



# Comprehensive Analysis of Critical Determinants of Profitability of Manufacturing Firms in Nigeria

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**ABSTRACT:** This study examined the determinants of profitability of manufacturing firms in Nigeria. The study adopted time series data of 11 years collected from 12 manufacturing firms listed on the Nigeria stock exchange for analysis. To achieve the objectives, panel data was used, the unit root and cointegration tests were carried out including the Hausman test to check whether random or fixed effect was the best suitable for the study. The random effect result showed that firm size and exchange rate have positive impact on profitability of manufacturing firms in Nigeria given the positive signs of their coefficients. This result is in line with a priori expectation, meaning that an increase in firm size and exchange rate by one percent, resulted in an increase in profitability by 1.49 and 0.013 percent respectively ceteris paribus. The results have also shown that, due to the negative indications of their coefficients, company age and inflation rate all had a detrimental effect on profitability. This result is also consistent with the theoretical expectations, showing that a one percent increase in firm age and inflation resulted in a decrease of profitability by 1.027 percent and 0.419 percent respectively all other things being equal. Judging from the probability values of 0.2845 for FAGE and 0.6906 for EXCH respectively show that they are not statistically significant because their probability values are respectively greater than 5 percent (0.05) level of significance. Instead, the probability values of 0.0000 for FSIZ and 0.0002 for INF shows that they are statistically significant because their probability values are less than 5% level of significance. The adjusted R-squared (R<sup>2</sup>) of 0.549 shows that about 55 percent of the variation in the dependent variable is explained by the independent variables. This indicates that the model has a moderate explanatory power. The Durban-Watson value is 1.64 may be judged to mean that there is no problem of autocorrelation in the model.

**KEYWORDS:** Profitability Aspects, Exchange Rate, Stocks, Return Assets, Statistical Analysis, Manufacturing Sector, Nigeria.

## INTRODUCTION

The majority of corporate organizations have wealth development and profit maximization as their main goals. These groups could also consider other secondary goals to be significant. How much and how regularly an organization can create profit is sometimes used to determine its level of success. However, profit and profitability are two distinct concepts, although related.

Every corporate organization's primary goal is to maximize profits, and manufacturing organizations are no exception. It is impossible to maximize shareholder wealth without making a profit. Making a profit guarantees the business's survival. Any business's ability to remain in operation and make a profit depends on its profitability. As a result, it serves as the company's engine. A company's ability to make profits determines how long it will remain in business, and this is viewed to be the primary element affecting the company's reputation. While profitability is a relative idea, profit is an absolute phrase. Profitability is simply the ability to make profits. So, a firm is profitable if it is able to achieve excess revenue over cost, or better put, more revenue than cost of operations (Yana, 2010).

A company's success is influenced by a number of factors, including intangible, external, and internal assets. These variables are what is seen as the determinants of profitability of manufacturing firms, and these includes cost of capital, firm's age, sources of funds, the environment in which the business is located, the technology adopted, size of firms, management style, financial leverage, availability of resources, cost of production, product innovation, taxation, exchange rate, interest rates, inflation rate, etc. The list is endless because the manufacturing sector is complex, as such, one factor cannot determine its profitability.

But for the sake of this study, "Return on Assets" (ROA) will be used as reliant on variable and as proxy for profitability, while size of the firms and firms age will be used as targeted variables and exchange rate and inflation rate as control variables. One of the key variables that determines a firm's success is its size, which in particular reveals the profitability of the enterprise (Oyelade, 2019). The goal of the companies has always been to grow in order to get an advantage over their rivals. Mule, *et al.* (2015) opined that difference in size could disturb the performance of firms in various ways. For big businesses, the profitability of the company is primarily influenced by factors such as the degree of administrative process simplification, the capacity to take advantage of economies of scale, the diversity of business operations, and the ability to exploit a wide market. Compared to small businesses, big businesses may enhance productivity by taking advantage of economies of scale (Liu, 2018). Large businesses so often operate more effectively than small businesses due to economies of scale. The government expects business growth to increase access to finance, use cutting-edge technology, and generate high-quality employment at a reasonable cost. These are all hampered by the modest size of the company.

The majority of scholars agree that business age influences both growth and profitability (Muhammad & Shahimi, 2013). They believe that as a company becomes older, its risk rate will decrease and its chances of surviving would rise. Because young businesses are frequently viewed as lacking the management resources and experience necessary to attain economies of scale, this statement may be deemed correct. On the other hand, several academics expressed contradictory opinions, claiming that older businesses lack the flexibility to quickly adapt, posing obstacles to innovation and financial success. Their inability to adapt due to their organizational rigidities prevents them from growing since most businesses continue to operate with antiquated machinery, plants, and other equipment that restricts their capacity for innovation.

Nevertheless, studies investigating the age of firms failed to provide solid proof of a connection between age measurement and profitability. Several studies like Muhammad & Shahimi (2013) used different variables to measure firm age. However, the majority of literature defines firm age as the duration of a business's existence. Another factor to consider is the duration of the business after its listing on the stock market. It is also crucial to remember that a high exchange

rate will cause inflation, which will raise production costs and decrease consumer demand for produced products since the majority of the machinery and raw materials used in manufacturing are imported.

Examining the elements that determine manufacturing facilities firms' profitability is relevant given the fundamental challenges that businesses face in this era of artificial intelligence (AI) and widespread technological advancement and modernization. This will enable businesses to focus on their comparative advantage. Specifically, this study is aimed at determining the profitability of manufacturing firms listed in the Nigerian stock exchange.

### **STATEMENT OF PROBLEM**

Many Nigerian businesses have underperformed compared to expectations when it comes to profitability, total production, revenue creation, and innovation. The current financial climate and high manufacturing costs may be to blame for this poor result. Many of these businesses cannot get loanable cash since borrowing is expensive. The economic climate is still highly unfavorable, and many companies regardless of how long they have been in operation are experiencing a decline in their profit margins.

In comparison to other nations that were at the same stage of development as Nigeria throughout the 1960s and early 1970s, such as Singapore, Malaysia, Indonesia, and South Korea, Nigeria's manufacturing sector's yearly growth rate as a proportion of GDP is negligible. Empirical data indicates that, despite manufacturing's generally acknowledged significance to the process of progress, its innate potential has not been fully realized for the advancement of the Nigerian economy. The available statistical data indicates that the manufacturing industry in Nigeria has not performed well throughout the years. Nigeria's manufacturing sector component declined gradually on average from 11.8 percent in 1982 to 7.4 percent in 1997, remaining at about 6 percent from 1998 to 2010, despite the country's overall real Gross Domestic Product (GDP) growing consistently over time. After that, it increased slightly to 10% in 2011 before dropping to 9.5 percent in 2015. The average percentage between 2016 and 2020 was 8.7% (Udo,2021).

In an attempt to rescue the manufacturing industry from these challenges, and create a favorable environment for them to thrive, several governments have introduced and implemented several policies, including the recent growth plan of 2017 to 2020 which was introduced to assist the ease of doing business and fast track the growth of the economy. Implementing the "Nigerian Industrial Revolution Plan" (NIRP), fostering innovation and technologically driven businesses, and encouraging the growth of resource-processing industries are a few of the plan's major industrial strategies. The issue persisted even after subsequent governments used a combination of these policies. Despite the fact that several academic works have differing opinions about the factors influencing a company's profitability. In the light of the above, it is imperative to carry out a study on which variable(s) influence profitability of manufacturing firms in Nigeria.

### **OBJECTIVE OF THE STUDY**

The general objective of this study is to investigate the determinants of profitability of manufacturing firms in Nigeria. The specific objectives are to:

1. Analyze how firm size affects the profitability of Nigerian listed manufacturing companies.

2. Define the impact of firm's age on the profitability of listed manufacturing firms in Nigeria?

### EMPIRICAL LITERATURE

In this section, the review of empirical literature is carried out with respect to the determinants of effectiveness of manufacturing firms. Specifically, the literature was reviewed based on the following sub-heading: (i) firm size and profitability of firm, and (ii) firm age and profitability of firm.

#### *Firms' size and profitability*

A link or interaction with size exists anywhere there is profit. Segun and Olufemi (2017) concluded that there is a bidirectional causal relationship between firm size and profitability in Nigeria's manufacturing sector. The study examined 45 financial publicly traded companies in Nigeria using the novel and recently introduced "panel vector autoregressive" (PVAR) along with two-step mechanism "generalized method of moments" (GMM) methods.

In the same vein, the work of Mule, *et al.* (2015) investigated how Kenyan business size affects market value and profitability. Information was gathered from businesses that participated in the Nairobi Securities Exchange (NSE) from 2010 to 2014. The empirical estimates were performed using the multiple regression and panel correlation techniques. The findings show a significant positive relationship between company size and profitability, or return on equity, meaning that, under all other conditions, an increase or decrease in firm size increases the return on equity of companies outlined at the Nairobi Securities Exchange by 0.012. However, firm size only marginally positively predicts profitability, or return on asset. Furthermore, the findings indicate that, under the random impact specification, corporate size had no statistically significant influence on market value.

Also, Lydia (2015) carried out research on how financial leverage and the profitability of companies listed on the Nairobi Securities Exchange relate to one another. Descriptive research approach was adopted in the study. The study's population included 64 listed enterprises during a five-year period. The association was shown using descriptive statistics. Larger companies are less likely to file for bankruptcy than smaller ones, according to the study's conclusion. This is because they have more advantages from diversification. This suggests that bigger businesses have the opportunity to take on more debt in order to strengthen their capital structure since they incur lower bankruptcy costs. They may also benefit from less market volatility and easier access to additional funding as a result of this. Because of this, a firm's capital structure is largely determined by its size, and size and profit are constantly related to one another.

Akbas and Karaduman (2012) used the panel data approach to examine the impact of company size on the profitability of manufacturing businesses represented on the Istanbul Stock Exchange between 2005 and 2011. Return on Assets was used to determine profitability, whereas total assets and total revenues were used as substitutes for company size. The study findings indicate that the profitability of Turkish manufacturing enterprises was positively correlated with company size. Salawu, *et al.* (2012) examined the impact of company size on corporate performance in relation to financial policy and firm-specific factors. The research used panel data from 70 businesses between 1990 and 2006. The evaluation has made use of the Fixed Effect Model, the Generalized Method of Moment panel model, and Pooled OLS. Their results showed a negative correlation between enterprises' performance and their size, expansion, and foreign direct investment.

The work of Babalola (2013) studied the impact of the company's size on the profitability of manufacturing businesses listed on the Nigerian Stock Exchange. The research covered the years 2000–2009 and was conducted using a panel data analysis approach. Return on Assets was used to gauge profitability, while total assets and total revenues were used to approximate company size. The findings showed that the profitability of Nigerian manufacturing enterprises is positively impacted by company size, as measured by total assets and revenues.

#### *Firm age and profitability*

Age of the firm is one of the non-financial factors in explaining and predicting the profitability of companies and it is measured by taking difference between observation and establishment year of the company and thereafter taking natural logarithm of the outcome (Malik, 2011). The belief that firms age determines profitability of firm has over the years generated heated debate. In the words of Claudio and Urs (2009), they considered that as companies mature, they learn more about their capabilities and how to accomplish things more effectively. Furthermore, Muhammad and Shahimi (2013), affirms that the experience and expertise a business has gathered since its founding is represented by its age. It is thus believed to have an impact on business performance. As a result, it is believed that a company's age increases its profitability. However, contrary to the opinion of Muhammad and Shahimi (2013), Osunsan, *et al.* (2015) stated that older businesses lack the flexibility to respond quickly, lower obstacles to innovation, and turn a profit because of organizational rigidities that impede development by making changes more difficult to implement over time. As a result, as the businesses age, they have weaker.

Ilaboya and Ohiokha (2016) examined the correlation between the size, age, and profitability of the 202 listed businesses that were traded on the Nigerian stock exchange as of 2014. Information was gathered between 2006 and 2012. For the research, the panel data technique of analysis was used. The research discovered a strong correlation between profitability, business size, and age. According to the research, management should work to grow the company's operations and, therefore, its size in order to increase its appeal and reputation.

Osunsan, *et al.* (2015), conducted research on Firm Age and Performance in Kampala, Uganda: A Selection of Small Business Enterprises. The purpose of this research was to determine how company age affected performance employing both nonfinancial (operational performance indicators) and financial (net profit before tax) metrics for performance. The survey design utilized was cross-sectional, descriptive correlation, ex post facto, and descriptive comparison. There were 409 enterprises in the sample, and the age ranges fell into six groups. Cronbach's Alpha reliability coefficient test yielded a content validity proportion of 0.93 for the accuracy of the instrument. Two hypotheses were tested: (i) firm age and performance level vary significantly, and (ii) firm age and performance have a substantial positive association. The hypothesis that there is a statistically significant positive correlation between firm age and performance was rejected by the study's conclusion.

Elif (2016) examined the effect of company age on Turkish companies listed on Borsa Istanbul's profitability. A model with fixed effects with strong standard errors was developed using a dataset that included 302 non-financial enterprises annually on average and covered the years 2005 to 2014. The findings indicate that the profitability of a company, as determined by ROE, return on assets, or gross profit margin, is negatively and convexly correlated with its age. Haykir and Celik (2018) examined the relationship between age and company performance by examining family-run businesses in underdeveloped nations like Turkey. The



research used 38 listed and non-financial family-owned businesses using ordinary least squares to estimate the years 2008–2016. Profitability as a stand-in for company effectiveness. Income before interest and taxes divided by total assets is the definition of profitability. Consequently, the research reveals a convex link between family-owned businesses' profitability and age, indicating that younger businesses make more money up to a certain age. Older businesses outperform younger enterprises after they reach that age level. When additional control variables like debt ratio, asset turnover, and liquidity are included and the result is checked for heteroscedasticity, the conclusion becomes more reliable.

### **THEORETICAL FRAMEWORK**

In 1959, Modigliani and Miller proposed the traditional theory of the company. The theories of classical economics like David Ricardo and Leon Walras served as the foundation for the theory. Traditional theories of firms are predicated on the core tenet that their owners and employees have access to quality information that allows them to optimize earnings. These theories strive to maximize profits.

According to the theory, businesses want to maximize profits since doing so will allow owners and managers to increase their own dividends, bonuses, and wages. They will look for ways to reduce expenses while determining the pricing and production level that would optimize earnings. Additionally, the proponents claimed that a corporation used marginal analysis to maximize profits. In other words, profit occurs at an output when marginal cost and marginal revenue are equal. Better still, that profitability is attained when other factors like firm size, age of the firm, cost of production and some macroeconomic variables are considered.

However, this theory has been challenged on a number of grounds, including the notion that a company's objectives should not be limited to maximizing profits; these could also include maximizing sales, maximizing market share, corporate social responsibility (such as protecting the environment), and co-ops that aim to enhance the welfare of society as a whole. Furthermore, such marginal approach to businesses does not exist in the actual world. Critics contend that businesspeople lack the skills and time necessary to calculate marginal costs and earnings. They often use arbitrary "rules of thumb" such average cost-plus profit margin.

### **RESEARCH GAP**

This study derives its model from the work of Eitokpa (2015), but with the inclusion of variables such as exchange rate and inflation rate, but expunged liquidity ratio. This study also extends its scope to 2021 and increased the number of firms to 12 to capture the recent and trending issues in the determination of profitability of manufacturing firms. These new-variables introduced, the category of firm used and the time scope differentiate this work from other literature reviewed above. Hence, the absence of empirical literature on the relationship between these variables and the time scope is a gap in empirical literature that this study is out to fill. This gap in the literature provides the basis for the conduct of this study. Hence, the study will attempt to address this gap through the use of data from 12 manufacturing firms registered in the Nigerian stock exchange from 2011 to 2021.

#### *Target Population and Sample of the Study*

The population of the study consists of all 12 manufacturing firms listed on the Nigeria Stock Exchange. The use of listed manufacturing firms can be justified based on availability and reliability of data. This study focused on the investigation of main factors that drive the profitability of listed manufacturing firms in Nigeria. The entire population of 12 listed

manufacturing firms were selected as the sample size of the study. The population and sample of the study are shown in Table 1 and Table 2 respectively.

**Table 1: Listed manufacturing firms (Population)**

| S/N | FIRM NAME                                |
|-----|--|
| 1   | Cadbury Nigeria Plc                      |
| 2   | Champion Breweries Plc                   |
| 3   | GlaxoSmithKline Consumer Plc             |
| 4   | Julius Berger Nigeria Plc                |
| 5   | Lafarge Africa Plc                       |
| 6   | NASCON Allied Industries Plc             |
| 7   | Neimeth International Pharmaceutical Plc |
| 8   | Nestle Nigeria Plc                       |
| 9   | Nigerian Breweries Plc                   |
| 10  | Nigerian Enamelware Plc                  |
| 11  | Pharma-Deko Plc                          |
| 12  | PZ Cussons Nigeria Plc                   |

[Source: Nigerian Stock Exchange 2023]

**Table 2: Sample of the study**

| S/N | FIRM NAME                                | YEAR LISTED ON NSE |
|-----|--|--------------------|
| 1   | Cadbury Nigeria Plc                      | 1965               |
| 2   | Champion Breweries Plc                   | 1974               |
| 3   | GlaxoSmithKline Consumer Plc             | 1971               |
| 4   | Julius Berger Nigeria Plc                | 1970               |
| 5   | Lafarge Africa Plc                       | 1959               |
| 6   | NASCON Allied Industries Plc             | 1973               |
| 7   | Neimeth International Pharmaceutical Plc | 1957               |
| 8   | Nestle Nigeria Plc                       | 1961               |

|    |                         |      |
|----|-------------------------|------|
| 9  | Nigerian Breweries Plc  | 1946 |
| 10 | Nigerian Enamelware Plc | 1960 |
| 11 | Pharma-Deko Plc         | 1969 |
| 12 | PZ Cussons Nigeria Plc  | 1948 |

[Source: Nigerian Stock Exchange 2023]

### Source of Data Collection

This study used secondary data. The secondary data were extracted from the Annual Report, annual audited financial statements and publications of these companies and Nigerian Stock Exchange fact book of sampled manufacturing firms for the period under study. The researcher gathered data from the financial statements on the amount of current assets, current liabilities, liquid assets, total asset, total equity, and shareholder's fund, Earnings before Interest and Tax (EBIT), and total long-term and short-term debt.

### Model Specification

Following the theories and empirical literature reviewed, a linear regression model was formulated to test the hypotheses of the determinants of profitability of manufacturing firms listed in Nigeria stock exchange. The model is anchored on the traditional theory of the firm. The model is formulated thus:

$$ROA_{it} = f(\beta_1 FSIZ_{it}, \beta_2 FAG_{it}, \beta_3 EXCH_{it}, \beta_4 INF_{it}) \quad \dots (1)$$

$$ROA_{it} = \beta_0 + \beta_1 FSIZ_{it} + \beta_2 FAG_{it} + \beta_3 EXCH_{it} + \beta_4 INF_{it} + e_{it} \quad \dots (2)$$

Where:

$ROA_{it}$  = Return on asset, which is a proxy for profitability (measured as earnings before interest as well as tax by total assets of firm  $i$  at time  $t$ ).

$FSIZ$  = Firm size (measured as natural log of total assets of firm  $i$  at time  $t$ )

$FAG$  = Firm age (measured as the difference between the current year and the year of incorporation of firm  $i$  at time  $t$ )

$EXCH$  = Exchange rate

$INF$  = Inflation (measured by annual consumer price index)

$\beta_1, \beta_2, \beta_3, \beta_4$  = the parameters to be estimated

$\beta_0$  = Constant intercept

$e$  = Stochastic error term

$t$  = time dimension

### Explanation of Variables and a Priori Expectation

#### a. Return on Asset (ROA):

In this study, the dependent variable is profitability, and the proxy for it is ROA, which is calculated as profit after taxes divided by total assets (Yana 2010). The sole expectation for a company that remains in operation is to make profit, if otherwise the most rational decision is to wind-up the business. Profit itself is revenue minus cost. Although there are several ways to



measure firm profitability, the major ones are ROA, return on investment (ROI), return on equity (ROE) or the net interest margin (NIM), (Ayanda 2013, Ahmed 2013). Scholars disagree on which of the measures is a better sign of profitability than the other. However, ROA is used in this research. The most crucial measure for assessing a company's profitability is ROA, which in theory demonstrates how businesses may make money from their assets even if it may be biased by off-balance sheet operations (Athanasoglou, *et al.* 2005).

b. Firm Size (FSIZ):

In this study, the firm's size is determined by taking the natural logarithm of its entire asset value. The literature indicates that, depending on the study's location, data source, and methodology, there is a mixed connection between business size and profitability (Sufian 2009). The logarithmic representation of total assets is used for the regression analysis as it is regarded as the absolute figure in the balance sheet, including both short- and long-term financing. The benefits of economies of scale and lower costs associated with information collection and processing are anticipated with larger sizes. Therefore, in cases where there are large economies of scale, business size may positively impact profitability. It is thus anticipated that business size would have a favorable effect and indication on profitability.

c. Firm Age (FAG):

This is the experience possessed by the firm in operations over time. According to Ericson and Pakes (1995), Businesses are in the learning business; as a result, they improve their skills and efficiency over time. Businesses specialize, discover methods to standardize, coordinate, and expedite their production processes, as well as lower costs and raise quality, via learning. The learning by doing effect hypothesis provides the best explanation for the age and performance. Learning by doing occurs when businesses become more productive as they get more knowledgeable about production methods and use them to creatively rethink their production processes. Firm age will be determined by subtracting the current year from the year of incorporation, and it is anticipated to have a negative influence on the profitability of the company.

d. Exchange rate (EXCH):

This is the price of one currency in terms of another currency. The relationship between exchange rate and profitability is via import and export. In this study, the exchange rate is expected based on the a priori expectation to have a negative effect on profitability.

e. Inflation (INF):

The rate of growth in overall price levels is known as the inflation rate. The consumer price index (CPI) is used to measure inflation. Profitability is predicted to decrease in response to rising inflation. With a negative sign, it so enters the model.

### *Estimation Techniques*

This study used panel unit root and co-integration test. The panel unit root and panel co-integration tests which will be used include:

### *Data Presentation, Analysis of Result and Discussion of Findings*

This chapter presents the results from the analysis of data and its interpretation. The chapter was divided into two sections. The first section deals with the preliminary analysis of the sample using descriptive statistics. The second section presents correlation analysis between the explained and explanatory variables.

*Descriptive Statistics*

Table 3 depicts the descriptive statistics on the microeconomic variables captured in this study. The aim was to examine the underlying characteristics of the dataset used for empirical analysis. Table 3 shows mean value for ROA, FSIZ, FAGE, EXCH, and INF to be 7.16, 7.51, 53.25, 266.48, and 12.34 respectively. the maximum values of the variables are 37.76, 8.76, 75.00, 0.87, 0.30, 403.58, and 16.54 for ROA, FSIZ, FAGE, EXCH and INF respectively, while their corresponding minimum values are -28.37, 6.01, 37.00, 155.53 and 8.06.

**Table 3: Summary statistics**

| <b>Variables</b> | <b>Obs</b> | <b>Mean</b> | <b>Std. Dev.</b> | <b>Min</b> | <b>Max</b> |
|------------------|------------|-------------|------------------|------------|------------|
| ROA              | 132        | 7.159545    | 12.00248         | -28.37000  | 37.76000   |
| FSIZ             | 132        | 7.510682    | 0.795325         | 6.010000   | 8.760000   |
| FAGE             | 132        | 53.25000    | 9.488744         | 49.00000   | 75.00000   |
| EXCH             | 132        | 266.4761    | 97.59239         | 155.5300   | 403.5800   |
| INF              | 132        | 12.34042    | 3.000975         | 8.060000   | 16.54000   |

[Source: Authors computation (2023)]

*Correlation Matrix*

The correlation coefficient represents the linear association or relationship between two variables (explained and explanatory) as well as also between the explanatory variables themselves. The correlation matrix derived from the Spearman correlation which shows in Table 4 correlation values displaying the Spearman correlation coefficient between all pairs of variables. Table 4 indicates that while relationships exist between the variables used in this study, such relationships are not perfect. This means that none of the variables perfectly collinear.

**Table 4: Correlation matrix**

|             | <b>ROA</b> | <b>FSIZ</b> | <b>FAGE</b> | <b>EXCH</b> | <b>INF</b> |
|-------------|------------|-------------|-------------|-------------|------------|
| <b>ROA</b>  | 1.000000   |             |             |             |            |
| <b>FSIZ</b> | 0.310152   | 1.000000    |             |             |            |
| <b>FAGE</b> | -0.000674  | 0.351370    | 1.000000    |             |            |
| <b>EXCH</b> | -0.212961  | 0.104351    | 0.320078    | 1.000000    |            |
| <b>INF</b>  | -0.185234  | 0.069971    | 0.201549    | 0.696834    | 1.000000   |

[Source: Authors computation (2023)]

*Panel Unit Root Test Results*

The result of the panel unit root test conducted using the Levin, Lin and Chu panel unit root method are shown in Table 5. Table 5 demonstrates that out of the five variables used in this study, four of them being ROA and INFL were stationary at levels. This means these variables have no unit root at their nominal level. The rest of the variables, that is FSIZ and EXCH were stationary after first difference, this means these variables have unit root at their nominal levels and they require differencing for them to be stationary. For FAGE, we cannot conclude if it is

stationary at level or at first difference, because there is no result for the unit root test. However, the conclusion of the panel unit root test result shows mixed stationarity of the variables.

**Table 5: Levin, Lin and Chu unit root test result for all the variables**

| Variable | Level                | First difference     | Order of integration |
|----------|----------------------|----------------------|----------------------|
| ROA      | -1.7694<br>(0.0384)  | -7.5696<br>(0.0000)  | 1(0)                 |
| FSIZ     | -0.61071<br>(0.2707) | -15.4995<br>(0.0000) | 1(1)                 |
| FAGE     | -                    | -                    | -                    |
| EXCH     | 1.9541<br>(0.9747)   | -2.3009<br>(0.0107)  | 1(1)                 |
| INF      | -3.8239<br>(0.0001)  | -8.0290<br>(0.0000)  | 1(0)                 |

[Source: Author's computation (2023)]

#### Hausman Test for the Model

The Hausman test helps us in determining which of the panel regression models (random or fixed) is appropriate for estimating the results. In doing this, we state the hypotheses thus:

Null hypothesis (H0): random-effect model is appropriate

Alternative hypothesis (H1): fixed effect model is appropriate

Criterion: If the P-value is statistically significant, we reject the null hypothesis and accept the alternative hypothesis.

Hausman test for return on assets (ROA) model:

After running both the fixed and the random effect model, the model was subjected to the Hausman test to determine which one is appropriate for return on assets (ROA) model that was specified. From the results shown in Table 6, it shows that the P-value is not statistically significant, so we accept the null hypothesis and reject the alternative hypothesis. This is because the P-value of 0.7986, with the corresponding chi-square statistic of 3.0811, is greater than 5 percent level of significance, and therefore not statistically significant. This means that the panel regression for return on assets model is estimated using the random-effect model.

**Table 6: Return on assets model hausman test result**

Correlated Random Effects - Hausman Test

Equation: Untitled

Test cross-section random effects

| Test Summary         | Chi-Sq.<br>Statistic | Chi-Sq.<br>d.f. | Prob.  |
|----------------------|----------------------|-----------------|--------|
| Cross-section random | 3.081122             | 6               | 0.7986 |

[Source: Authors computation (2023)]

*Discussion of Results and Findings*

The results of Return on Assets model:

The estimated return on assets model in Table 7 has the correct expected signs of the coefficients of the variables captured in the model. The positive sign of the coefficient of the Exchange Rate (EXCH) and Firm Size (FSIZ) shows that they have positive impact on ROA which is a proxy for profitability. The result matches what was anticipated in advance. A rise in the exchange rate will result in higher overall costs for goods and services, enabling businesses to raise the cost of produced items and generating more profits as a result. Increase in firm size leads to greater productivity and hence, increased profit margin. This means that a one percent increase in EXCH and FSIZ resulted in an increase in profitability by approximately 0.013 and 1.485 percent respectively. The result of firm size is in line with the findings of Oyelade, (2019). Firm size positively affects profitability, and the exchange rate result is consistent with Harley's (2018) findings that, *ceteris paribus*, exchange rates positively affect profitability.

The result shows that firm age (FAGE) and inflation rate (INF) all have negative impact on profitability given the negative signs of their coefficients. These results are also consistent with the theoretical expectations, showing that one percent increase in firm age and inflation resulted in a decrease of profitability by 1.027 percent and 0.419 percent respectively *ceteris paribus*. Firm age was shown to have a non-statistically significant negative effect on the profitability of Nigerian manufacturing enterprises. This means that, as a company ages, it becomes harder for it to adopt new procedures since most of them continue to operate with antiquated machinery, facilities, and other equipment that restricts their potential to innovate. Thus, the profitability decreases with the age of the company. This result is in line with the study of Muhammad and Shahimi (2013), who believe that older businesses lack the flexibility to respond quickly, lower obstacles to innovation, and turn a profit because of organizational rigidities that impede development by making changes more difficult over time. As a result, as the businesses age, they get worse. The result of inflation rate in line with the study of Ibrahim et al. (2018) inflation rate has a negative relationship with profitability *ceteris paribus*.

Judging from the probability values of 0.2845 for FAGE and 0.6906 for EXCH respectively show that they are not statistically significant because their probability values are respectively greater than 5 percent (0.05) level of significance. However, the probability values of 0.0000 for FSIZ and 0.0002 for INF shows that they are statistically significant because their probability values are less than 5 percent level of significance.

The adjusted R-squared (R<sup>2</sup>) of 0.549 shows that about 55 percent of the variation in the dependent variable is explained by the independent variables. This indicates that the model has a moderate explanatory power. The Durban-Watson value is 1.64 may be judged to mean that that there is no problem of autocorrelation in the model.

**Table 7: Summary of Return on Assets panel regression random-effect estimations**  
Dependent variable: Return on assets

| Independent variable | Coefficient | Standard Error | t-Statistic | Probability |
|----------------------|-------------|----------------|-------------|-------------|
| Constant             | 52.26965    | 52.14017       | 1.002483    | 0.3182      |
| FSIZ                 | 1.485276    | 5.958421       | 0.249273    | 0.0000      |

|                    |           |          |                    |          |
|--------------------|-----------|----------|--------------------|----------|
| FAGE               | -1.027167 | 0.955191 | -1.075352          | 0.2845   |
| EXCH               | 0.013320  | 0.033380 | 0.399040           | 0.6906   |
| INF                | -0.418568 | 0.376434 | -1.111930          | 0.0002   |
| Adjusted R-squared | 0.548744  |          | F-statistic        | 8.077401 |
| Durbin-Watson stat | 1.638543  |          | Prob (F-statistic) | 0.000000 |

[Source: Authors computation (2023)]

## CONCLUSION

After careful review of the results and discussion, as well as relevant literature, the study concludes that the firm size has a favorable and considerable impact on manufacturing businesses' profitability as measured by ROA. This indicates that, throughout the reviewed period, listed manufacturing enterprises in Nigeria were profitable due in large part to their size. Firm age has a negative and negligible impact on listed manufacturing companies' profitability. This suggests that the profitability of listed manufacturing enterprises in Nigeria is not considerably impacted by company age. Thus, it may be said that listed manufacturing companies in Nigeria become less profitable as they become older. It was advised that Nigerian manufacturing companies become larger in order to get an advantage over rivals, capitalize on economies of scale, and tap into the vast market for increased profitability.

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