liabilities) / Total Assets
Return on Assets	Earnings Before Interest & Tax / Total Assets
Sales Growth Rate	(Current Year Sales - Previous Year Sales) / Previous Year Sales
Tobin's Q	Market Value of Equity / Book Value of Equity [Assuming market value and book value of Liabilities are equivalent]