

Effect of Firm Size and Firm Age on Profitability: A Study of Listed Industrial Goods Firms in Nigeria (2013-2022)

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Abstract

The profitability of firms plays a crucial role in determining their financial success and sustainability in the marketplace. Within the context of industrial goods firms in Nigeria, there is a need to investigate how firm size (FSZ) and firm age (AGE) influence profitability (ROA). Thus, the study was specifically designed to establish the effect of firm age and firm size on the profitability of listed industrial goods in Nigeria. The study used an ex-post facto research design to analyze 13 listed industrial goods firms on the Nigerian Exchange Group. Purposive sampling was used to select firms with complete financial statements and relevant research variables. Time series data was obtained from the firms' financial statements and the NGX Group fact book for the period 2013 through 2022. Using regression analysis to test the effect of FSZ and AGE on ROA, the findings showed that FSZ (size) does not have a statistically significant effect on ROA, but the age of the companies (AGE) shows a significant positive relationship with ROA. It is recommended that the management of listed industrial goods firms recognize the value of experience and longevity in the industry and leverage it to enhance ROA and redirect their focus towards improving efficiency and productivity by embracing initiatives aimed at optimizing operations, streamlining processes, and maximizing resource utilization.

Keywords: Firm age, firm size, financial performance, profitability, return on asset,

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1.0 Introduction

The profitability of firms plays a crucial role in determining their financial success and sustainability in the marketplace. The profitability of firms can vary based on several factors such as firm size and firm age. Generally, large companies can afford to have relaxed policies on inventories and account receivables since they have access to external funding and fewer borrowing limitations (Hill et al., 2010). Larger companies have higher sales volumes and, therefore, need bigger investments in working capital. They also have sophisticated bargaining power with creditors and customers and tend to be more diversified (Moussawiet al., 2006). These large companies tend to enjoy the benefits of economies of scale, which are associated with the long-run phenomenon of a reduction in average cost as output capacity is increased (Dwevidi, 2006). This could increase their profitability. Older firms may have accumulated knowledge, experience, and established processes over time (Okunbo & Oghuvwu (2019). This can lead to improved operational efficiency, reduced costs, and higher profitability through the optimization of production processes, supply chain management, and organizational practices. But younger firms are often more agile and adaptable to market changes (Sebastian, et al., 2020). They may introduce innovative products or services, leverage emerging technologies, and respond quickly to customer demands, which can lead to competitive advantages and higher profitability.

Despite advances in understanding the effect of both firm age and firm size on profitability, the findings have not yet reached maturity due to the ambiguity of existing theories and empirical data. The scarcity of data on firm age in administrative databases or surveys is one explanation for this (Coad et al., 2013). It is also likely that the firm age and size-profitability connection is country-specific and is influenced by a variety of institutional variables (Selcuk, 2016). Firms, on the other hand, may deteriorate with time and lose their ability to compete in the market which might be due to increased size. According to Loderer et al. (2011) if profitability falls as companies' age and perhaps size, it explains why the majority of them are finally taken over. However, aging may actually help companies become more efficient as they learn what they are

excellent at and how to execute things better through time. The link between firm age and profitability is debatable. Studies by Akinyomi and Olagunju (2012), Halil and Hasan (2012) have shown a positive and substantial link between age and profitability, while others like that of Dogan (2013) and Coad et al. (2013) have found a negative relationship. Also, researches into the effect of firm size on profitability yielded both positive and negative result. For example, Adeyemi et al. (2022), Rahman and Liu (2021) found positive result while Jurna (2020) and many more found negative outcome. The discussion has become inconclusive and as a result of this varied reactions, establishing the effect of firm size and firm age on profitability was important for both theory and practice.

Thus, this study is specifically designed to establish the effect of firm size and firm age on the profitability of selected industrial goods firms in Nigeria.

2.0 Literature Review and Conceptual Framework

Firm Size

Firm size encompasses a firm's production capacity and service offerings. Larger firms enjoy advantages in obtaining loans due to better credit ratings, lower bankruptcy risk, and skilled human resources (Levine & Robert, 1985; Ferrando & Mulier, 2013). They benefit from strategic diversity, negotiation power, and enhanced profitability through pricing advantages (Akbas & Karalduman, 2012). Notably, size strongly impacts performance and shareholder rights (Chi & Choi, 2017; Anton & Nucu, 2021). Thus, firm size is a crucial determinant of performance, reflecting its impact on financial strength and strategic advantages.

Firm Age

Firm age pertains to the duration of a company's existence, with the option of using establishment or listing age as a defining measure (Ilaboya & Ohioka, 2016). As in living beings, aging might affect a company's competitiveness and functioning (Loderer & Waelchli, 2010). The impact of firm age on financial performance intrigues researchers across disciplines, leading to debates on the optimal basis for measuring age. Ilaboya and Ohioka (2016) advocate for listing age due to its significance in a firm's life, favoring year of incorporation as the chosen metric

Concept of Profitability

Profitability is one of the factors that indicates the effectiveness and efficiency of a firm in achieving its goals or making profits (Karamoy&Tulung, 2020). Alternatively, it is defined as the achievement of the firm's financial goals for a certain period covering the collection and allocation of finance (Fatihudin et al.,2018). It covers the firm's ability to manage and control resources at its disposal and indicates how well a firm is utilizing its resources to maximize the shareholder's wealth and profitability. Nazl etal. (2016) asserted that profitability reflects business sector outcomes and results that indicate overall financial health of the sector over a determined time period. It may also be described as a company's capacity to generate higher growth through sales and value of a business entity for its shareholders through managing its current and non- current assets, financing, equity, revenues and expenses.

2.1 Empirical Review

Firm Size and Profitability

In a series of studies conducted by different researchers, various aspects of the relationship between firm size and profitability among different industries and regions were explored. Adeyemi et al. (2022) studied Nigerian FMCG companies from 2008 to 2019, employing multiple regression analysis to explore firm size's impact on performance measured by return on shareholders' funds. Their findings revealed a positive relationship, indicating that larger-sized companies experience higher returns on shareholders' funds. Rahman and Liu (2021) investigated China's stock market, using data from 2008 to 2018, to explore firm size's impact on profitability. Employing a fixed effects model, they found a positive link between firm size and profitability, indicating larger firms tended to have higher profitability levels, consistent with international findings. Widhiaslutis (2021) examined Indonesian real estate companies using secondary data and a structural equation model, finding a significant positive impact of firm size on profitability, though there were concerns about the model's use of raw data. Jurnal (2020) studied Indonesian manufacturing firms listed on BEI (2016-2018). Using Eviews software, they found a non-significant negative relationship between firm size and financial performance,

suggesting larger firms didn't significantly outperform smaller ones in terms of financial performance.

Firm Age and Profitability

Several studies have delved into the intricate relationship between firm age and profitability across different regions and industries. Aribaba et al. (2022) focused on Nigeria's oil and gas sector, revealing a positive association between firm age and financial performance through pool and cross-sectional data techniques, while acknowledging the context of pre and post-economic downturn periods. Nyamiobo et al. (2018) explored the Nairobi Security Exchange (NSE) context, demonstrating firm age's significant contribution to financial performance through multiple regression analysis; however, the potential for correlated dependent variables should be considered. In the context of Turkey, Haykir and Celik (2018) investigated family-owned non-financial firms on Borsa Istanbul, finding a negative effect of firm age on profitability through correlation and regression analysis, though ANOVA might have provided a more robust approach. Similarly, in the Croatian food industry, Pervan et al. (2017) utilized dynamic panel analysis to highlight a negative relationship between firm age and profitability. Lastly, in Turkey, Selcuk (2016) studied Turkish firms on Borsa Istanbul, revealing a negative and convex relationship between firm age and profitability through fixed effect model analysis, while acknowledging the potential for conservative estimates in such models. These diverse studies collectively contribute to our understanding of the complex interplay between firm age and profitability, offering insights across different methodologies, industries, and regions.

2.2 Theoretical Framework

This study is anchored on the basis of technological and learning by doing theory:

Technological Theory

The technological theory of firm size, proposed by McConnell (1979), assumes that firms adapt to external factors based on goals. Firm size is influenced by market size, driving specialization, and larger firms employ specialized employees (Kumar & Kaur, 2016). This theory suggests that larger, specialized firms with efficient resource allocation and adaptability may experience enhanced profitability.

Learning- by -Doing Theory

The "learning by doing" theory of firm age, proposed by Arrow (1962), assumes firms acquire knowledge through experience. It posits that firms' efficiency improves with experience, encouraging growth. In this context, firm age corresponds to increased efficiency and potentially higher profitability due to accumulated knowledge and expertise.

3.0 Methodology

This study used ex-post facto research design. The research design was regarded as suitable design for this study because the existing data on firm size, firm age and profitability (proxy by return on asset) were not subject to the researcher's manipulations since they are already in existence. The population of the study is the thirteen (13) listed industrial goods firms on the Nigerian Exchange Group Plc. (NGX Group) as at December, 2022. Purposive sampling technique was used to select the firms considered in this study based on the criteria that; the firm must remain listed on the Nigerian Exchange Group Plc. (NGX Group) during the 2013 – 2022 periods; and that the firm must have complete financial statements with data on the research selected variables for the period under review. Based on this criterion, a total of five (5) listed industrial goods firms (i.e. Berger Paints Plc., Dangote Cement Plc., Lafarge Africa Plc., Portland Paints & Products Nig. Plc., and Beta Glass Plc.) were selected for the study. The study utilized secondary data which consists of both time series and cross-sectional data (expressed using ratios to enhance the analysis) which were generated from the financial statements of the five selected listed industrial goods firms and the Nigerian Exchange Group Plc. (NGX Group) fact- book for the period 2013 to 2022 (i.e. 10 year period). Multiple regression models were employed to evaluate the hypothesis. The model's equation is given below:

Panel Regression Model:

$$ROA = f(FSZ, FA) \quad - \quad - \quad - \quad - \quad i$$

$$ROA_{it} = \beta_0 + \beta_1 FSZ_{it} + \beta_2 FA_{it} + \varepsilon_{it} \quad - \quad - \quad ii$$

Where:

ROA = Return on Asset

FSZ = Firm Size

FA = Firm Age

The variables and proxies employed in this study were adopted from prior studies and are presented in the table below:

Table 1:

Measurements of Variables

Type of Variables	Indicators	Measurements	Sources
Dependent Variables	Profitability		
	Return on Asset (ROA)	Net Profit after Tax / Total Assets	Kabajeh et al. (2018)
Independent Variables			
	Firm Size (FSZ)	Natural (Ln) of Total Assets	Kawakibi&Hadiwidjoja (2019)
	Firm Age (FA)	Natural (Ln) of Age	Haykir&Celik (2018)

Source: Researcher's Computations (2023)

4.0 Results and Discussions

Descriptive Statistics

Table 2 presents the descriptive statistics of the entire variables (i.e. return on asset, firm size, and firm age as represented by ROA, FSZ, and FA respectively) for the five (5) industrial goods firms for the period 2013-2022.

Table 2:

Descriptive Statistics

Variables	Mean	Median	Minimum	Maximum	Standard Dev.
ROA	0.281	0.281	0.008	0.596	0.178
FSZ	22.34	22.235	0.019	36.75	5.592
AGE	40.74	37	19	60	12.882

Source: Stata Output Result (2023)

It has been observed that there exist no missing values on the datasets for all the variables that have been used for this analysis. This connotes that the data is accurate for meaningful analysis and inference. The mean and median of ROA are very close, indicating a relatively symmetrical distribution. The average return on assets is 0.281, which suggests that, on average, the companies generate a return of 28.1% on their assets. The standard deviation from the mean was 0.178 which means the ROA is stable for the period under review. The minimum value of ROA was 0.008 while the maximum was 0.596 which means there were some firms that didrealized very low profitability in the industry.

The mean value for firm size (FSZ) was 22.34 while the median value was 22.235 suggesting the absence of outliers in the dataset. The standard deviation of 5.592 indicates a moderate level of variability in the firm size values. The minimum value of FSZ was 0.019 while the maximum was 36.79 which means that some firms are relatively small in size compared to most of the studied firms.

The mean value for firm age (AGE) was 40.74 with a median value of 37also signifying the absence of outliers. The standard deviation from the mean was 12.882 which proves consistency in data sets. The minimum value of AGE was 19 while the maximum value was 60 which indicates that some firms included in the analysisare relatively new in the industry while others have longer years of operations in the industry.

Test of Multi-collinearity

The existence of multicollinearityamong the variables was further confirmed through VIF test. The result of which is shown in table 3 below:

Table 3:*Collinearity Test*

Variables	VIF
FSZ	1.455

AGE 1.427

Source: Stata Output Result (2023)

Table 3 presents the Variance Inflation Factor (VIF) to detect colinearity issues. The Variance Inflation Factor (VIF) was used to evaluate co linearity of the indicators. VIF values of 5 or above indicate critical co linearity issues among indicators of formatively measured construct (Hair et al., 2018). From the analysis carried out, all the VIF values for all the indicator variables – firm size (FSZ) and firm age (AGE) are less than the threshold of co linearity issue. This means that there is no issue of co linearity among the variables suggesting the absence of overlapping variables.

Table 4:

Predictive Relevance of the Model

Model	R ²	R ² Adjusted	Std. Error Estimate
ROA	0.557	0.46	0.2814

Source: Stata Output Result (2023)

The R-squared (R²) value measures the proportion of the variance in the dependent variable that can be explained by the independent variable(s) in a regression model. In this case, the R² value for the model predicting ROA is 0.557. This means that approximately 55.7% of the variance in ROA can be explained by the independent variable(s) included in the model.

The R-squared adjusted (R² adjusted) value takes into account the number of independent variables and the sample size to provide a more conservative estimate of the model's explanatory power. It penalizes the R² value for the inclusion of irrelevant or redundant variables. In this case, the R² adjusted value is 0.46. This indicates that after adjusting for the number of independent variables and the sample size, approximately 46% of the variance in ROA can be explained by the independent variable(s) in the model.

The standard error of estimate (Std. Error Estimate) measures the average distance between the actual values of the dependent variable and the predicted values by the regression model. In this

case, the standard error estimate is 0.2814. A smaller standard error estimate suggests that the model's predictions are closer to the actual values of ROA.

In summary, the R^2 value of 0.557 suggests that the independent variable(s) in the model explain a substantial portion of the variance in ROA. The R^2 adjusted value of 0.46 takes into account the model's complexity and provides a more conservative estimate. The standard error estimate of 0.2814 indicates that, on average, the predicted values by the model are within 0.2814 units of the actual values of ROA.

Table 6:

Test of Hypotheses

Hypotheses	Coefficient	Std. Error	t-Statistics	Prob.
C	40.90	7.88	2.944	0.003
FSZ → ROA	- 0.033	1.44	0.295	0.768
AGE → ROA	0.4	2.60	4.454	0.000

Source: Stata Output Result (2023)

The intercept term (C) of the regression line indicates the value of the dependent variable (ROA) when all independent variables (FSZ and AGE) are set to zero. In this case, the intercept value is 40.90. The statistically significant t-statistic of 2.944 and the p-value of 0.003 suggest that the intercept has a significant impact on the ROA. Therefore, when both FSZ and AGE are zero, the expected value of ROA is 40.90. The coefficient for FSZ (Size) on ROA is -0.033. However, the non-significant t-statistic of 0.295 and the p-value of 0.768 indicate that there is insufficient evidence to conclude a significant relationship between FSZ and ROA. In other words, the size of the company (FSZ) does not have a statistically significant impact on the ROA. The finding is in line with that of Adeyemi et al. (2022), Widhiastuti(2021), and Rahman and Celik (2019) but inconsistent with Jurnal (2020). This finding also aligns with technological theory since the technological theory of firm size concurs with the idea that firm size may not necessarily yield a significant impact on profitability. The theory acknowledges that profitability is influenced by

factors beyond size, such as specialization, resource allocation, and adaptability, indicating that size alone might not ensure a pronounced effect on profitability.

The coefficient for AGE on ROA is 0.4. The significant t-statistic of 4.454 and the p-value of 0.000 provide strong evidence to reject the null hypothesis and conclude that there is a statistically significant positive relationship between AGE and ROA. On average, for each unit increase in AGE, ROA is expected to increase by 0.4 units. Also, the findings indicated that the age of the company (AGE) shows a significant positive relationship with ROA. These findings highlight the importance of considering the age of the company when analyzing its Return on Assets. The finding is consistent with that of Aribaba et al. (2022), Nyamiobi et al. (2018), but inconsistent with Haykir and Celik (2018), Pervan et al. (2017) and Selcuk (2016). The finding is supported by the learning by doing theory since the learning by doing theory aligns with the assertion that the age of a firm can have a positive effect on profitability (ROA). This theory posits that firms accumulate knowledge and expertise over time through experience, which can lead to increased efficiency and improved performance. If the assertion implies that older firms have had more time to accumulate knowledge and improve their operations, then the learning by doing theory supports the idea that firm age can positively impact profitability.

Conclusion

Based on the finding of this study, it can be concluded that firm size (FSZ) does not have significant effect on profitability (ROA), implying that the size of the company does not have a significant impact on ROA in the given model; while firm age had significant positive effect on the profitability of listed industrial goods firms in Nigeria.

Recommendations

Hence, it is recommended that:-

- 1) Management should recognize the value of experience and longevity in the industry and leverage it to enhance ROA. They can consider implementing strategies that capitalize on the company's established reputation and knowledge gained over time; and

- 2) Since size does not appear to be a significant driver of ROA in this analysis, the firm can redirect its focus towards improving efficiency and productivity. Emphasize initiatives aimed at optimizing operations, streamlining processes, and maximizing resource utilization. This could involve implementing lean practices, investing in automation or technology, and continuously monitoring performance indicators related to efficiency and productivity.

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