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THE DETERMINANTS OF FIRM GROWTH IN NIGERIA

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This study investigates the factors that influence the growth rate of firms in Nigeria with a sample of 94 publicly listed firms during the period 1994-2005. The theoretical/analytical framework rested on the optimal firm size growth theory. It offers the most practical approach. The empirical methodology combines descriptive/statistical with econometric analysis. The significant determinants of the firms' growth rates include the firms' previous growth rates, size, age, capital intensity, financial constraints, management efficiency, and the extent of vertical integration. However, the significance of these factors depends on how the growth of firm is defined and/or measured as well as the estimation methods.

I. Introduction

Firm's primary objective is an issue of concern in the relevant literature. Often profit, growth prospective and goals are being considered as main objectives of a firm – whether complementary or concurrent – still debatable (Aregleyen, 2004). Despite differences in views, every firm strives to survive and grow, though firms do not all have the same opportunity to grow. According to Coad (2007), firm growth is a matter of "demand" for growth and "supply" of growth opportunities. This implies that firm growth requires both a willing attitude to take up growth opportunities, and also the availability of suitable opportunities. This therefore suggest that there is often a disconnect between a firm's ability to grow and its desire to grow. This gives rise to the question: what factors are available and suitable for firms' growth? In other words, what factors determines the growth of firms? This question bears a number of issues of importance for policy actions, because firms' growth is closely associated with the process of job creation, wealth generation and with the changing distributions of employment across economic activities and production units. Furthermore, differences in firms' growth rates also influence the quality of jobs and consequently affect living standards. To ascertain which factors determine the growth of firms necessitates an empirical investigation and analysis. Certainly, this is the essential recipe for formulating and implementing appropriate policy towards promoting private firms/sector development and harnessing the benefits to the economy. The motivation for the study is primarily to provide empirical support for policy formulation and implementation with regard to government avowed

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commitment to private firms/sector development in Nigeria, by investigating and uncovering the factors that have influence firms growth rate in Nigeria. In addition, the study is intended to enrich the existing literature on the determinants of firms' growth. The theoretical foundation for the study is the optimal firm size theory. The choice of the theory is justified by the fact that it offers the most practical approach to the study. The empirical methodology combines descriptive and econometric analysis, former used to characterize the firms' growth pattern, while the econometric analysis was employed to identify the determinants of the firms' growth rate. The econometric analysis follows the two variants of the model developed viz; tagged model 1 and 2. Model 1 measures growth using changes in turnover, while model 2 is the model of growth using changes in value added. Alternative estimation techniques were utilized to estimate the models. The findings show that (i) when growth measured with changes in turnover, the significant determinants of the firms' growth rates are the previous year growth rate of the firms, their size, age, capital intensity, management efficiency , the extent of vertical integration and inflation. While growth measured by value addition, the significant determinants include capital intensity, financial constraints, management efficiency and vertical integration.

The rest of paper is organized into five sections. Section II reviews both theoretical and empirical literature. Section III discusses the theoretical framework for the study. The methodological approach to the analysis of the paper is laid out in Section IV. The analysis of the data collected and results obtained are presented in Section V, while Section VI bears the summary and conclusion of the paper.

II. Review of the Literature

Quite a number of factors have been suggested in the relevant literature as capable of accounting for differences in the growth rates of firms.[2] This may include size, age, legal form, location, innovative capacity, market size, capital intensity, governance structure, industry-specific environment, market structure elements (growth of demand, advertisement), research and development, diversification, investment and financial constraint, knowledge structure (levels of human capital and the composition of human resources in firms), stability of the workforce, multi-technology characteristics, institutions and missing arenas for entrepreneurship in the care sectors and for households-related services, taxation of entrepreneurial income, incentives for wealth accumulation, wage-setting institutions and labour market regulations, government regulations and policies and the macroeconomic environment among others. As would be expected, different theoretical perspectives and expectations are associated with these determinants. Interestingly, the results of empirical analyses have also been mixed. In the rest of this section, therefore, a broad review of the theoretical perspectives as well as the empirical evidences on some determinants of firm growth is presented.

Size of the firm is the earliest identified and the most widely investigated determinant of firm's growth. Traditional economic theory postulates a negative relationship between size and firm growth rate. This is premised on the assumption

2 For an extensive review of literature see, Geroski (1995), in particular.

that large firm operates close to the optimum level and so would grow very little and might even have to shrink. But a small firm would be far below the optimum size and would need to grow faster [Harhoff et. al., (1998); Almus and Nerlinger, (1999); and Weiss, (1998)]. However, this traditional postulation was challenged by Gilbrat's (1931) formulation of the "Law of Proportionate Effect". In its simplest interpretation, the law states that both big and small firms have equal chances of growing at a given rate during any specific period of time.

The combination of findings of some empirical invalidation of this law [(Baumol, (1959); Inanga and Soyibo, (1982); Ogiogio, (1988); Evans, (1987 a,b); Wagner, (1992); Mead, (1994); Dunne and Hughes, (1994); Audertsh, (1995); and Hart and Qulton, (1996)] resulted in the belief that the "bigger the better". This belief postulate a positive relationship between firm size and growth that is, the large firms have an advantage over the smaller ones in the sense that the larger firms can enter into all product lines that the small firms enter, while the reverse is not true due to the presence of size and scale advantages. The argument was further extended by Biggs et al (1996), who noted that larger firms have easier access to capital and money market than the less well-known small firms. Indeed, access to external sources of finance is now widely recognized as important to firms' ability to survive and grow over time.

Lall (1976) theorized that the age of firms in operation would exercise some influence on their growth. The theory of firm learning proposed by Jovanovic (1982) and later extended by Ericson and Pakes (1995); Das (1995) and Farinas and Moreno (2000), predicted a negative correlation between firm age and growth. Decreasing returns to learning over time is one major reason as well as that the probability diminishes that an aging firm will achieve additional efficiency gains. This postulated negative association was confirmed for German firms by Harhoff, et al (1998), and Steil and Wolf (1999). Khalilzadeen-Shirazi (1971) indicates that differences in firms' performance could be linked with differences in their capital intensity. Siddharthan (1983) predicts an inverse relationship between capital intensity and growth rates of firms in a labour surplus and capital short economy, as typified by most developing countries.

According to Larcker et.al. (2004) corporate governance generally refers to the set of mechanisms that influence the decisions made by managers when there is separation of ownership and control. At the level of theory, effective corporate governance reduces "control rights" of stockholders and creditors on managers, increasing the probability that managers invest in positive net present value projects. Thus, it is assumed that better governed firms have a better operating performance and/or growth (Shleifer and Vishny, 1997). Empirically, although a number of works [see for example Sanda et al., (2005); Bebczuk, (2005); and Brown and Caylor, (2004); and Adenikinju and Ayonrinde, (2002)] have provided some insight into the role of corporate governance, the results of these studies and many others are frequently contradictory and a consistent set of results has yet to emerge regarding the importance of corporate governance for understanding managerial behavior and organizational performance. The results and observation of Larcket et. al. (2004) in this respect is very instructive. From their examination of the relation between a

broad set of 13 corporate governance factors and various measures of managerial behavior and organizational performance using a sample of 2,126 firms, they noted that the results obtained suggest that the typical structural indicators of corporate governance used in academic research and institutional rating services have very limited ability to explain managerial behavior and organizational performance. Diversification also affects the growth process positively. It helps firms to cope with demand constraints on a specific product line and creates new opportunities for growth. Harabi (2003) reported diversification and market share expansion as significant factors of firms' growth. Other factors identified include location in large urban centers, legal status as a limited liability company, the presence of price competition, presence in markets with high demand, and certain government policies such as labor regulations, anti-trust and environmental policy (Harabi, 2003).

The theoretical relationship between Foreign Direct Investment (FDI) or multinationality and firm growth is complex and devoid of definite conclusion. FDI or foreign equity holdings could be a veritable source of investable capital and technological and managerial capabilities, which can positively impact on the growth of the firm. It could also impact negatively firms' growth rate due to the often substantial remuneration for foreign partners/experts and the associated remission of the larger proportion of such remuneration to their home country. For vertical integration, Siddharthan et. al. (1994) argued that the greater the degree of vertical integration, the smaller the need to keep large unsold stock of goods in process or as raw materials. Consequently, vertical integration is expected to influence profitability positively and inventory holdings negatively. The empirical findings of Siddharthan et. al. from their study of 385 manufacturing firms during the period 1981-1984 in India, indicate that vertically integrated firms were able to exploit their internationalization advantages and as such grow faster.

The availability and cost of finance have been identified as major factors that affect the ability of a business to grow (Binks and Ennew, 1996:17). The growth of firms, especially small and young ones, is constrained by the amount of internally generated funds. Butters and Lintner (1945:3) provide a documentation of some earliest studies supporting this theory. In relation to this, the financing constraints theory also complements recent researches that emphasize how access to finance affects firm formation, survival and growth. Oliveira and Fortunato (2005) studied the effect of financial constraints on the growth of Portuguese manufacturing (surviving) firms over the period 1990-2001. The results reported suggest that the growth of the sampled Portuguese manufacturing firms was finance constrained. Economic theory and industrial experience(s) also suggest that the market structure and the structural features of an industry strongly influence the competitive conducts of its constituents firms. Dunne et. al., (1988, 1989) show that firm' growth rates vary significantly among the different industries in the manufacturing sector in the United States. Similarly, Harhoff et. al., (1998) confirm sectoral differences in growth rates in Germany.

Marris (1964), Manche (1974), Siddharthan et. al. (1994) and Bigsten et. al. (1997) indicate that differential investment behaviour could account for inter-firm variations in growth and profit rates. This is, however, linked to the size and age of

the firm. Older firms are said to have larger needs for the replacement of worn-out capital. Moreover, older firms are believed to be larger in size and requiring comprehensive plans for expansion and modernization and therefore larger levels of fixed investment. As the framer of the legal environment within which firms operate, as well as the largest single domestic customer for goods and services, government through its state regulations and policies affects the ability of firms to grow in a sustainable manner.

Lastly, coming to macroeconomic factors, several studies have discussed how firm growth varies over the business cycle. For example, Higson et. al (2002, 2004) analyze US and UK firms over periods of 30 years and above and observed that the mean growth rate is indeed sensitive to macroeconomic fluctuations. Furthermore, higher moments of the growth rate distribution appear to be sensitive to the business cycle. In the same vein, Hardwick and Adams (2002) investigate changes in the Gibrat Law coefficient over the business cycle and they obtained some evidence of a countercyclical variation of this coefficient. In other words, smaller firms appear to grow relatively faster during booms, whereas larger firms grow faster during recessions and recoveries. Results from cross-country differences in firm growth indicate that the growth of GDP is positively correlated with firm growth (Beck, et. al., 2005). These results imply that firms grow faster in an economy with greater growth opportunities. Beck et. al. (2005) also reported a positive impact on growth rates of the firms, although they recognized that this most likely reflects the fact that the firms sales growth is given in nominal terms.

III. Theoretical/Empirical Framework

The debate in the extant financial economics literature on the desirability or otherwise of growth by firms and whether firm growth is intentional and proactive or just happens persists. On growth imperatives, it is indicated that firms may be desirous of growth if the opportunities present itself. As documented in Coad (2007) firms desire growth (i) to keep its members satisfied and alleviate tensions in its internal management; (ii) as a means of attaining other objectives related to its production of goods and services; (iii) if firms wish to expand their production capacity or boost their output so as to deter entry from potential competitors; (iv) to be able to spread its risks among its various activities i.e. a basis for security; (v) because growth is a more suitable metric of performance than profits-particularly in high volatile markets; and (vi) for want of a better alternative- a means of avoiding heavy taxes on dividends, for example. Considering the firm growth dynamics, the popular view stemming from the Gilbart's Law considers firm growth as a passive absorption and accumulation of growth opportunities. Subsequently, the 'Island models" developed by Ijiri and Simon (1967), Sutton (1997) and Bottazzi and Secchi (2003) present statistical processes in which firms growth is seen as "islands" or independent entities, whose resultant growth is simply accumulation of the stochastic opportunities they receive in any period. These growth opportunities are supposed to be exogenously created and upon arrival they are randomly allocated across firms. Thus, firms are assumed to have minimal rationality, and more generally, these statistical models have a minimal recourse to any economic theory

because growth is considered entirely explained by random factors. To Coad (2007), one advantage of this class of models is that they can explain the observed size distribution whilst demonstrating both simplicity and generality.

The counter view/postulation is that there is certain rationality and intentionality in the process of firm growth. According to Parkinson (1957) and Starbuck (1971), the size of an organization has inherent and quasi-automatic tendency to drift upwards. Penrose (1955) put this more succinctly by noting that firm growth is an informed and intentional process. Also in neoclassical works, even stronger rationality is attributed to firms that grow. In this perspective, growth is the result of a forward-looking process in which firms adjust their current scale of production to anticipate future market trends. Indeed, the neoclassical q-theory, assumes that firms have rational anticipation and that their size is determined as the solution to an inter-temporal profit-maximization problem in an infinite time horizon. In summary, firm growth is considered not just an "organizational drift" but instead that there is rationality and planning involved. In the light of the foregoing review of the contemporary debate, the theoretical review and the survey of previous studies, the theoretical and empirical approaches to this study are hinged on the models of optimal firm size.[3] The driving assumption is that every firm aspires to grow i.e. attain an optimal size and therefore behaves rationally. In other words, the notion that firm growth is not just an "organizational drift" but instead there is rationality and planning involved. Thus, it is assumed that firms choose long-run stable growth path depending on their respective utility functions, resources/ features and other constraints.

The utility functions of the firms are determined by the internal organization and structures of the firms. In large firms, there is the divorce of ownership from control which gives rise to the principal-agency problem. According to the principal agency theory, there is the likelihood of opportunistic behaviour on the part of managers as agent of firm owners i.e. the shareholders. The theory therefore posits that where and when both managers and the shareholders are utility maximizers, there is good reason to believe that the managers will not always act in the best interest of the shareholders. According to Jensen and Meckling (1976) and Shleifer and Vishny (1997), managers have incentives to expropriate a firm's assets by undertaking projects that benefits themselves personally but that impact shareholders wealth adversely. But the managerial theory of the firm asserts that managers attach utility to the size of their firms. Utility –maximizing managers are assumed to maximize growth rate of the firm subject to the constraint of earning a satisfactory profit rate, which should be large enough to avoid being dismissed by shareholders or being taken over by stock-market "raiders" [Marris, (1963, 1964); Baumol, (1959) and Williamson, (1964)]. This, therefore, makes for the need to distinguish "good growth" from "bad growth" in terms of the long-run shareholders interest. Thus, "good growth" is that which maximizes the interest/value worth of the shareholders, otherwise, "bad growth". It is generally believed that with good corporate governance practices, the interest of the managers and those of the shareholders could be well synchronized.

3 This is because this theory/model offers us the most practical approach to this study/research.

For this study, I leaned towards the managerial theory of the firm that managers (with good governance practices) will seek to maximize firm growth rate subject to the constraint of earning a satisfactory profit rate even though there may not be persistency in growth rates in line with the Law of Proportionate Effect (LPE) as postulated by Gilbrat's (1931), which in its strongest form implied no serial correlation between firm growth rates.

The literature (both theoretical and empirical) indicates that there exist several factors that influence the optimal firm size and firm growth. Several economists/researchers have analyzed many of these determinants of optimal firm size and growth through the use of simple, empirically testable model(s). Our empirical model therefore follows the lead by Geroski (1995, 1998), Geroski and Gugler (2001) and Harabi (2003). The model is specified as follows:

$$\Delta Si(t) = Si^* + \beta Si(t-1) + \mu i(t), \tag{1}$$

where $Si(t)$ is the actual size of firm i at time t, Si^* is the long-run steady-state size of firm i, β is the speed with which firm i converges toward Si^* when $Si \neq Si^*$, and $\mu i(t)$ is a normally distributed white noise error process.

But before equation (1) can be used for empirical work, one has to specify S^*. The most common approach is to write

$$Si^*(t) = c + \alpha X(t) + \eta i(t), \tag{2}$$

where $\eta i(t)$ is a white noise error process and $X(t)$ is a set of observable exogenous drivers of $S^*(t)$.

If $\alpha = 0$, equation (2) says that S^* is constant over time and the same for all firms (up to a stochastic term). If $\alpha \neq 0$, S^* also depends on a set of exogenous variables $X(t)$.

Substituting equation (2) into equation (1), yields equation (3) thus:

$$\Delta Si(t) = c + \alpha X(t) + \beta Si(t-1) + vi(t), \tag{3}$$

where $vi(t) \equiv \mu i(t) + \eta i(t)$.

Equation (3) therefore can be interpreted simply to mean that the growth of a firm over a specified period is dependent on its size and other determinants. By this interpretation, equation (3) can be re-specified into equation (4) as follows:

$$GR_{it} = C + \alpha SZ + \beta X(t) + \varepsilon(t) \tag{4}$$

where

GR_{it}	=	growth rate of *ith* firm over a specified period
SZ	=	Size of *ith* firm
$\beta X(t)$	=	Vector of other determinants of *ith* firm growth rate over a specified period
(t)	=	The Error term

IV. Methodology

1. The Study Sample and Data Collection

The study population covers all business firms quoted on the Nigerian Stock Exchange (NSE), and by law are required to submit their Annual Reports and Statement of Accounts. However, our sample included only those firms that have been listed since 1998 and remained in existence up till 2005. The time frame for the study covered a twelve-year period from 1994 to 2005. The choice of the year 1998 as the basis for drawing our sample is therefore informed by the fact that all firms listed by 1998 on the NSE will have available financial records dated back at the limit to 1994. A total of 188 firms make the sample but completed data was obtained for only 94. The analysis of this study is therefore based on these 94 firms.

The data pertaining to all the variables on the firms over the study period were sourced from the individual firm's various issues of Annual Report and Statement of Accounts. The theoretical and empirical literature indicates that there are various measures of firm size. The major ones include employment, assets, net asset, sales or turnover, capital employed, market value, and value added. Though each of this has its limitations, however, in practice the choice of a measure is governed by data availability (Hart and Oulton, 1995). This study used two measures namely sales or turnover and value added as measures of size with each serving as control to check the results obtained by using the other. Growth of the firms was therefore measured by percentage changes in these measures of size.

2. The Empirical Model

The tenet of this analysis is the theoretical and empirical framework as laid out in the previous section.

The impact of a number of factors capable of accounting for differences in the growth rates of firms was investigated based on data availability. These factors were broadly categorized into (i) basic characteristics of the firm- size, age, capital intensity, and nature of the industry to which the firms belong; (ii) internal factors that are under the direct purview of the firms and affects the ability of the firms to cope with external factors –governance structure, ownership structure, vertical integration, financial constraint, managerial efficiency, and operational efficiency; and (iii) external factors that are beyond the control of the firms, and that are generally economy-wide namely government regulations and economic policies, and the macroeconomic environment.

The impact of government regulations and policies on the growth of the firm was captured through the level of tax paid by the firm. Aside the normal income tax paid by the firms, they also pay 2 % of their profit as education development levy or tax. In addition, in accordance with Monetary, Credit, Foreign Trade and Exchange Policy Guidelines for 2001 fiscal year and thereafter of the Central Bank of Nigeria, 10% of profit before taxation of the banks must be transferred to the Small and Medium Scale Industries (SSI) development fund reserve of the government being administered by the Central Bank.

Operating efficiency is considered because surveillance is a critical part of the control process in firms. Even if no weaknesses are detected, the firm must still plan for future growth. One important element of such planning relates to decision about expansion of existing operations as well as movements into new product lines. If a greater degree of automation is to be employed, then relatively heavy investment in fixed asset must be made, and this will increase fixed costs. Variable costs will, however, be low in such cases. The extent to which fixed costs are incurred in the production process is defined as operating efficiency or leverage.

Management efficiency is indicative of the firms' abilities to survive in a situation of falling prices, rising costs of production or declining demand for their products. It also shows that the firm is in a good position to exploit advantageously any existing favorable conditions e.g. rising sales prices, falling production costs and increasing demand for products. In other words, it is a measure of firms' capacity to withstand adverse economic conditions and exploit favorable ones. Lastly, Tobin's Q is indicative of the firms' financial performance as well as intellectual capital which are expected to influence the firms' growth rate positively.

The empirical model to investigate these determinants for our sampled firms' growth rates is given by equation (5), which makes an extension of equation (4) earlier derived.

$$Gr_{it} = C + \alpha_1 LSZ_{it} + \alpha_2 Ag_{it} + \alpha_3 CI_{it} + \alpha_4 FEH_{it} + \alpha_5 VI_{it} + \alpha_6 TQ_{it} + \alpha_7 GOV_{it} + \alpha_8 OP_{it} + \alpha_9 ME_{it} + \alpha_{10} LFC_{it} + \alpha_{11} GRP_{it} + \alpha_{12} GRGDP_{it} + \alpha_{13} INF_{it} + U_{it} \quad (5)$$

Where:

GR = Growth rate of the firms measured alternatively by annual growth rate of the firm's Turnover (GRTT) and Value added (GRTV).

LSZ = Log of Size of the firm measured by log of sales (SZT) and value added (SZV)

AG = Age of the firm determined by the number of years the firm has been in existence.

CI = Capital Intensity in the firm captured by Capital-Output ratio

FEH = Foreign Direct Investment in the firm measured by percentage share of foreign equity in total equity of the firms

VI = Vertical Integration denoted by value added as a percentage of sales

TQ = Modified Tobin's Q measured by the sum of the market value of equity and the book value of debt divided by the book value of total assets.

GOV = Governance structure captured by a composite score on board size, block holdings or ownership concentration and directors' interest as percentage of total shareholdings.

OP = Operating Efficiency in the firms captured by change in gross fixed asset expressed as a ratio of capital stock.

ME = Management Efficiency in the firms captured by net profit margin i.e. net profit after taxes as a percentage of sales.

LFC = Log of Financial Constraint measured by retained profit plus depreciation

GRP = Effect of Government Regulations and Policies captured by tax margin-taxes as a percentage of gross profit.
GRGDP = Growth rate of the economy measured by the growth rate of GDP
INF = Inflation rate
U = The Error Term

3. *The Approach to Estimation*

I considered a typical static panel regression model below:

$$y_{it} = X'_{it}\beta + u_{it} \tag{6}$$

$$u_{it} = \mu_i + v_{it} \tag{7}$$

where y_{it} represents the regressand for firm i over period t; X_{it} denotes the exogenous regressors and u_{it} is the composite error term. This model is a one-way error component model with firm specific effects (μ_{it}) and the remainder disturbance term (v_{it}).

This study employs different estimation methods including (OLS) estimator and the fixed effect and random effect estimators, which account for the firm specific effects in order to carefully and thoroughly estimate the static panel model and to obtain robust results. The OLS estimator is consistent only when the orthogonal assumption holds i.e. when all regressors are uncorrelated with the error term (E (x_{it} v_{it}) = 0). However, a number of reasons have been adduced for the possible violation of orthogonality assumption in the GRTT and GRTV regressions. First, the regression disturbance term may include some unobserved main effects that may be correlated with the regressors employed (for example, ($E(x_{it}$ $\mu_i)$ $\neq 0)$)

A model with these effects has been applied by Cheng and Wall (1999), Baltagi, Egger, Pfaffermayr (2003), Baldwin, Taglioni (2006), Martinez-Zarzoso, Felicitas, Horsewood (2009), and Yu (2010), among others. These studies argue that a panel model that accounts for these effects eliminates the bias resulting from misspecification or omission problem. Second, some of the regressors such as inf and *GRGDP* indicators may be correlated with shocks that affect *GRTT* (for example, E (x_{it} v_{it}) $\neq 0$). Also, there is possibility of simultaneity biases resulting from the endogeneity of *GRGDP* in the *GRTT* and *GRTV* regressions.

Given the highlighted econometric problems inherent in the use of OLS for the estimation of panel data model, empirical studies have suggested the use of panel data techniques among which include fixed effects (FE) estimator, random effects (RE) estimator, Hausman-Taylor (HT) estimator and Amemiya-Marcurdy (AM) estimator to overcome these problems (see Baltagi, 2008). If all the effects are assumed significant, the FE estimator or the random effect estimator is often used. The FE estimator is applied when $E(x_{it}$ $\mu_i) \neq 0$ while assuming $E(x_{it}$ $v_{it})$. This implies endogeneity of all regressors with the fixed effects. Conversely, the RE estimator is employed when $E(x_{it}$ $\mu_i)=0$ while also assuming $E(x_{it}$ $v_{it})=0$. This implies exogeneity of all regressors with the random effects. Thus, the choice of either FE estimator or RE estimator is based on whether there exists endogeneity or exogeneity between all the regressors and the effects. The HT estimator, which is based on instrumental variables, allows for some of the regressors to be correlated with the effects as opposed to the all endogeneity choice or all exogeneity in the case of FE estimator and RE estimator respectively. The AM estimator is an extension of HT estimator. It suggests a more efficient set of instruments.

In this study therefore, results obtained from OLS, FE, RE, HT, and AM estimators were all reported in order to compare the performance of these techniques in the estimation of gravity model. The study also conducts some diagnostic tests to complement the estimation techniques applied to estimate the gravity model. Among the diagnostic tests are the F test and a number of Hausman tests. The F test is carried out to investigate the joint significance of fixed effects. The first Hausman test, which is based on the difference between the fixed and random effects estimators, is conducted to validate the exogeneity (endogeneity) of the regressors with the effects. The study also conducts the second Hausman test, which is based on the difference between HT and the FE estimators, to validate that the set of instruments chosen are legitimate.

Furthermore, based on the difference between the HT and AM estimators, the third Hausman test is also carried out to validate the need for additional exogeneity assumptions for the AM estimator. We also account for these dynamics by also estimating dynamic panel data model. In order to formulate equation (6) dynamically, the study adds a lagged endogenous variable. The dynamic model is specified below:

$$y_{it} = \delta\, y_{i,t-1} + X'_{it}\beta + \mu_i + v_{it} \tag{8}$$

The consideration of the dynamic model is characterized by two sources of persistence over time (see Baltagi, 2008). These are autocorrelation resulting from the inclusion of a lagged dependent variable among the explanatory variables and the unobserved main effects and interaction effects characterizing the heterogeneity among the firms. Applying either OLS or FE estimator may render the estimates biased and inconsistent for a number of reasons. First, y_{it} is a function of both the firm specific effects (μ_i). This then follows that $y_{ij,\ t-1}$ is also al function of these effects. Thus, $y_{i,\ t-1}$ is correlated with the error term (i.e. E ($y_{i,\ t-1}$ v_{it})). This undoubtedly renders the OLS estimator biased and inconsistent even if the error term (v_{it}) is not serially correlated.

In the case of FE estimator, although the within transformation might have eliminated the effects, however, ($y_{i,\ t-1}$ - $\bar{y}_{i,\ -1}$) where $\sum_{t=2}^{T} y_{i,\ t-1}/(T-1)$ will still be correlated with (v_{it} - $\bar{v}_i$) even if the error term (v_{it}) is not serially correlated. By construction, $y_{i,\ t-1}$ is correlated with $\bar{v}_i$ since the latter average contains, $v_{i,\ t-1}$ which is obviously correlated with, $y_{i,\ t-1}$. Similarly, v_{it} is correlated with $\bar{y}_{i-1}$ since the latter average contains y_{it}. This correlation also renders the FE estimator inconsistent particularly when N is large and T is small, which actually is the case is in the present study.

To overcome these econometric problems inherent in the use of OLS and FE estimators for the estimation of dynamic model, a number of empirical studies have suggested the Arellano and Bond (1991) Generalized Method of Moment (GMM) estimator and the Blundell and Bond (1998) system GMM estimator. The GMM estimator proposed by Arellano and Bond (1991) differences the dynamic model (i.e. equation (8)) to get rid of the effects along with any time-invariant regressor. Therefore, equation (18) becomes:

$$y_{it} - y_{i,t-1} = \delta(y_{i,t-1} - y_{i,t-2}) + \beta(x'_{it} - x'_{i,t-1}) + (vit - v_{i,t-1}) \qquad (9)$$

where $(v_{it} - v_{i,t-1})$ is assumed to follow first order moving average process (i.e MA (1)) with unit root. The differencing of the dynamic model as shown in (9) also eliminates any endogeneity that may be due to the correlation between the regressors and the effects. Based on the fact that the GMM estimator assumes that $(v_{it} - v_{i,t-1})$ follows MA (1) with unit root, Arrelano and Bond (1991) propose a test for the hypothesis that there is no second-order serial correlation for the remainder disturbances of the differenced equation. This becomes inevitable as the consistency of the GMM estimator relies upon the assumption that E $(\Delta v_{it} - \Delta v_{i,t-2})$. This test along with other tests such as the Sargan test of over identifying restrictions was computed to complement the Arellano and Bond GMM estimator.

This test along with other tests such as the Sargan test of over identifying restrictions was computed to complement the Arellano and Bond GMM estimator.

In addition, this study considers the Blundell and Bond (1998) system GMM which improves the standard GMM estimator. Blundell and Bond (1998) show that an additional mild stationarity restriction on the initial conditions process allows the use of an extended system GMM estimator that uses lagged differences of y_{it} as instruments for equations at levels, in addition to lagged levels of y_{it} as instruments for equations in first differences (see Balatgi, 2008).

V. Data Analysis and Results

The logical follow up to the preceding section is the analysis of the data and the application of the model developed. The analysis covers 94 of the 188 firms within our sample frame for which we obtained uniform data set over the period 1994-2005. The first part of the analysis is the descriptive/statistical analysis of the data. The second part is the empirical/econometric analysis and results.

1. Descriptive/Statistical Analysis

The descriptive statistics of the 94 firms validated for analysis are contained in Table 3. Starting with age (AGE), the youngest firm is 2 years while the oldest is 82 years. The mean age is 35 years. The value for size measured by sales or turnover (SZT) ranged from 10 to 21 with an average value of 15. The alternative measure of size by value added (SZV) ranged from -17 to 20 with an average value of 13. Capital intensity (CI) was lowest at 0.04 and highest at 16217.690 with an average of

14.92. Similarly, foreign equity (FEH), and Tobin's Q (TQ)) had minimum values of 0.00, 0.10 and highest values of 87.67 and 7.36 with averages of 27.27 and 0.99, respectively. Governance (GOV) and Growth rate of real GDP (GRGDP) were lowest at 6.61 and 1.30 and highest at 66.69 and 6.58 with mean values of 30.79 and 4.00, respectively. Inflation (INF) for the period has a mean value of 22.13 from lowest and highest values of 6.60 and 72.8, respectively.

TABLE 3

Descriptive Statistics of the Sample Firms

Variables	Min.	Max.	Mean	Std. Dev.
AGE	2	82	35	13
C	I0.004	16217.690	14.923	482.861
FEH	0.000	87.670	27.267	24.822
GOV	6.613	66.691	30.793	9.606
GRGDP	1.300	6.580	4.001	1.479
GRP	-305.049	1588.368	13.411	70.467
GRTT	-99.893	1223.587	27.959	71.387
GRTV	-4389.708	10849.840	12.812	440.680
INF	6.600	72.800	22.132	20.320
LFC	-16.436	16.349	9.541	6.993
ME	-333.835	573.904	3.055	30.331
OP	-18.254	277.555	1.725	12.703
SZT	10.000	20.962	14.729	2.301
SZV	-16.547	20.441	12.802	4.727
TQ	0.104	7.362	0.994	0.352
VI	-209.758	309.386	26.783	24.717
No of Firms	94	94	94	94
Observations	1128	1128	1128	1128

Source: Computed by Author.

The remaining five variables namely vertical integration (VI), management efficiency (ME), operational efficiency (OP), financial constraint (LFC) and tax burden (GRP) all had negative minimum values of less than zero. Their highest and average values are 309.39, 573.90, 277.56, 16.34, 1588.37 and 26.78, 3.06, 1.73, 9.54 and 13.41, respectively. Finally on the growth of the firms, measured alternatively by percentage change in turnover and value added; the minimum recorded growth rates stood at -99.89 and -4389.71, respectively. The maximum growth rates posted are 1223.59% and 10849.84 for turnover and value added, respectively. Average growth rate recorded amounted to 27.96 and 12.81 also respectively.

2. Econometric Estimation Results

The econometric analysis follows the two variants of our model tagged model 1 and 2, respectively. Model 1 measures growth using changes in turnover, while model 2 is the model of growth using changes in value added. The STATA package for economic modeling and forecast which has the full compliments of the alternative methods to estimation as we proposed was utilized to estimate the models.

The results obtained from the alternative approaches to estimation of the two models are presented in Tables 4 and 5. Starting with the first model, Table 4 shows that all the different estimation methods produced significant explanations of the dynamics of growth among the sample firms. However, using the model aggregate diagnostic statistics, the Arellano-Bond estimation method produced the most statistically significant estimates relative to all others.

According to the estimates, differences in growth rate among the sampled firms was significantly explained by the previous year growth rate of the firms, their size, age, capital intensity, management efficiency , the extent of vertical integration and inflation. Four of these seven factors namely the previous year growth rate of the firms, age, capital intensity and vertical integration bear negative relationship, while the remaining three including size, management efficiency and inflation positively influenced the firms growth.

Coming to the second model, the best estimates going by the appropriate diagnostic statistics, is produced by the Hausman-Taylor (HT) estimator (see Table 5). Of all the factors considered, only four significantly explained the sampled firms' growth dynamics. Three of these namely capital intensity, financial constraints, and management efficiency exerted negative impacts. The last, which is vertical integration, bears a positive sign suggesting that it has been helpful to the firms' growth rates.

TABLE 4

Alternative Estimates of the Determinants of the Firm Growth Rate measured by Changes in Turnover

Variables	OLS	F.E	R.E	HT	AM	Arellano-Bond	System GMM
GRTT(-1)	-	-	-	-	-	-0.122***	-0.085***
						(-3.98)	(-3.56)
ZST	1.027	16.033***	1.144	5.292***	5.006***	31.082***	19.055***
	(1.02)	(4.64)	(1.10)	(2.65)	(2.55)	(7.29)	(5.32)
AGE	0.407**	-1.296	0.410**	0.431	0.428	-3.010*	0.269
	(2.31)	(-0.72)	(2.13)	(1.10)	(1.09)	(-1.63)	(0.33)
COR	1.885	3.419*	1.836	1.819	1.690	-0.987*	-4.839
	(1.26)	(1.75)	(1.21)	(1.04)	(0.97)	(-1.63)	(-1.45)
FEH	-0.160*	-0.005	-0.160*	-0.137	-0.141	0.593	-0.135
	(-1.76)	(-0.02)	(-1.70)	(-0.79)	(-0.81)	(1.03)	(-0.30)
GOV	-0.228	0.058	-0.225	-0.115	-0.120	-0.454	-0.714
	(-1.29)	(0.15)	(-1.03)	(-0.36)	(-0.38)	(-0.75)	(-1.18)
GRGDP	-2.287	-3.259	-2.297	-2.936	-3.184*	-4.354	-4.275*
	(-1.29)	(-0.82)	(-1.30)	(-0.48)	(-1.63)	(-1.07)	(-1.62)
GRP	-0.031	-0.032	-0.031	-0.302	-0.032	-0.068	-0.062
	(-1.07)	(-1.03)	(-1.07)	(-0.99)	(-1.05)	(-1.34)	(-1.20)
INF	0.521***	0.579***	0.524***	0.563***	0.560***	0.711***	0.740***
	(4.27)	(4.64)	(4.30)	(4.77)	(4.75)	(5.56)	(5.78)
LFC	2.208*	1.423	2.174*	0.520	1.579	3.810	-3.091
	(1.83)	(0.55)	(1.74)	(0.21)	(0.74)	(1.03)	(-0.88)
ME	0.864***	0.928***	0.872***	0.961***	0.948***	1.098***	1.093***
	(10.98)	(11.06)	(11.06)	(11.86)	(11.82)	(10.80)	(10.61)
OP	-0.049	-0.023	-0.519	-0.604	-0.073	0.368	0.381
	(-0.09)	(-0.04)	(-0.09)	(-0.11)	(-0.13)	(0.55)	(0.56)
TQ	-0.031	-6.913	-0.409	-5.719	-4.752	-8.550	-7.049
	(-0.01)	(-1.09)	(-0.07)	(-0.93)	(-0.78)	(-0.97)	(-0.79)
VI	-0.503***	-0.683***	-0.519***	-0.744***	-0.688***	-1.331***	-1.425***
	(-5.44)	(-6.15)	(-5.56)	(6.95)	(-6.60)	(-9.49)	(-10.04)
Cons	-7.977	-159.928***	-8.680	-42.631	-51.081	-324.285***	-152.346***
	(-0.41)	(-2.50)	(-0.43)	(-1.21)	(-1.49)	(-4.30)	(-2.53)
No. of Obs:	1128	1128	1128	1128	1128	1128	1128
F- Stat	13.33***	16.26***	-	-	-	-	-
Wald	-	-	175.19***	206.27***	203.77***	299.99***	271.84***
R^2	0.1346	0.0531	0.1346	-	-	-	-

Note: ***, ** and * indicates 1%, 5% and 10% significance level respectively.

TABLE 5

Alternative Estimates of the Determinants of the Firm Growth Rate measured by Changes in Value Added

Variables	OLS	F.E	R.E	HT	AM	Arellano-Bond	System GMM
GRTV(-1)	-	-	-	-	-	0.006	0.004
						(0.17)	(0.16)
SZV	3.591	4.968	3.591	11.437	5.422	-23.506	-14.294
	(0.57)	(-0.37)	(0.57)	(0.201)	(0.64)	(-1.31)	(-0.82)
AGE	-1.127	-7.203	-1.127	-1.136	-1.234	5.304	-2.897
	(-0.98)	(-0.62)	(-0.98)	(0.65)	(-0.70)	(-0.39)	(-0.31)
COR	-21.331**	-17.765	-21.334**	-19.990*	-18.839*	-34.902	-25.680
	(2.22)	(-1.45)	(-2.22)	(-1.88)	(-1.78)	(-1.48)	(-1.14)
FEH	0.931	-0.889	0.931	0.9635	0.857	-3.261	-1.302
	(1.60)	(-0.47)	(1.60)	(1.15)	(1.02)	(-0.75)	(-0.36)
GOV	-2.256	0.174	-2.256	-1.175	-1.368	-3.298	-3.737
	(-1.65)	(-0.07)	(-1.65)	(-0.66)	(-0.77)	(-072)	(-0.84)
GRGDP	-10.737	20.476	-10.737	-1.702	-6.219	4.335	6.019
	(-0.94)	(0.79)	(-0.94)	(-0.14)	(-0.53)	(0.14)	(0.25)
GRP	-0.031	-0.119	-0.131	-0.148	-0.127	0.047	0.149
	(-0.71)	(-0.58)	(-0.71)	(-0.73)	(-0.65)	(0.13)	(0.41)
INF	-0.249	-0.624	-0.249	0.503	-0.384	-0.819	-1.173
	(-0.32)	(-0.77)	(-0.32)	(0.65)	(-0.50)	(-0.84)	(-1.22)
LFC	-10.951	-60.021***	-10.951	-49.080***	-28.373**	-88.105***	-73.080***
	(-1.33)	(-3.60)	(-1.33)	(-3.23)	(-2.31)	(-3.19)	(-2.79)
ME	-2.798***	-3.461***	-2.798***	-3.425*	-3.182***	-3.744***	-4.092***
	(-5.53)	(-6.37)	(-5.53)	(-6.45)	(-6.13)	(-5.28)	(-6.01)
OP	-0.002	-1.188	0.002	-0.595	-0.961	-4.203	-3.525
	(-0.00)	(-0.31)	(-0.00)	(-0.16)	(-0.03)	(-0.85)	(-0.72)
TQ	1.805	13.517	1.805	12.323	6.328	21.763	3.874
	(0.05)	(0.33)	(0.05)	(0.30)	(0.16)	(0.35)	(0.06)
VI	4.316***	5.042***	4.316***	5.062***	4.803***	7.063***	7.074***
	(7.18)	(6.94)	(7.18)	(7.13)	(7.11)	(6.77)	(6.83)
Cons	129.715	870.275**	129.715	346.888**	228.807	1190.635	1151.84***
	(1.09)	(2.37)	(1.09)	(2.06)	(1.44)	(2.45)**	(2.66)
No. of Obs:	1128	1128	1128	1128	1128	1128	1128
F- Stat	5.35***	6.36***	-	-	-	-	-
Wald	-	-	69.60***	83.02***	74.53***	75.05***	-
R^2	0.1346	0.0531	0.1346	-	-	-	-

Note: ***, ** and * indicates 1%, 5% and 10% significance level respectively.

VI. Conclusions and Policy Implications

This study has empirically investigated the determinants of growth rate of publicly listed firms in Nigeria during the period 1994-20005. The theoretical/analytical foundation for the study is the optimal firm size theory. The choice of the theory is justified by the fact that it offers us the most practical approach to the study.

The empirical methodology combines descriptive/statistical analysis with econometric analysis. The econometric analysis follows the two variants of the model developed, respectively. The first measures growth using changes in turnover, while the second used the changes in value added as a measure of growth. Alternative methods to estimation were utilized to estimate the models.

The findings show that (i) with growth measured with changes in turnover, the significant determinants of the firms' growth rates are the previous year growth rate of the firms, their size, age, capital intensity, management efficiency , the extent of vertical integration and inflation. With growth measured by value addition, the significant determinants of the firms' growth rates include capital intensity, financial constraints, management efficiency and vertical integration. The conclusion of the study is that the determinants of the firms' growth rates differ depending on how the growth rate is being measured. This, therefore, implies that the approach to the measurement of firms' growth is very important. Nevertheless, a crucial policy implication from the study is that the growth of firms in Nigeria has been influenced by both external-economic wide factors as well as internal-enterprise level factors. The conclusion of the paper, therefore, is that any policy formulation and efforts towards promoting private firms/sector development in Nigeria must accord significance to both internal and external factors that could affect firms' growth even beyond the coverage of this study.

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