Financial Constraints and the Growth of Manufacturing Firms in Nigeria

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Abstract
Using a data set from Nigerian manufacturing firms, this paper examines whether liquidity constraints affect firm growth in Nigeria. We utilise a modified version of Lu and Wang (2010) model which is based on ordinary least squares regressions. Our pooled data show that liquidity constraints engender a positive, statistically significant effect on growth. Further, after controlling for size, our results show that size alone has no significant effect on growth-financial constraints relationship. We however find age variable to have a statistically significant effect on the growth-financial constraints relationship. Finally, after controlling for both size and age, we find that the magnitude of the growth-financial constraints correlation increased substantially. Our results suggest that controlling for the effect of size, age as well as size and age makes an important difference in our measurement and interpretation of the firm growth-financial constraints relationship.
Keywords: *Firm growth, Liquidity Constraints, Firm Size, Manufacturing Firms*.

1. Introduction

In recent time, the subject matter of firm growth has become a much debated issue in economics as well as in strategic research (Laursen, Mahnke & Vejrup-Hansen, 1999). As Jensen and McGuckin (1997) observe, firm growth has not been explained in a satisfactory way as there are still unexplored sources of explanation. It is therefore clear that our knowledge of firm growth is still limited (Davidson & Wiklund, 2000; Wiklund, Patzelt & Shepherd, 2007).

The availability and cost of finance are often twin factors that affect the ability of a business to grow (Binks & Ennew, 1996). The growth of firms, both large and small, is constrained by the quantity of internally generated finance available (Oliveira & Fortunato, 2006). Buffers and Lintner (1945) provide some of the earliest research to support this theory. They conclude that many large and small companies-

even companies with promising growth opportunities-find it extremely difficult or impossible to raise outside capital on reasonably favourable terms and that most firms finance their growth almost exclusively through earnings.

Financial factors (such as liquidity constraints, availability of external finance and access to foreign markets) can have a significant impact on firm's investment decision. If financial factors significantly impact on firms' investment decisions, then they are likely to affect firm size and growth as well (Fagiolo & Luzzi, 2004).

The primary purpose of this study is to investigate empirically the effect of liquidity constraints on firm growth in Nigeria. The study investigates specifically whether firm growth might be better explained by taking into account the link between financial constraints and growth. This differs from the large body of existing literature that have either focused on traditional firm growth analysis, attempting to explain the relationship between firm size, age and growth (Oliveira & Fortunato, 2006), or those that focus on the examination of the validity of Gibrat's law, which states that firms' rate of growth is independent of firm size, and association between firm age and firms dynamics (Lu & Wang, 2010; Sardakis, Mole & Hay, 2007; Evans, 1987). Another important difference is that most if not all empirical evidence linking liquidity constraints to firm growth has been restricted to the United States, Europe and few other transition countries (Lu & Wang, 2010; Oliveira & Fortunate, 2006; Hermelo &Vassolo 2007; Fagiolo & Luzzi, 2004; Elston, 2002). It obviously appears that there are no studies linking the growth of firms to liquidity constraints in Nigeria. Thus this study is a pioneering effort to examine such relationship using firms quoted on Nigerian Stock Exchange. Apart from contributing to the stock of literature on the determinants of firm growth, this paper also provides empirical evidence that contributes to a broader understanding of factors affecting growth of firms in Nigeria. Results from this research will assist firm managers to focus attention on the most important determinants of firm growth especially in Nigeria. It will also assist policy makers in the design and implementation of efficient policies to promote growth of firms in Nigeria and other developing economies.

This study addresses 4 major issues by testing 4 non-committal hypotheses regarding firm growth and financial constraints: 1) there is no relationship between liquidity constraints and firm growth; 2) size has no effect on firm growth-liquidity constraints relationship; 3) age has no effect on firm growth-liquidity constraints relationship; and 4) size and age have no effect on firm growth-liquidity constraints relationship.

The remainder of this paper is structured as follows. Section two reviews the existing literature on the determinants of firm growth and provides the theoretical framework of the study. Section three describes the methodology employed in the study. The results of the empirical analysis are presented in Section four. Section 5 provides the summary and conclusions of the study.

2. Literature Review

The widespread interest on the phenomenon of business growth has generated a huge amount of literature. However, despite the advances achieved in the last twenty years, we still have not reached a clear understanding of this phenomenon. In part, this is because the empirical literature about firm growth is highly fragmented (Federico, 2009). Researchers have taken divergent paths in identifying the factors that determine corporate growth. While some took a traditional approach and empirically tested various models to explain the determinants of firm growth, others took neoclassical approach.

An alternative explanation for the divergent view as Delmar, Davidson and Gartner (2003) posit lies in the recognition of the heterogeneous nature of the firm growth phenomenon. They argued that the search

for an explanation for why firm grows without knowledge of firm growth leads to conflicting theories about causes of firm growth.

The law of proportionate effects (LPE) developed by Gibrat (1931) has become the empirical benchmark for the study of the evolution of firm size over time. In one of its most widely accepted interpretations, the LPE states that the growth rate of any firm is independent of its size at the beginning of the period examined (Fagiolo & Luzzi, 2004). However, despite the fact that their result was statistically significant, estimated growth size correlations appear to be rather weak, especially once sample selection biases are taken into account.

More recently, the robustness of the existing evidence in favour of (or rejecting) a LPE type of dynamics has been questioned by streams of researches. First, in a study by Evans (1987), it was found that firm age is an important determinant of firm growth, the variability of firm growth, and the probability of firm dissolution. Also, the age relationships found are broadly consistent with the predictions of Jovanoviz's theory of firm growth in which entrepreneurs learn about their abilities over time. Thus, Gibrat's law that says that firm growth is independent of firm size is rejected.

Elston (2002) finds that with or without controlling for cash flow, growth regression estimates indicate that Gibrat's law does not hold well. Also, Dunne and Hughes (1994) find that using continuous age had a negative effect on company growth. In a nutshell, there is no perfect consensus on this matter (See Jensen & McGuckin, 1997). Audretsch and Elston (2001) suggest therefore that rather than just asking whether Gibrat's law holds or not, one should rather ask under which context it may hold. Therefore, the debate on the Gibrat's law still remains unresolved.

Another theory of firm growth is the neoclassical theory of the firm. According to Laursen, Mahnke and Vejrup-Hansen (1999) the aim of neoclassical contributions in economics has largely been to study the principles that govern the efficient allocation of resources when both resources and preferences are given. The neoclassical theory of the firm looks at single product firms in an industry with a u-shaped average cost curve. Firms grow until they reach the size corresponding to minimum average costs. Thus, the prediction from the neoclassical theory of the firms is that firm size will in the long-run converge towards some optimum size. They concluded that from empirical point of view, the prediction of neoclassical theory has not gained much support.

The traditional approach, which is considered important in this paper, has stressed the investigation of growth-size relationships without extensively addressing a detailed analysis of other determinants of firm growth. Very little attention has been paid to other determinants of firm growth and size dynamics, such as financial factors (Fagiolo & Luzzi, 2004). Thus this study employs the financing constraints literature to explain the determinants of firm growth. Despite the growing body of literature investigating the role of financial constraints on firm performance, empirical studies on the effect of financing constraints or firm growth are scarce (Oliveira & Fortunato, 2006). However, according to Fagiolo and Luzzi a growing number of contributions have provided robust empirical evidence showing that financial factors (such as liquidity constraints, availability of external finance and access to foreign market) can have significant impact on firms' investment decisions. The studies of SMEs in developing countries have identified financing among others as the most claimed factors that have impact on the survival and growth of firms.

Studies by Oliveira and Fortunato (2006), Harabi (2005), Hsiao and Tahmiscioglu (1997), Fagiolo and Luzzi (2004); Elston (2002) have shown that financial constraints are significant determinants of firms' investment decision. This means that the investment rate of a firm depends on the cash flow that is available to it. As Fagiolo and Luzzi (2004) rightly put it, if financial factors significantly impact on

firm's investment decisions, then they are likely to affect size and growth dynamics as well. For instance, the study by Fazzari, Hubbard and Peterson (1988) indicate that high liquidity constrained firms might face difficulties in financing their investment and thus suffer from low growth rates in the future. Capital constraints according to Oliveira and Fortunato (2006) have been offered as an explanation for the pattern in the size distribution of firms and the relationship between size and age.

With respect to raising capital, various arguments point out that firms face different kinds of financial constraints in raising capital. According to Hobdari, Jones and Mygind (2000) smaller firms face higher costs in issuing new equity. Thus, small firms according to them are expected to rely more on internal funds. Agency costs may also be greater for these firms, raising further the cost of external financing. Overall, small firms are expected to rely more on internal funds than larger firms. The results of previous empirical studies also concur with this position.

Also, there is a particular difficulty for new firms in raising capital. Brito and Mello (1995) suggest that learning by outside financiers is critically important in determining growth as the firm gains a track record of how bankers learn about the firm and can lend more comfortably. The new firm with no track record is a more uncertain proposition for an outside financier.

A different approach suggests that firm size and age may also explain the degree of financial constraints. Fazzari, Hubbard and Peterson (1988) and Hooks (2003) maintain that financing constraints decrease with firm size. At the same time, size and age may affect the ability of the firm to weaken its liquidity constraints and to gain access to external finance (Fagiolo & Luzzi, 2004).

Cabral and Mata (2003) develop a model of firm growth that depends on investments and access to capital. Their model predicts the firm size distribution will be skewed. The intuition behind their result is that small firms with good investment opportunities may be periodically unable to raise the resources to exploit those opportunities. In that case, they will under-invest and grow more slowly than larger firms with an internal cash flow to fund their project.

There is therefore a preponderance of evidence from literature that suggests a relationship between liquidity constraints and firm growth. The present study extends the existing literatures.

3. Methodology

The following four sub-sections describe the methodology of this study.

3.1 Sample Selection and Data Source

This study uses manufacturing firms quoted on the Nigerian Stock Exchange (NSE). Manufacturing firms are considered suitable for this study because firms in this sector are mostly multinationals that trade in heavy machines and equipment. Businesses of this nature no doubt require sufficient and constant cash flow because of foreign exchange requirements.

For the purpose of this study, a number of filtering procedures have been followed for sample selection. First, observations with either missing values for the variable used (cash flow and sales) are excluded. Second, the data for this study is limited to surviving firms. Third, giving the requirements of the econometric methodology adopted, only firms in existence throughout the period of the study are considered.

After the application of the afore-mentioned procedures, the final observation is made up of sixty seven manufacturing firms quoted on Nigerian Stock Exchange. The set of data used in this paper is obtained

from two major sources-the Nigerian Stock Exchange Fact Books and the annual Financial Statements of the sample firms for all the relevant years. The study covers a period from 2000 to 2008.

3.2 Empirical Model

To investigate the effect of liquidity constraints on firm growth, this study uses modified version of Lu and Wang (2010) model. The original model is stated as

$$Growth_{i,t} = \beta_1 + \beta_2 lnSIZE_{i,t-1} + \beta_3 lnAGE_{i,t-1} + \beta_4 CF_{i,t-1} + \beta_5 RD_{i,t-1} + \beta_6 lnADV_{i,t-1} + \varepsilon it \ldots\ldots\ldots\ldots 1$$

Where Growthit is log of difference in size, measured by sales for firm i between the current period t and the previous period t-1, $lnAGE_{i,t-1}$ and $lnAGE_{i,t-1}$ represent the log of firm size and age respectively, $CF_{i,t-1}$ is the cash flow which is scaled by employment, $RD_{i,t-1}$ is the R&D ratio (R&D expenditure/sales) and $lnADV_{i,t-1}$ the log of advertising spending and represents the proxy for the entry barrier.

Unlike Lu and Wang (2010) who examine the effect of liquidity constraints as well as size, age, research and development, and advertising spending on firm growth, our study focuses on the relation between firm growth and liquidity constraints. We therefore modified the Lu and Wang's model as follows:

$$Growth_{it} = \beta_1 + \beta_2 lnCF_{it-1} + \varepsilon it \ldots\ldots\ldots\ldots 2$$

Where $Growth_{it}$ represents natural logarithm of firm growth for firm i between period t and the previous period t-1, $\beta_1$and β_2 are intercept and slope of the estimating equation respectively. InCF represents the natural logarithm of cash flow and $_{\varepsilon it}$ is stochastic disturbance or error term.

However, since a number of studies have indicated the robustness of size and age in the growth-financial constraints relationship, we attempted to address this concern by controlling for these variables separately and jointly. We first captured the size variable in the model as follows:

$$Growth_{it} = \beta_1 + \beta_2 lnCF_{it-1} + \beta_3 Size + \varepsilon it \ldots\ldots\ldots\ldots 3$$

We further captured the age variable in the model as follows:

$$Growth_{it} = \beta_1 + \beta_2 lnCF_{it-1} + \beta_3 Age + \varepsilon it \ldots\ldots\ldots\ldots 4$$

We finally incorporated both size and age variable in the model as follows:

$$Growth_{it} = \beta_1 + \beta_2 lnCF_{it-1} + \beta_3 Size + \beta_4 Age + \varepsilon it \ldots\ldots\ldots\ldots 5$$

Size is defined as the natural logarithm of total assets while age is defined as the number of years the firm has been in existence from the date of incorporation.

We also redefined growth in line with the work of Musa (2010). Thus growth in this study is represented by average growth in net sales measured by the average of the aggregate current sales less previous sales divided by previous sales. That is,

$$Growth_{it} = \sum_{t-1}^{n} \frac{(\text{Current Sales} - \text{Previous Sales})/\text{Previous Sales}}{n} \ldots\ldots\ldots\ldots 6$$

Unlike Lu and Wang (2010), our cash flow has also been redefined in terms of cash flow from operations which is in tandem with the definition adopted by Oliveira and Fortunato (2006), Adelegan (2003) and Musa (2009). Thus cash flow is measured as:

$$CF_{i,t} = Np_{i,t} + Dep_{i,t} - IT_{i,t} \quad \ldots\ldots 7$$

Where $Np_{i,t}$, $Dep_{i,t}$ and $IT_{i,t}$ are the net profit, depreciation, and interest and tax for firm i at time t.

3.3 Dependent Variable

The dependent variable is firm growth. Sutton (1997) Raspe and Oort (2008) suggest that while the number of employees is often used to measure growth, there are other appropriate measures of firm growth such as firm's level of sales or physical assets (Elston, 2002). Apart from these measures of firm growth, Zhou and Wit (2009) added that firm growth can be measured by other attributes such as market shares and profit. According to them, sales and employees are broadly used because both measures reflect short-term and long-term changes in a firm. Some of the previous empirical studies that use employment as proxy of firm growth are: Olivera and Fortunato (2006), and Elston (2002). The problem with employment as observed by Hermelo and Vassolo (2007) is that the measure is biased against the capital-intensive firm and firms that have a significant level of outsourcing. Therefore, the measure of growth used in this research study is the level of sales in line with the existing literature (see Lu & Wang, 2010; Musa, 2009). Hermelo and Vassolo (2007) argue that sales variable has the advantage of being a good measure of the total value of firm. Also information about firms' level of sales is easy to obtain.

3.4 Independent Variable

Firm's cash flow is used as a proxy of liquidity constraints. This variable has been commonly used in literature. According to Elston (2002) the rationale for the use of cash flow is that once we move away from the perfect capital markets world, we find that financial and real decisions are not always separable for the firm. Liquidity problems are often exacerbated by asymmetry of information between suppliers of finance and firms. Also, it was argued that cash flow is more direct measure of liquidity (Adelegan, 2003). Other studies that use cash flow as a proxy of liquidity constraints include Lu and Wang (2010), Elston (2002); Fagiolo and Luzzi (2004).

4. Analysis of Results

The results of this study are presented in three sub-sections. The first sub-section analyses the descriptive statistics. The second sub-section presents the correlation variables used in the regression analysis and the third sub-section discusses the regression results.

4.1 Descriptive Statistics

We begin our analysis with an examination of some of the summary statistics and present some basic features of the sample. Table 1 presents the summary of sample statistics.

In table 1, we report the summary statistics of the variables used in the econometric analysis for the whole sample. The data for total assets shows that the size distribution is skewed. The mean value of total assets is more than twice larger than the median. As Olivera and Fortunate (2006) indicate, this result is consistent with the idea that in the presence of cash constraints, firm size distribution will be skewed. This result confirms the fact that the sample comprises of firms of varying size. The average growth value is also nearly twice larger than the median. This signifies that the growth distribution is also skewed and concentrated around its average value.

The average firm age is about 58 years where as the median is 55.5 years. This result confirms the idea that most of the firms are old and matured. Finally, we find that on average, cash flow is 1427401, while the median is 636336.5.

4.2 Correlation Matrix

In table 2, we present the correlation variables used in the regression analysis.

A correlation matrix permits the measurement of the strength of the linear relationship between the variables. The correlation between cash flow, size, age and firm growth are positive as expected. The correlations are also strong at about 88%, 84% and 54% respectively. This signifies that an increase in cash flow, size and age can engender positive change in growth level.

4.3 Empirical Result

In this section, we present and analyze our growth and financing constraints relationship estimated by pooled data for the whole sample.

Table 3 shows the regression results for models 1 to 4. In model 1, we examine the relationship between cash flow and firm growth. The estimated regression relationship for the model is growth= 2061737 + 7.6976(CF). The model shows that cash flow has a significant positive effect on growth at 1% level. The coefficient of the model suggests that an increase in cash flow by 1% will lead to an increase in growth by about 8%.

The adjusted R^2 of the model is 77%. This implies that 77% of the variation in firm growth is explained by cash flow, a proxy for financial constraints. This provides evidence that the model is well fitted. The F-statistic indicates a value of 231.79 and was found to be significant at 1% level.

In model 2, we control for size in the growth-Cash flow relationship. The regression results indicate that cash flow has remained positively significant at 1% level. However, size is not significant. The implication of this result is that size alone does not have an effect on the relationship between growth and cash flow which suggests that irrespective of firm size, and increase in cash flow leads to an increase in the growth of a firm. The adjusted R^2 of the model has also remained at 77% while the F-statistic shows a value of 116.23 and remains significant at 1% level.

In model 3, we introduce age as a control variable in the growth - cash flow model. The results show that age has significant influence (at 1% level) on the growth Cash flow relationship. The adjusted R^2 increased to 81%, also significant at 1% level, which is an improvement on the fitness of the model.

In model 4, we control for both firm size and age. The results provide evidence that liquidity impacts firm growth even after controlling for firm size and age. Both cash flow and age are statistically significant at 1% level. Of particular interest is the larger and statistically significant coefficient of size at 5% level. Thus, we may conclude that the results in model 4 are more credible because firm size annuls spurious correlation between growth size and cash flow. Furthermore, the adjusted R^2 increased to 82% signifying an improvement in the fitness of the model over and above the first three models. The F-statistics shows a value of 108.38 and has remained significant at 1% level.

Our results are parallel with the findings of Fazzari, Hubbard and Peterson (1988), Brito and Mallo (1995), Fagiolo and Luzzi (2004), Olivera and Fortunato (2006) and Saridakis, Mole, and Hay (2007). These studies document a strong positive relationship between financing constraints and firm growth.

These results are important to the growth literature because they suggest that controlling for the effect of size, age as well as size and age make an important difference in how we are able to measure and interpret the growth-financial constraints relationship.

Focusing on policy implications, if we believe that policy makers are interested in the growth of both the larger and smaller firms in Nigeria stock market, a notion that is not farfetched, then the result of this study support the conclusion that both larger and smaller firms are growing faster, indicating some clear evidence of the market as a conduit of investment funds to high growth firms in the economy.

5. Summary and Conclusions

In this paper, we analyzed the relationship between liquidity constraints and firm growths for Nigerian manufacturing companies. Our major objective was to assess whether financial constraints (as proxied by cash flow) affect firm growth.

Our regression exercises on pooled data show that financial constraints engender a positive statistically significant effect on growth.

We also examined the effect of size, age as well as size and age on the growth-financial constraints relationship. Our regression exercises suggested that size alone had no significant effect on firms' growth-financial constraints relationship. However, age had a statistically significant effect on the firm growth-financial constraint relationship. A striking revelation from this study comes from the controlling effects of both size and age. We found that the magnitude of the growth-financial constraints correlation increased substantially. Both firm size and age were also found to be statistically significant. Based on these results, we rejected our first null hypothesis and hence concluded that there is a significant relationship between firm growth and liquidity constraints. We however accepted the second hypothesis that size has no significant effect on the firm growth-liquidity constraints relationship. The results further provided evidence for the rejection of our third and fourth null hypotheses. We therefore concluded that age as well as size and age had significant effect on the firm growth-liquidity constraints relationship.

There are some interesting issues that remained to be explored.

First, further studies are indicated in order to determine the degree to which listing on the Nigerian stock market has alleviated liquidity constraints.

In addition, future studies can consider the extent to which firm capital structure in general impacts on growth of firms.

Finally, alternative proxies of liquidity constraints could be considered in order to test the robustness of our results. Future studies may, for example consider "risk effect" by building liquidity constraints proxies based on the firms' financial stock variables such as leverage measures (Becchetti & Trovato, 2002). Such studies will no doubt have significant effect on the growth of Nigeria's stock market and the economy as a whole.

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Table 1. Summary of Sample Statistics

VARIABLES*	GR	CF	AGE	SIZE
Mean	13049284	1427401.	57.92857	8454317.
Median	7577137.	636336.5	55.50000	4141859.
Maximum	65945174	8829042.	85.00000	57262000
Minimum	1868.000	3000.000	30.00000	126000.0
Std. Dev.	15110907	1726138.	17.12471	11521464
Skewness	1.393371	1.862407	0.041889	2.492821
Kurtosis	4.602574	6.980149	1.502896	9.540625
Jarque-Bera	30.14133	86.67118	6.557657	197.2728
Probability	0.000000	0.000000	0.037672	0.000000
Observations	67	67	67	67

**GR = Growth, CF= Cash Flow,*

TABLE 2. Correlation Matrix of Variables

VARIABLES*	GR	CF	SIZE	AGE
CF	1.000000			
SIZE	0.929532	1.000000		
AGE	0.387995	0.282412	1.000000	
GR	0.879305	0.837818	0.539730	1.000000

**GR = Growth, CF= Cash Flow,*

TABLE 3. Regression Results

Variable[a]	Equation 1	Equation 2	Equation 3	Equation 4
Intercept	2061737	21410991	-8753590	-9877931
	(1.828340)*	(1.892579) *	(-3.131828) **	(-3.561025) ***
CF_{it}	7.697588	6.472182	6.903628	4.359672
	(15.22480) ***	(4.717652) ***	(14.00699) ***	(3.395662) ***
$Size_{it}$	-	0.197508	-	0.394848
	-	(0.960929)	-	(2.136545) **
Age_{it}	-	-	206265	230733
	-	-	(4.151835) ***	(4.638277) ***
R^2	0.773178	0.776262	0.819593	0.831264
Adj. R^2	0.76982	0.769583	0.814208	0.823594
F-statistics	231.7945***	116.2284***	152.1913***	108.3808***
Durbin-Watson stat	0.764226	0.7055334	0.670662	0.586173

[a] *-GR = Growth, CF= Cash Flow*

t – values are in parenthesis. ***, **, and * indicate that values are sig. at 1%, 5% and 10% respectively