The Size, Growth and Profitability of Quoted Manufacturing Companies in Nigeria: Panel Data Analysis

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ABSTRACT

The study examines the relationship among the size, growth and profitability of quoted manufacturing companies in Nigeria, using data from the Fact Books of Nigerian Stock Exchange between 2007 and 2011. For adequate capturing of the objectives, three models are formulated: growth is expressed as a function of size in the first equation, growth is expressed as a function of profitability in the second model, and size is expressed as a function of profitability in the third model. The technique of panel data model is employed to capture the three models and the results of the study reveal that there is independent relationship between growth and size of the firms which is in line with Gibrat's law. The study also indicates positive relationship between the growth and the profitability of the firms but statistically insignificant because the probability statistic is greater than 0.01 and 0.05 but it is rather 0.875. Moreso, the study reveals negative relationship between firm size and profitability and the coefficient of determination (R^2) which is 0.82 indicates that about 82% variations in size of the firms can be explained by the variations in profitability. Based on the findings, the study therefore recommends that government should put in place policy options that can enhance manufacturing profitability in order to boost the performance of the sector and create employment in Nigeria.

Key Word: Size, Growth, Profitability and Manufacturing Companies.

1. INTRODUCTION

Manufacturing sector remains crucial to the drive for rapid industrialization and economic growth in all countries of the world. Manufacturing in economic sense means the process of converting raw materials, components or parts into finished goods that meet consumer's expectations or specifications. Manufacturing commonly employs a man-machine set up with division of labour in large scale production. Manufacturing sector simply includes production of food, chemicals, textiles, machines and equipment (Web-finance, 2014).

The sector is reputed to be an important engine for growth and antidote for unemployment, a creator of wealth and the threshold for sustainable development. Manufacturing sector not only plays catalytic roles but also represents vital criterion in assessing a nation's development. Most countries that are major players in the global economy have transformed the structures of their economies by developing a strong and virile manufacturing sector. In view of this, the importance of manufacturing sector contributions to the growth of an economy cannot be over-emphasized. Central to the transformation of countries is the growth, size and profitability of manufacturing sector (Kouser, Bano, Azeem and Hassan 2012).

It is argued that firms grow in many ways and that a firm's growth pattern is related to age, size and profitability (Delmar, Davidson and Gartner 2003). It was pointed that firm growth is not static in nature and there may be considerable variation in growth over time. Growth along this dimension can be considered in terms of net profit margin or return on assets. Profit is an important indicator of firm's success, and it is assumed that profitability measures are particularly appealing in the performance of firms. Marris (1964),and Mueller (1972) assert that managerial growth-maximization hypothesis under market competition proposes that growth and profit are in a competitive relationship with each other, which suggests the possibility that growth victimizes profit for the fact that managerial objective of a firm is to maximize growth rather than profit.

Profits are necessary for survival in the long run; Long-run profitability derives from the relations between cost and revenue: It is a necessary but not sufficient condition for growth. Revenue may be held up by entry barriers and cost pushed down by management ingenuity. A low profit firm will lack the finance for expansion, but a high profit business may consider the reward of expansion inadequate (Foreman, Makepeace and Morgan 2006).

On the basis of the enumerated roles played by firms in fostering growth as evidenced in developed and few emerging economies, we can clearly posit that manufacturing firms are one of the major sources of economic propeller through the production and export contribution.   In Nigeria, the unemployment situation has worsened with improvement in educational attainment and as a result of rapid urbanization but the industrial sector has failed to expand along with the growth of labour force thereby increasing urban unemployment. The lesson of the past few years in Nigeria has shown that if local manufacturers are to survive in a globalized world, the actual problems and their solutions need to be identified optimally. Therefore, the nature of the relationship among size, growth and profitability of manufacturing companies is an important consideration in revealing the necessary information for the formulation of strategic policy that will stimulate industrial growth in Nigeria, particularly the possibility of trade-offs among the variables. This study sets out to analyse the relationship among size, growth and profitability of manufacturing in Nigeria. Analyzing output growth in manufacturing sector in Nigeria is important because Nigeria is one of the slowest growth regions in the world in terms of manufacturing productivity. Thus, the study is expected to shed light on how to overcome the challenges and how it influences performance in Nigeria manufacturing companies.

The paper is organized into five sections. Following these introductory remarks is a section on the review of the literature. This is followed by the research methodology and the empirical lessons based on the Nigerian experience in sections three and four respectively. The study ends in section five with concluding remarks.

2   LITERATURE REVIEW

Conceptual Issues

According to Ande (2008), firms may be small or large depending on capital outlay and the level of production. Small firms require small capital outlay as compared with large firms which require large capital outlay. Apart from the capital outlay, small firms usually employ small number of workers while large firms employ large number of workers. Teriba (1981) defines firm size according to how much it produced, the number of workers employed, how much it sold and how much fixed capital it has.

Hassan (2012) defines growth as a gradual process and in the context of the firm, it can be defined as an increase in the sales of company, expansion of business through acquisition or merger, growth of the profits, product development, and diversification and also an increase in the number of employees of the firm.

Profit is the excess of income over expenditure. Encarta (2009) views profit as the monetary difference between the cost of producing and marketing goods or services and the price subsequently received for those goods or services This simple statement is often expressed as the profit identity, which states that: Total profit = total revenue (TR) – total costs (TC). The ability to earn a profit is called profitability. It is a state of yielding a financial profit or gain. Without profitability the business will not survive in the long run.

EMPIRICAL LITERATURE

Audretch ,Klomp and Thurik (2002) examine the basic tenet underlying Gibrat's law - that growth rate are independent of firm size -for the Dutch service firms. They use longitudinal data based on a large sample of statistics Netherlands to track the growth rates over 1000 Dutch service firms between 1987 and 1991. The study measures firm size in term of sales, and the mean growth rates as the percentage change in firm sales between 1987 and 1991; the evidence suggests that growth rates are, in fact independent of firm size. Validation of Gibrat's law is confirmed in Dutch service firms. Hardwick and Adams (2002) analyze the relationship between growth and size of 176 firms in the life assurance from U.K. The period analyzed is between 1987 and 1996. Size is measured as annual total net assets while growth is measured as "organic" growth in firm size. They use a multivariate model in which the dependent variable is the logarithm of size regressed on the factors that is expected to affect firm growth and WLS procedure is applied in their research methods. Their results show that Gibrat's law is accepted for the entire period of 1987-1996.

Biesebrock (2005) carries out research into the growth and productivity of growth in 9 African manufacturing firms between 1992 and 1996. Growth is measured by change in size, while firm size is measured in terms of employment. The results of his probit regression show that large firms grow more rapidly and improve productivity faster, conditional on other covariates or on previous performance. Moreover, transitions between size classes or movements in the productivity distribution are very slow, especially at the top of the size or productivity distribution. Large firms remain large, and more productive firms remain at the top of the

distribution. Smaller and less productive firms have a very hard time advancing in the size or productivity distribution.

Bohrem and Mogensen (2010) investigate the relationship between income growths on future profitability using data from Centre for Corporate Governance Research database, cover all Norwegian private firms with limited liability for the period of 1994-2008. Growth is calculated by changing in total operating income, while profitability is measure in terms of return on assets. The results of the panel data techniques reveal positive and near-linear effect between income growth and future profitability in Norway.

Dogan (2013) uses multiple regression and correlation methods to investigate the size effect of the firm profitability in Turkey with data of 200 companies between 2008 and 2011. Return on asset is used as indicator of firm profitability and total sales and number of employees are used as indicator of size. The results indicate a positive relationship between size indicator and profitability. In other words, the firms listed in Istanbul Stock Exchange have higher profitability as their sizes expand.

Maja and Josipa (2012) use regression analysis to examine the relationship between firm size and business success. All the data necessary for the research are obtained from the web site of Croatian Financial Agency and from Amadens database for the period of 2002 to 2010 financial year. They use different measures of firm size and profitability: firm size is measured by natural logarithms of firm assets and natural logarithms of number of employees; profitability in terms of return on assets and return equity; and the results of the study show that firm size has a weak positive impact of firm profitability.

Abiodun (2013) studies the effect of firm size on firm profitability in Nigeria, by using a panel data set over the period of 2000-2009. He measures Profitability by using Return on Assets, while both total Assets and total sales are used as proxies of firm size. According to the results of the study, firm size both in terms of total assets and in terms of total sales, has a positive impact on the profitability of manufacturing companies in Nigeria.

Akinlo (2012) investigates the long-run relationship and causality issues between firm size and profitability in 66 firms in Nigeria by using panel cointegration method for the period 1999- 2007. Profitability is measured as return on assets while size is measured as log of sales and his empirical results show that there is a long run steady-state relationship between firms' size and profitability. The short run causal relationship shows that there is bidirectional relationship between firms' size and profitability. This implies that firm size Granger causes profitability and profitability Granger causes firm size. The results clearly refute the general assumption that causation runs from only firms' size to profitability on which most exciting studies have been based.

3 METHODOLOGICAL FRAMEWORK
The theoretical framework for this study follows the Gibrat`s law and optimum size theory. This theoretical model was developed to measure the relationship between firm growth and it initial size. Gibrat`s law shows how firm growth depends on random shocks that are independent of each other and on initial firm size. According to this framework, size and growth are not dependent on each other. When the size and growth are independent and unrelated then firm growth increases or decreases arbitrarily and there is unlimited variance of firm size, while optimum theory describes the size at which a firm fully utilizes its scale of operation and produces optimum output with minimum cost per unit of production. Economic forces tend to motivate the firm towards an optimum position.

Model Specification
This study adopts the model of Vlachvei and Notta (2008),and Awoyemi (2011) which took it roots from the Gibrat's law and the optimum size theory with modifications. This model is specified in three forms for adequate capturing of the stated objectives in which size is expressed as a function of growth in equation (3.2) as asserted by Gibrat's law, while equation (3.3) and equation (3.4) developed from optimum theory. The models are explicitly specified below:

$$GR = a_o + a_1 SZ + \mu_{1t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \ .(3.2)$$
$$GR = b_0 + b_1 PR + \mu_{2t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.3)$$
$$SZ = \delta_0 + \delta_1 PR + \mu_{3t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.4)$$

Where,
GR = Growth rate of the Manufacturing Firms. Growth is measured in terms of change in size overtime. That is, current size minus previous size of the firm divided by previous size of the firm.
SZ = Size of the manufacturing firms. Firm size is proxied by the net assets.

PR = Profitability variable. This is measured in terms of return on asset. This clearly reveals the actual profit generated by the firm at the end of each financial year.

$a_0, b_0, \delta_0 =$ intercept

a_i, b_i and δ_1 are the parameters to be estimated

μ_{1t}, μ_{2t} and μ_{3t} are error terms

Estimation Techniques

The study used panel data for the selected quoted manufacturing companies in Nigeria. Certain preliminary test such as Hausman Test was conducted to know which type of panel data (either fixed or random effect model) to adopt.

4 EMPIRICAL RESULTS

Panel Data Analysis

Panel Data regression is used to analyze the models for this study. Before reporting the results of the Panel Data Analysis, initial specification tests were conducted. The Huasman specification test was conducted to know the appropriate model between the Fixed effect and Random effect. This is a test on the constant term assumption.

Hausman Specification Test

Table 3 : Hausman Specification Test

Correlated Random Effects - Hausman Test				
Pool: POOL01				
Test cross-section and period random effects				
Test Summary		Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random		0.369108	2	0.8315
Period random		1.5131	2	0.4693
Cross-section and period random		0.091103	2	0.9555
Cross-section random effects test comparisons:				
Variable	Fixed	Random	Var(Diff.)	Prob.
SIZ	0	0	0	0.9053
PRF	8.749062	-18.34687	2043.1713	0.5489
Period random effects test comparisons:				
Variable	Fixed	Random	Var(Diff.)	Prob.
SIZ	0	0	0	0.6739
PRF	-22.7405	-18.34687	12.852756	0.2204
Cross-section and period random effects test comparisons:				
Variable	Fixed	Random	Var(Diff.)	Prob.
SIZ	0	0	0	0.9728
PRF	-4.52312	-18.34687	2108.31752	0.7634

Source: Computed from the data

Hausman specification test was conducted on the two models simultaneously. The null hypothesis underlying the Hausman test is that Fixed Effect Model and Random Effect Model do not differ substantially. The test has an asymptotic χ^2 distribution. If the null hypothesis is rejected, the conclusion is that Random Effect Model is not appropriate and that we may be better off using Fixed Effect Model. The test summary in Table 3 shows that the null hypothesis is rejected at 5% level of significance for the cross section random, period random and cross section/period specific combine random models. This is so as the probability values for the models are each greater than 0.05. That means the null hypothesis is rejected for the two models, that is, the Gibrat's model and firm growth - profitability model. This suggests that Fixed Effect model is most appropriate for further analysis

Panel Analysis of the Gibrat's Model.

The first assumption here takes care of "individuality" of each firm because, the intercept is assumed varied for each 45 manufacturing firms. But, the slope coefficients the marginal effects are constant across firms. The term "fixed effect" is due to the fact that although the intercept may differ across individual manufacturing firms, each individual intercepts does not vary overtime. It is time invariant. This assumption implies that, the shift factors (intercepts) of individual firm, such as technology improvement, Research and Development, human capital development, economies of scale etc., do not change over time but varies across firms. The second assumption here takes care of both individuality and time effect of the constant term. The assumption implies that the shift factors of individual firms vary across firms and over time. The results of the two models are presented in Tables 4 and 5.

Table 4: Fixed Effect Cross Section Specific (Gibrat's Model)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	478.9644	491.0608	0.975367	0.3307
SIZ	1.11E-07	2.22E-06	0.050043	0.9601

Dependent Variable: GRT

The result in Table 4 shows that the coefficient of firm size (SIZ) is not significant at both 99% and 95% level, given the fact that the probability of the t – test is greater than 0.01 and 0.05. Also the magnitude of the coefficient is so small and more or less zero that one can conclude that the relationship between growth and size of firm is near zero. This result satisfies our a priori expectation of the Gibrat's law, which says that an independent relationship is expected between the firm growth and the size. The intercept values for the 45 firms are significantly different across the firms. This variation confirms that the connection between growth of firm and their sizes depends on the shift factors such as institutions, policies, technological changes, etc

Table 5: Fixed Effect Cross Section and Period Specific (Gibrat's Model)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	489.6551	491.5008	0.996245	0.3205
SIZ	-2.78E-08	2.24E-06	-0.01239	0.9901

The result in Table 5a is the second assumption of Fixed Effect to test the Validity of Gibrat's law in the Nigeria manufacturing sector. The result shows that the coefficient of firm size is confirmed not significant at both 1% and 5% respectively. This is so as the probability of the t - test is greater than the level of significant (0.01 or 0.05). This confirms the validity of Gibrat's law using evidence from Nigeria manufacturing firms.

Panel Analysis of Growth - Profit Model

This section reports the Panel Data analysis of the second model. The objective of this test is to assess the relationship between firm growth and profitability. The two Fixed Effect assumptions under the Gibrat's model above also hold under this model. The results are presented in Tables 6 and 7.

Table 6: Fixed Effect Cross Section Specific (Growth-Profit Model)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	359.5127	934.119	0.384868	0.7008
PRF	8.575519	54.45451	0.15748	0.875
R-squared	0.196135		F-statistic	0.970537
Adjusted R-squared	-0.00595		Prob(F-statistic)	0.531471

Dependent Variable: GRT

Table 6 gives room for individuality of the firms because, the intercept is assumed varied for each 45 manufacturing firms. But, the slope coefficients the marginal effects are constant across firm. The coefficient of profitability (PRF) is positive as expected. The coefficient is not significant at both 1% and 5% because the probability of the t-test is 0.875 even though the value of the coefficient is large enough. This suggests that even though profit is a major determinant of growth of firms but there are other significant determinants of growth not included in the model. The low R^2 (0.196) confirms that only about 20% of variations in the growth of firms can be explained by variations in their profitability. The constant terms are different for the individual firms. These differences in the intercepts may be due to unique features of each manufacturing firm, such as differences in management style, managerial talent, technological advancement etc.

Panel Analysis of Size - Profit Model

The test summary in Table 8 is the Hausman Specification test for Size-Profit model. It shows that the null hypothesis is rejected at 5% level of significance for the cross section random, period random and cross section/period specific combine random models. This is so as the probability values for the models are each greater than 0.05. That means the null hypothesis is rejected for the Size-Profit models. This suggests that Fixed Effect model is most appropriate for further analysis.

Table 8 :Hausman Specification Test (SIZE - PROFIT MODEL)

Correlated Random Effects - Hausman Test				
Pool: POOL01				
Test cross-section and period random effects				
Test Summary		Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random		0.400067	1	0.5271
Period random		0.147259	1	0.7012
Cross-section and period random		0.198171	1	0.6562
Cross-section random effects test comparisons:				
Variable	Fixed	Random	Var(Diff.)	Prob.
PRF	-1372486	-1765054.904	3.8521E+11	0.5271
Cross-section and period random effects test comparisons:				
Variable	Fixed	Random	Var(Diff.)	Prob.
PRF	-1471185	-1765054.904	4.3578E+11	0.6562
Period random effects test comparisons:				
Variable	Fixed	Random	Var(Diff.)	Prob.
PRF	-1858128	-1765054.904	5.8825E+10	0.7012

Source: Computed from Data

To check the relationship between size and profitability of firm, we compare the R^2 for the size – profit regression with that of the profit – size. The R^2 when size is made the endogenous variable is 0.82 while when PRF is made the endogenous variable it is 0.69 (see the Appendix). Size of firm seems to be more endogenous than the profit of firms. The result of the fixed Effect Model for the Size – Profitability model is presented in Table 9.

Table 9 : Fixed Effect Cross Section and Period Specific (Size-Profit Model)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	99044030	31668369	3.127538	0.0021
PRF	-1471185	1850766	-0.79491	0.4277
R-squared	0.822122	Mean dependent var		77084785
Adjusted R-squared	0.772316	S.D. dependent var		4.87E+08
S.E. of regression	2.32E+08	Akaike info criterion		41.55771
Sum squared resid	9.44E+18	Schwarz criterion		42.31685
Log likelihood	-4625.243	Hannan-Quinn criter.		41.8641
F-statistic	16.50649	Durbin-Watson stat		1.496185
Prob(F-statistic)	0.0000			

Source: Computed from Data

From table 9, it is clear that the marginal effect of profit of firms on their sizes even though negative and not significant. A look at the overall effect as measured by the R^2 suggests that about 82% of the total variations in the size of firms can be explained by variations in the profit of firms. This is significant at 1%, considering the probability of the F – test which is 0.000.

Summary/ Conclusion

The main focus of this study is to investigate the relationship among the size, growth and profitability of quoted manufacturing companies in Nigeria using data from the Fact Books of Nigeria Stock Exchange for the period of 2007 – 2011. The study employs econometric technique of panel data to test the validity of Gibrat's law, to assess the relationship between firm growth and profitability, and to examine the effect of profitability on firm size. The results of the tests show that fixed effect model is appropriate for the study. Having determined the necessary condition for using fixed effect model, the study confirms the validity of Gibrat's law in Nigeria manufacturing sector, meaning that independent relationship exists between firm growth and size. The results of the study also exhibit a positive relationship between firm growth and profitability. The result of the panel on the size – profitability nexus shows negative association between the two variables which implies that Nigerian manufacturing firms are not operating in their optimum level, and size of firm seems to be more endogenous than the profitability.

There is evidence in the findings which concludes that Gibrat's law is valid in Nigeria manufacturing firms and that the nexus between the growth and size in Nigeria manufacturing firms depends on the shift factors such as institutions, policies, technological changes etc.

Also, there is no growth-profit trade-off of the type outlined by Marris 1964 in Nigerian manufacturing firms and the effect of profitability on growth of firm shifts overtime because of factors such as technological changes, managerial endowment, change in government regulation etc. The relationship between firm size and profitability is industry specific; and the effect of profit on size of firms is sensitive to the specific characteristics of individual firms and time period.

Policy Recommendations:

Based on the findings of this study, the following recommendations were suggested:

Government should put in place policy options such as granting tax holiday and subsiding manufacturing inputs that enhance manufacturing profitability in order to boost the performance of the sector and create employment in Nigeria. Government can put up more efforts by improving the infrastructural base of the manufacturing firms in order to reduce cost of production vis-à-vis enhancing their profitability.

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