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DETERMINANTS OF INDUSTRIALIZATION IN NIGERIA: A MICRO-PERSPECTIVE

***OKECHUKWU SOLOMON KENE; **OGUNYEMI FOLASHADE HELEN; & **ADIATU HUSSIEN KEHINDE**

**Productivity Capacity Building (PCB) Departmen, National Productivity Centre. **Consultancy and Business Development (CBD) Department, National Productivity Centre, Lagos State Office*

ABSTRACT

Industrialization had been and still remains one of the policy choruses sung by different administrations in Nigeria since early independence to-date followed by various policy strategies and programmes with little or nothing being accomplished to that effect. This study investigated the major determinants of industrialization in Nigeria from a micro-perspective using a panel firm-level dataset (World Bank Enterprise Survey) collected and published by World Bank. The dataset covered the periods 2007, 2009 and 2014. Given the short time-period covered by the dataset, static panel models of fixed, random effects and pooled regression models were used to analyse the data. The Hausman test demonstrates that random effect is more appropriate than fixed effect model while Breusch–

Introduction:

Industrial development is regarded as a bedrock for economic growth at all stages of development of both advanced and developing economies of the world. Today, regardless of level of development, all countries around the globe continue to embark upon relevant policies and strategies to ensure stable macroeconomic policies that would guarantee a virile working environment for sustainable industrial development. Since the political independence of Nigeria in 1960, achieving economic growth and development via industrial

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Pagan LM presents that random effects do not matter in the model, and as a result, pooled regression is the right model. Findings of various pooled regression models in the study disclose that physical capital, foreign ownership, top manager education level, employee's education, trade openness, economic growth, institutional index and financial system with strong institution have positive significant effects on the manufacturing firms' productivity in Nigeria. However, the findings display that scale of firm's operation (micro, small or medium), nature of firm's activity (especially textiles), macroeconomic stability index, financial development index and log oil revenue have negative significant impacts on the firms' productivity in the country. The study recommends, among others, incentive strategy to encourage manufacturing firms, financial institutions should be made to be real professionals and comply with CBN's directives, and so forth.

Keywords: *Industrialization, manufacturing, Micro-perspective, World Bank, Institution and Nigeria.*

Transformation has remained crystal clear a prime objective and focus of various administrations in the country. This can be demonstrated with numerous development plans and policies[1] with each having industrialization as one of its goals.

However, it is worrisome that all these development plans and policies have not yielded the required level of expectation as the industrial base of the country is till rated poor and backward (Iwuagwu, 2009 & World Bank, 2002).

Besides that, the contribution of the industrial sector to the gross domestic product (GDP) has not been appreciating for decades. For instance, the percentage share of the manufacturing subsector (which measures the actual value added) to Nigeria's GDP had started rising from 4.6 percent in 1960 to 7. 5 percent and 11.1 percent in 1970 and 1980 respectively. This suggested that First and Second National Development Plans had begun yielding some positive results on industrialization. However, this process had been halted, perhaps, by Structural Adjustment Programmes of 1985

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as the percentage share of the manufacturing subsector to Nigeria's GDP fell from 11.1 percent in 1980 to 8.6 percent and 6.4 percent in 1990 and 2000 respectively (CBN, 2010). Again, the process was reinvigorated in 2010 as the share slightly rose to 6.6 percent in 2010 and finally up-surged to 9.1 percent in 2015 (CBN, 2016).

The discovery of oil in the early 70s has also worsened the situation as other sectors of the economy were neglected due to cheap money coming from the sales of crude oil. But, in the present decade, fluctuation in the oil market and activities of militants in the oil region of Nigeria has generated calls for diversification of Nigeria economy to break the culture of heavy reliance on the oil sub-sector.

World Bank (2002) states that understanding the factors influencing industrial productivity in developing economies is very critical for formulation of industrial policies. Therefore, assessing the factors influencing industrial (manufacturing) productivity becomes necessary in unlocking and providing a framework of overcoming the challenges of achieving sustainable industrial development in Nigeria. Although, there is proliferation of studies on the determinants of industrialization in Nigeria such as (Adenikinuju and Olofin, 2000; Ekpo, 2001; Dan & Wanjuu, 2012 & Otalu & Anderu, 2012) among others but, most of these studies applied time series data with different forms of proxies and measurement which has made their conclusions questionable. The availability of cross-sectional data of the enterprise survey published by World Bank has made it possible to directly measure the determinants of industrialization from micro perspective without proxies and biasness.

The paper goes beyond the existing studies in a number of ways. Firstly, the paper is a departure from previous studies conducted for Nigeria as it has applied micro data which tends to be more accurate and reliable in econometric estimation. Secondly, the study used wide specification by capturing new variables such as firms' characteristics, economic and political variables that were not previously applied for Nigerian case. The omission of these variables would produce biased estimate. Lastly, it has used sound and robust econometric techniques and would contribute to

the body of knowledge by providing fresh insight on the determinants of industrialization in Nigeria.

The remainder of the paper is organized in five sections as follows: following the introduction (section 1), section 2 provides theoretical and empirical literature. Respectively, methodology and results and discussions are treated in section 3 and 4 followed by conclusion and recommendation in the last section.

Literature Review

There is plethora of studies that supported industrialization as the engine of growth and development. For instance, Bolaky (2011) summits that the level of industrial development in a country to a large extent influences the rate of growth and development. In the same vein, Dan and Wanjuu (2012) opine that there is higher marginal product of labour from industrial sector compared to agricultural sector in developing economies. In the same vein, Otalu and Anderu (2015) stress that rapid industrial growth would produce the much needed self-reliant economy and hence, pave way for the achievement of macroeconomic objectives. It would also generates linkages with the development of other sectors of the economy particularly agriculture.

The belief that industrialization commove economic growth has instigated many economists and theorists to formulate theories and hypotheses by putting into cognizance the importance of industrialization in growth process particularly in developing economies. Well known among these theories include Rosenstein- Rodan's (1943) big push theory; Hirschman's (1958) unbalanced growth theory and Regnar Nurse's (1959) balanced growth model. All these theories emphasize the role of industrialization as bedrock for growth and development. Although, the policy implication of these theories varied greatly across time and regions but they all advocated that market and resources constraints are the main barriers to industrialization in less developed countries. Therefore, they favour massive public investment and adequate harnessing of available markets

(domestic and foreign) as a finest approach to overcome the challenges of industrialization in developing economies.

The miraculous growth and development witnessed in former USSR, China and Eastern Europe in the 20th century and the emergence of the newly industrialized nations and emerging economies like Singapore, Malaysia and Taiwan is largely attributed to industrial development of their economies.

In advanced economies, innovation, research and development (R&D) and other scientific discoveries especially after the industrial revolution are largely the sources and drivers of their technological advancement leading to robust industrial development. This is not, however, the case in developing economies, since the aforementioned factors are either lacking or totally absent in most cases leading to poor industrial base. In a bid to foster industrialization, developing countries mostly apply policies, plans and strategies such as export promotion, import substitution and other relevant development plans in short, medium or long term. These policies and strategies have proved to be efficacious in most countries like Nigeria, albeit, in most cases were weaken by poor implementation and political instability. Thus, economic growth and development cannot therefore be disconnected with industrial development.

On the empirical ground, there is profusion of studies that examine the determinants of industrialization around the world using different sample size and methodological framework. These studies range from developing and emerging countries to developed ones of the world. For instance, Guadagno (2016) examines the determinants of industrialization covering a large sample of 74 countries for the period 1960 to 2005. The findings reveal that industrialization is faster for larger countries with undeveloped industrial base and development strategies. Trade openness, undervaluation and skills and knowledge are also found to be significant factors influencing industrialization. In another study by Samouel and Aram (2016), using a sample of 35 African countries for a period between 1970 and 2012, found that although the determinants of industrialization vary across regions in the continent, but human capital, labour market

condition, exchange rate and GDP per capita are significant determinants across all regions in the continent.

Anaman and Osei-Amponsah (2009) studied the determinants of industrial output of manufacturing industries in Ghana applying time series data between 1976 and 2006. The result shows that level of per capita income, political stability and export- import ratio are found significant in influencing industrial output. In a similar study, using Comwall (1977), Guadagno (2012) estimates the determinants of industrialization for a set of developing countries and the finding shows that size of domestic market and trade openness are found significant. Albeit, we cannot deduce and generalize the above finding to all countries in the region as their economic and political setting differs significantly. Nurunnisa and Hastiadi (2016) examined the links between instability of exchange rates and deindustrialization phenomenon in Indonesia. Using 2SLS method, the study found that these problems are interrelated and cannot be separated from each other. Deindustrialization problems in Indonesia, which are explained by the decline in manufacturing exports, decline in manufacturing labor productivity, trade balance deficit and investment displacement from the tradable sector (manufacturing), directly and indirectly relates with exchange rate. The implication of this study is that government should pay attention to Indonesian manufacturing sector in solving exchange rate problem.

Babatunde (2009) using a large sample of Sub-Saharan African countries found that trade liberation has significant influence on export performance. In contrast, Shafeddin (2005) found that trade liberalization has led to de-industrialization of low income countries especially those that did not apply selective trade policies. Seetanah and Khadaroo (2007) applied Cobb Douglas production function using both dynamic and static modelling found that FDI is a very significant factor in government decision on manufacturing policies. Otalu and Anderu (2015) investigate the determinants of industrial growth in Nigeria and the result reveals that labour, capital and exchange rate are found to be significant while openness, inflation and capacity utilization are found to have inverse

relation with industrialization. Adenikinuju and Olofin (2000) applied panel data for seventeen African countries. The result shows that human capital and trade openness have positive effect on manufacturing output while trade liberalization and competitiveness index have negative influence on growth of industrial output. Ekpo (2001) found similar evidence for Nigeria that human capital and technological advancement are pre-requisite for industrial development in Nigeria.

Moreover, the presence of god governance and sound political and social system can influence industrial productivity in a country. For instance, Ng and Yeats (1999) using structural regression model found that government regulation on trade has strong influence on industrial activities. Earle and Gehlbach (2014) in their study demonstrated that political favouritism with weak institutions has a substantial negative redistribution effect on productivity of manufacturing firms.

Turning to micro based studies, Arnold, Javorcik, Lipscomb and Mattoo (2012) using panel data for about 4,000 manufacturing firms in India for a period between 1993 and 2005 found that banking, telecommunication, insurance and transport reforms all have significant positive effect on the productivity of manufacturing firms. In another similar study by Arnold, Javorcik and Mattoo (2011) they applied firm level data and found that increased foreign participation in services provision has led to insignificant improvement of manufacturing productivity in Czech Republic. Accordingly, Javorcik and Lin (2004) in their analysis found that entry of new foreign retail chains improves the productivity of the supplying industries in Romania. Amini and Konings (2007) go deeper into the channels through which liberalization effect productivity in Indonesia. The result reveals a positive correlation between liberalization and productivity of manufacturing firms.

In another recent study by Ding, Guariglia and Haris (2016) on the determinants of productivity of Chinese manufacturing industries found that there exists heterogeneous evidence among industries on the effect of high political affiliation. Also, R&D and export are found to be insignificant drivers of productivity among Chinese industries. Hsich and Klenow

(2009) also found that distortions in Chinese economy reduce productivity of manufacturing firms by 30-50 percent. In another micro level study by Bas and Chausa (2013) shows that trade restriction brings about productivity gains and benefits to manufacturing firms.

There are also studies that investigate the effect of industrialization on economic growth. For example, Dan and Wanjuu (2012) using data set for Nigeria found that industrialization has no significant influence on economic growth of Nigeria. Similarly, Jelilov, Enwerem and Isik (2015) using a small sample size (2000-2013) for Nigeria found that industrialization has negative effect on growth. In contrast, Isiksal and Chimezie (2016) found a stable long run relationship between industrial output and economic growth. Obioma and Uche (2003) applied two-stage least square techniques using Nigeria dataset found that there is positive correlation between industrial output and economic growth.

Umoru and Eborieme (2013) studied the nexus between trade liberalization and economic growth using data for Nigeria. The econometric result reveals that trade liberalization and structural deregulation have significant impact on industrial output while capital formation has insignificant negative effect on industrial output. Kim (2000) found identical evidence that trade liberalization has positive effect on industrial output.

Methodology of the Study

Theoretical Model

The principal goal of this study remains to examine the determinants of industrialization at firm-level in Nigeria. This was done by examining the impacts of various factors on the manufacturing firms' productivity in Nigeria. Solow's, (1956) model of output growth posited that units of physical capital and labour remain the most important inputs that majorly determine productivity at either firms' or country's level. It is however acknowledged by Nelson and Phelps, (1966); Lucas, (1988); Becker, Murphy and Tamura, (1990); Romer, (1990) and Barro, (1991); that quality (not only quantity) of labour is important in trying to boost the

productivity of a country or firm. This implies that accumulated human capital has positive impact on firms' productivity. Standard Cobb-Douglas production function is a starting point of most growth models, and this can be specified as below:

$$Y_{it} = AK_{it}^{\alpha} L_{it}^{\beta} \text{ ---------- (1)}$$

Where Y_{it} is the output; K_{it} is the physical stock of capital and L_{it} is the quantity of labour; all of firm i at time t. A is an efficiency parameter representing state of technology in the firm while α and β are the output elasticities which could be used to measure the scale of production of the firms: α + β=1 (Constant returns to scale); α + β<1 (Decreasing returns to scale); and α + β>1 (Increasing returns to scale).

To account for human capital in production function, Mankiw, Romer & Weil, (1992) developed what they called an *augmented-Solow Growth model,* which can be specified as below:

$$Y_{it} = K_{it}^{\alpha} H_{it}^{\beta} (A_{it} L_{it})^{1-\alpha-\beta} = A_{it} K_{it}^{\alpha} H_{it}^{\beta} L_{it}^{\gamma} \text{ ----------(2)}$$

Where H_{it} is the stock of human capital of firm i at time t. Equation (2) can be linearized by by taking logarithm of both sides so that the equation is now expressed in per capita terms.

$$\log Y_{it} = \log A_{it} + \alpha \log K_{it} + \beta \log H_{it} + \gamma \log L_{it} + \mu_{it} \text{ -------- (3)}$$

Where Y_{it}, K_{it}, L_t and H_{it} are the output, physical capital stock, labour and human capital of firm i at time t respectively. Equation (3) can be further modified to capture other important variables that determine firms' productivity. The modified equation can be specified as below:

$$\log Y_{it} = \log A_{it} + \alpha \log K_{it} + \beta \log H_{it} + \gamma \log L_{it} + Z + \mu_{it} \text{ --------(4)}$$

Where Z is a vector of controlled variables in the firms' productivity model.

Empirical Model

As implied in the theoretical and empirical studies reviewed, several factors come into interplay to determine industrialization, at micro or macro level, in an economy. Based on the availability of data and micro nature of this study, the factors that determine the level of total sales of manufacturing firms were generally classified into: (i) *Firm-specific*

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characteristics (age, foreign ownership, scale and products or services offered by firms); (ii) *Controlled factors* (labour or employment, physical capital stock, ownership structure, top manager's education leveland education received by employee); and (iii) External factors (rate of economic growth, indices of macroeconomic stability and institutional factors, financial development, trade openness and oil revenue). Note that indices of macroeconomic stability and institution were constructed using principal component analysis. Equation (5) below modeled the above factors:

$$indstz_{it} = \lambda_1 + \lambda_2\, frsx_{it} + \lambda_3 contl_{it} + \lambda_4 extf_{it} + \mu_{it} \text{ ----------(5)}$$

Where $indstz_{it}$ is the industrialization variable, in which logarithm of sales of manufacturing firms was used as a proxy of industrialization. frsx is a vector of firm-specific characteristics; contl is a vector of controlled variables; extf is a vector of external factors; and 'it' represents cross-section and time units.

Sources of Data

In order to examine the major determinants of manufacturing firms' productivity in Nigeria (source of industrialization), the study used Enterprise Panel Survey dataset collected and compiled by World Bank (2015) for the periods 2007, 2009 and 2014. The Enterprise Surveys currently cover over 130,000 firms in 135 countries, of which 121 have been surveyed, and the data was collected on firms' experiences and enterprises' perception of the environment (including innovative activities) in which they operate. Nigeria Enterprise Survey is a nationally representative obtained randomly from about 2640 business establishments, involved mainly in retail, food, hotel and restaurant, Furniture, non-metallic mineral products, garment and Publishing, printing, and Recorded media. The Enterprise Surveys centre on the several factors that shape the business environment. These factors are either constraining firms' performance, or are viewed as *sine qua non* for firms' prosperity. Again, data on external factors explained in section 3.2 were sourced from World Development Indicators (WDI), CBN Statistical

Bulletin and World Governance Indicators (WGI) by World Bank (2016), Central Bank of Nigeria (2016) and World Bank (2016).

Estimation Strategy

Static panel models of fixed and random effects as well as pooled regression model would be used to estimate the determinants of firms' productivity. Fixed effect is a static panel model that allows for differences in the intercept parameter for each individual. In the fixed effects method, the constant is treated as group (section)-specific. It is known as the least squares dummy variables (LSDV) estimator because it allows for inclusion of dummy variables in order capture different constants for each group (Greene, 2012 and Maddala, 1992). The random effects model, on the other hand, treats the heterogeneity across individual firms as a random component. In random effects model, a constant for each unit is considered as not fixed but as random parameter (Greene, 2012 and Baltagi, 2005). In order to determine which of the two models (fixed and random effects) is preferable or more appropriate, Hausman test is, developed Hausman, (1978), conducted. There are two hypotheses in the test: Under H_0, both estimators are consistent but are inefficient, and under H_1 both estimators are consistent and efficient. When the value of the statistic is large, then difference between the estimates is significant, thus null hypothesis, that random effect model is consistent, is rejected and fixed effect estimators are preferable. However, a small value of the test suggests that the random effect estimator is more appropriate.

Basically, panel models have several advantages over cross-sectional or time-series models because the former control for individual heterogeneity, are more informative, have less collinearity, more degrees of freedom and efficiency and etc.. Static Panel models were applied in this study because the dataset of the study is unbalanced panel with very short time scope (2007, 2009 and 2014), which may not be adequate and suitable for dynamic panel analysis.

Presentation and Discussion of Results

This section presents and discusses the results obtained from panel static models including pooled regression model, descriptive and trend analyses. Table 1 shows the distribution of firms by their respective sectors and sizes.

Table 1 reports that there are more manufacturing firms in Nigeria than retail and service firms based on World Bank Business and Enterprise. The panel survey indicates that 47.12 percent of the firms surveyed were manufacturing ones as compared 23.34 and 29.54 percents of the firms, which were retail and service firms respectively. This implies that the dataset contains adequate information about manufacturing firms, which could help in attaining the objectives of this study.

Table 1: Distribution of Firms in Nigeria

By Firm-Type		
	Frequency	Percentage
Manufacturing	3,043	47.12
Retail	1,507	23.34
Service (non-retail)	1,908	29.54
Total	6,458	100.00
By Firm-Size		
Micro	164	1.34
Small	8,355	68.19
Medium	3,246	26.49
Large	487	3.97
Total	12,252	100.00

Source: Author's Computation using WBES 2015

Table 1 also reveals that Nigerian business environment is dominated by small- and medium-scale firms, as they respectively account for 68.19 and 26.49 percents of the total firms studied in the panel survey. However, large- and micro- firms account for 3.97 and 1.34 percents of the total firms respectively. This implies that there are larger proportions of small- and medium-scale firms, which are more susceptible to policy changes of government especially during transition than large-scale firms that are

long established and not easily responsive to policy reforms. Furthermore, table 2 provides information about basic characteristics of manufacturing in the panel survey. The table shows that the average full-time workers employed by manufacturing firms during the periods were 35 people with standard deviation of about 177 people.

Table 2: Characteristics of Manufacturing Firms in Nigeria

Variables	Observation	Mean	Std. Dev	Min	Max
Total Sales	2,795	₦1,300,000,000	₦25,100,000,000	₦15,000	₦1,000,000,000,000
Full-Time Workers	2,991	35.22434	176.5285	0	5,000
Age	2,932	17.48124	9.467428	1	101
Physical Capital	586	₦98,900,000	₦1,260,000,000	0	₦27,700,000,000

Source: Author's Computation using WBE2015

Table 2 indicates that there are firms with no full-time workers and those firms employing 5,000 people. Again, the average age of firms surveyed is 17.5 years with the standard deviation of 9.5 years. The minimum age of the firms is 1 year and the maximum age is 101 years. The total average sales made by the firms hover around ₦1.3 billion with standard deviation of ₦25.1 billion. However, the minimum and maximum sales made by the firms during the periods (2007, 2009 and 2014) are ₦15,000 and ₦1 trillion respectively. The netbook value of fixed assets of the firms is ₦98.9 million on average with standard deviation of ₦1.3 billion. Also, the minimum and maximum netbook values of fixed assets of the firms are ₦0 and ₦27.7 billion correspondingly. The wide divergence in the characteristics of the firms could be due to the presence of both micro-scale firms at one extreme

end and large-scale firms at the other extreme end. This is because micro-scale firms have very small capacity when matched with large ones.

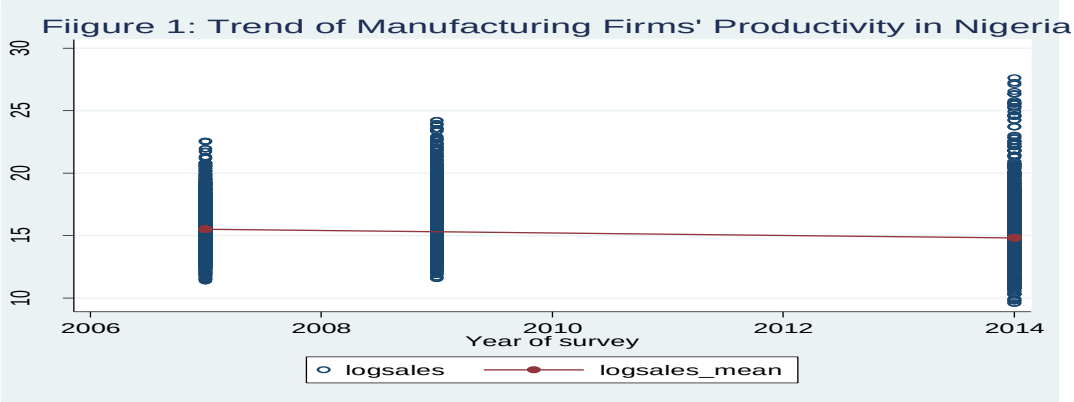

Figure 1 depicts that the total productivity of manufacturing firms have been on increase from 2007 through 2009 and finally to 2014 as shown by the dots in the graph. Conversely, the average productivity of manufacturing firms remains stagnant throughout the periods as indicated by the maroon line in the chart. This suggests that several factors could be responsible for this stagnation including large proportion of small-scale firms, and others, which may be revealed by the models estimated in this study.

Table 3 reports the results of static panel models (fixed effect, random effect and pooled regression). The table reveals that the significant determinants of manufacturing firms' productivity in all the models are physical capital, foreign ownership, top managers' education level, and being either micro-, small- or medium-scale firms. While physical capital, foreign ownership, top managers' education level, and being either micro-, small- or medium-scale firms are statistically significant at 1 percent in all the three models; age and employee's education are significant at 10 percent in random effect model.

The models also suggest that employee's education is significant at 5 percent level of significance in pooled regression model. The models unanimously reveal that physical capital and top managers' education level have positive significant impacts on manufacturing firms' productivity, whereas foreign-ownership and being either micro-, small- or medium-

scale firms compared to large-scale firms have negative significant impacts on productivity of the firms.

Table 3: Static Panel Model Results on Determinants of Micro-Industrialization

	(1)	(2)	(3)
VARIABLES	Fixed	Random	Pool
Full-time workers	-0.000167	-0.000230	9.29e-05
	(0.000933)	(0.000933)	(0.000837)
Age	0.0165	0.0181*	0.0134
	(0.0110)	(0.0109)	(0.00907)
Physical capital	2.41e-10***	2.33e-10***	2.32e-10***
	(7.24e-11)	(7.24e-11)	(6.57e-11)
Employee edu.	0.356	0.504*	0.556**
	(0.291)	(0.269)	(0.242)
Top manager edulevel	0.547***	0.713***	0.770***
	(0.195)	(0.176)	(0.155)
Foreign ownership	-0.929***	-1.026***	-0.958***
	(0.349)	(0.344)	(0.294)
Micro	-2.649**	-2.535**	-2.489**
	(1.084)	(1.073)	(0.964)
Small	-2.746***	-2.574***	-2.568***
	(0.496)	(0.490)	(0.406)
Medium	-1.539***	-1.473***	-1.204***
	(0.497)	(0.495)	(0.408)
Constant	15.73***	15.02***	14.90***
	(0.822)	(0.734)	(0.622)
Observations	376	376	533
R-squared-Within	0.253	0.251	0.281
R-squared-	0.6070	0.810	

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Between			
R-squared-Overall	0.257	0.261	
Hausman=4.41(0.8183)			
Breusch–Pagan LM Test=0.00(1.000)			
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity= 3.61(0.0575)			

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1*

The random effect's results further indicate that age and employee's education have positive significant effects on productivity of the firms; whilst pooled regression model's results show that employee's education affects productivity of the firms significantly and positively.

These results are generally consistent with the theoretical propositions (Mankiw, Romer and Weil's, 1992 augmented Solow growth model) of the study, which posit that it is quality labour that can improve the firms' productivity. However, foreign ownership is reported to have negative on the manufacturing firms' productivity, perhaps foreigners invested majorly on crude petroleum and gas sector, which is not part of manufacturing sector except the refining. And even refining itself is usually done outside Nigeria, that is, it is not refined by firms located in Nigeria.

Table 4: Pooled Model on Determinants of Manufacturing Firms' Productivity, Nigeria

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Baseline	Openness	Growth	Macro	Financial	Institution	Interaction	Oil Rev
Full-time wrk	9.29e-05	0.000125	0.000125	0.000125	0.000125	0.000125	0.000125	0.000125
	(0.00160)	(0.00163)	(0.00163)	(0.00163)	(0.00163)	(0.00163)	(0.00163)	(0.00163)
age	0.0134	0.0115	0.0115	0.0115	0.0115	0.0115	0.0115	0.0115
	(0.0160)	(0.0164)	(0.0164)	(0.0164)	(0.0164)	(0.0164)	(0.0164)	(0.0164)
Physical cap	2.32e-10***	2.45e-10***	2.45e-10***	2.45e-10***	2.45e-10***	2.45e-10***	2.45e-10***	2.45e-10***
	(4.17e-11)	(4.33e-11)	(4.33e-11)	(4.33e-11)	(4.33e-11)	(4.33e-11)	(4.33e-11)	(4.33e-11)
Employee edu	0.556*	0.159	0.159	0.159	0.159	0.159	0.159	0.159
	(0.332)	(0.343)	(0.343)	(0.343)	(0.343)	(0.343)	(0.343)	(0.343)
topmgredulevel	0.770***	0.364*	0.364*	0.364*	0.364*	0.364*	0.364*	0.364*
	(0.164)	(0.213)	(0.213)	(0.213)	(0.213)	(0.213)	(0.213)	(0.213)
fownship	-0.958***	-0.653*	-0.653*	-0.653*	-0.653*	-0.653*	-0.653*	-0.653*
	(0.362)	(0.361)	(0.361)	(0.361)	(0.361)	(0.361)	(0.361)	(0.361)
micro	-2.489*	-2.590**	-2.590**	-2.590**	-2.590**	-2.590**	-2.590**	-2.590**
	(1.278)	(1.123)	(1.123)	(1.123)	(1.123)	(1.123)	(1.123)	(1.123)
small	-2.568***	-2.887***	-2.887***	-2.887***	-2.887***	-2.887***	-2.887***	-2.887***

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	(0.561)	(0.582)	(0.582)	(0.582)	(0.582)	(0.582)	(0.582)	(0.582)
medium	-1.204**	-1.475**	-1.475**	-1.475**	-1.475**	-1.475**	-1.475**	-1.475**
	(0.565)	(0.587)	(0.587)	(0.587)	(0.587)	(0.587)	(0.587)	(0.587)
textiles		-0.662*	-0.662*	-0.662*	-0.662*	-0.662*	-0.662*	-0.662*
		(0.361)	(0.361)	(0.361)	(0.361)	(0.361)	(0.361)	(0.361)
publishing		-0.151	-0.151	-0.151	-0.151	-0.151	-0.151	-0.151
		(0.328)	(0.328)	(0.328)	(0.328)	(0.328)	(0.328)	(0.328)
openness		11.43***						
		(4.112)						
Econ growth			1.535***					
			(0.552)					
Macrstainde x				-0.452***				
				(0.163)				
findevindex					-0.272***			
					(0.0980)			
instindex						0.218***		
						(0.0784)		
findinstimde x							0.805***	
							(0.289)	
Log Oil Rev								-

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								4.364***
								(1.570)
Constant	14.90***	12.27***	6.547**	16.33***	16.61***	16.73***	18.75***	32.96***
	(0.780)	(1.401)	(3.293)	(0.895)	(0.937)	(0.959)	(1.462)	(6.371)
Observations	533	533	533	533	533	533	533	533
R-squared	0.281	0.312	0.312	0.312	0.312	0.312	0.312	0.312

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Hausman test suggests that random effect model is more appropriate and efficient than fixed effect model at all levels of significance. Breusch-Pagan LM test, however, reports that random effects do not matter and as such, pooled regression model is the appropriate model.

Table 4 reports various determinants of manufacturing firms' productivity in Nigeria over the years using pooled regression model with Cluster-robust standard errors controlling for heteroskedasticity. The models are estimated using cluster by firm identifier so as to control for possible inter-correlation among observational error terms in the dataset. Model 1 in table 4 presents the results of Baseline model where physical capital, foreign ownership, top managers' education level, employees' education and being either micro-, small- or medium-scale firms are the significant determinants of manufacturing firms' productivity in Nigeria. Model 2 controls for the activities of manufacturing firms and trade openness. The model reveals that engaging in textile activity makes the firms to lower their productivity by 0.66 percent while as degree of trade openness increases the manufacturing firms' productivity goes up by 11.43 percent. This is of course evident as a look at a typical Nigerian suggests that whatever he/she wears from head to toe is mostly imported not locally produced. Trade openness enlarges market size in a country.

Being micro-enterprising, small- and medium-scale manufacturing firms make them to have lower productivity by 2.59, 2.89 and 1.48 percents than

large-scale firms respectively. Foreign-owned manufacturing firms have lower productivity by 0.65 percent than otherwise. Models 3 and 4 in table 4 assess the impacts of economic growth and macroeconomic stability index on the firms' productivity respectively. Model 3 indicates that as the economy grows, the manufacturing firms' productivity goes up significantly by 1.54 percent. This is so because as economy grows employment opportunities are created and subsequently per-capita income of such people rises up, thereby raises effective demand. Model 4 shows that macroeconomic stability has a negative significant role in influencing the firms' productivity because the result implies as the economy becomes stables, the firms' productivity reduces by 0.45 percent. This has been proven to be right during the current (2015/2016) recession for the crisis reveals that during economic instability it becomes cheaper and easier to produce locally than to import given the scarcity and high value of dollar as the international medium of exchange.

Models 5 and 6 in table 4 examined the effects of indices of financial development and institution on the firms' productivity. The model 5 depicts that financial development has a negative significant on the firms' productivity implying that as the financial system develops the firms' productivity dives by 0.27 percent perhaps due to failure of financial institutions to comply with Central Bank of Nigeria's (CBN's) directives to give soft credit facilities to manufacturing firms and other unprofessional practices evidently associated with financial institutions in Nigeria. Model 6 indicates that as institutions become stronger the firms' productivity increases significantly by 0.22 percent. When indices of financial development and institution are interacted in model 7 to see the effect of financial system with strong institutions, the results suggest that the firms' productivity rises up significantly by 0.81 percent. Finally, model 8 reveals that logarithm of oil revenue impacts the firms' productivity negatively and significantly. Precisely, the results bring forth the problem of cheap petrol-dollar and its attendant consequence of resource-curse. Again, the results signifies that not only does petrol-dollar cause resource-curse but it also

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distracts investors from investing in manufacturing sector to highly capital-intensive oil and gas sector.

The findings of this are generally consistent with the findings of such studies as Anaman and Osei-Amponsah (2009), Aram (2016), Comwall (1977), Guadagno (2012) and (2016), Javorcik and Lin (2004), Nurunnisa and Hastiadi (2016), etc.

CONCLUSION AND RECOMMENDATION

Industrialization had been and still remains one of the policy choruses sung by different administrations in Nigeria since early independence to-date followed by various policy strategies and programmes with little or nothing being accomplished to that effect. The available studies on industrialization in Nigeria and other parts of the world are generally macro in nature. This study investigated the major determinants of industrialization in Nigeria; from a micro-perspective using a panel firm-level dataset (World Bank Enterprise Survey) collected and published by World Bank. The dataset covered the periods 2007, 2009 and 2014. Given the short time-period covered by the dataset, static panel models of fixed, random effects and pooled regression were used to analyze the data. The Hausman test demonstrates that random effect is more appropriate than fixed effect model while Breusch–Pagan LM presents that random effects do not matter in the matter, and as a result, pooled regression is the right model.

Findings of various pooled regression models in the study disclose that physical capital, foreign ownership, top manager education level, employee's education, trade openness, economic growth, institutional index and financial system with strong institution have positive significant effects on the manufacturing firms' productivity in Nigeria. However, the findings display that scale of firm's operation (micro, small or medium), nature of firm's activity (especially textiles), macroeconomic stability index, financial development index and log oil revenue have negative significant impacts on the firms' productivity in the country.

The study suggests the following measures to improve manufacturing activity in Nigeria. First, there should be total re-orientation of the firms in

the country to encourage them to manufacture and add value to commodities because selling or exporting them. This can be achieved through such incentive mechanisms as tax holidays or reliefs for manufacture, affordable leasing machines and equipment, and providing technical training to the firms on their activities. Second, financial institutions should be carefully monitored to ensure that they comply with Central Bank of Nigeria's directives to provide good financing facilities to the firms that meet criteria for the programme, and the institutions must be made to adhere to professional financial institutions. This can be accompanied through reward and sanctions for the complying and wanton institutions respectively. Third, political and economic institutions have to be built up for labeling playing ground for manufacturing firms. This can be done by way of full-fledged and truthful electoral reforms, and democratic practices. Finally, government must urgently speed up the process of diversification by paying adequate attention to agriculture and other sources of raw materials for manufacturing sub-sector. By so doing, cost of doing business and resource-curse can be curtailed in the country.

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Appendix A: Description of variables

VARIABLE	*DEFINITION*
DEPENDENT	
Industrialization/Manufacturing Firms' Productivity	The Logarithm of firms' total sales over the years
EXPLANATORY	
Age	The number of years a firm has been in operation (natural logarithm)
Full-time workers	The total number of firms' full-time employees
Foreign Ownership	Dummy for the presence of foreign ownership
Top Manager Education Level	Dummy for level of education acquired by top manager (no education=0, primary education=1, secondary education=1 and tertiary education=3)
Employee education	Percentage of employees who completed high

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	school
Formal training	Dummy for the percentage of employees who received formal training.
R&D	Dummy for any firm's expenditure on research and development
Competitors	Dummy for the presence of competitors in the main market of a given firm
Micro	Dummy for micro-scale business firm
Small	Dummy for small-scale business firm
Medium	Dummy for medium-scale business firm
Large	Dummy for large-scale business firm
Textiles	Dummy for any firm involved in textiles, garments, and leather
Publishing	Dummy for any firm involved in publishing, printing, recorded media, and paper
Macroeconomic Stability Index	Principal component analysis is used to construct the index using such variables as exchange rate, interest and inflation rate
Financial Development Index	Principal component analysis is used to construct the index using such variables as Credit to private sector, broad-money supply and market capitalization
Institutional Index	Principal component analysis is used to construct the index using such variables as Voice and accountability, government effectiveness, regulatory quality, rule of law, political stability and absence of violence, and control of corruption
Level of economic growth	Rate of Economic Growth
Trade Openness	Sum-total of exports and imports as a percentage of GDP
Oil Revenue	Logarithm of oil revenue
Retail	Dummy for any firm whose major sector is retail
Service	Dummy for any firm whose major sector is service
Manufacturing	Dummy for any firm whose major sector is manufacturing

Authors' construction using WBES dataset.

Appendix B: Variables and their Sources

Vector	Variables	Source
Industrialization	Logarithm of total Sales of manufacturing firms	WBES by World Bank (2015)
Firm-specific Characteristics	Age, size (labour) location, activities	WBES by World Bank (2015)

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Internal Factors	Physical capital, ownership structure, export, innovation, employees' formal education and training	WBES by World Bank (2015)
Controlled Factors		
Macroeconomic Stability Index	Interest rate, inflation rate, exchange rate	Statistical Bulletin by CBN (2016) and WDI by World Bank (2016)
Level of economic growth	Rate of Economic Growth	Statistical Bulletin by CBN (2016) and WDI by World Bank (2016)
Financial Development Index	Credit to private sector, broad-money supply, market capitalization	Statistical Bulletin by CBN (2016)
Index of Institutional Factors	Voice and accountability, government effectiveness, regulatory quality, rule of law, political stability and absence of violence, and control of corruption	WGI by World Bank (2016)
Trade Openness	Sum-total of exports and imports as a percentage of GDP	WDI by World Bank (2016)
Oil Revenue	Logarithm of oil revenue	Easy of Business report by World Bank (2016)

Authors' construction using WBES dataset.

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