

Linkage Behaviour of Manufacturing Firms in Nigeria

Abdelrasaq Na Allah¹ and *David Adebisi Samuel²

¹Department of Economics, University of Abuja

²Department of Economics, Trinity University, Lagos

*Corresponding Author

DOI: <https://dx.doi.org/10.47772/IJRISS.2023.70945>

Received: 26 June 2023; Revised: 24 August 2023; Accepted: 29 August 2023; Published: 30 October 2023

ABSTRACT

Postulations and investigations have shown that with strong connection to the global value chain theory, industrial upgrading at the national level necessitates a paradigm shift from ordinary assembly of imported inputs to a more sophisticated integrated forms of production that will require a more intensive use of both forward and backward linkages. This work employed Ordered Probit Framework and the findings revealed that manufacturing firms in Nigeria exhibit poor linkage with the local economy. The results show that firms in the country generally source their inputs from foreign sector. Only the size variable showed evidence of positive linkage with local suppliers. Policy drive should therefore be geared towards addressing obstacles that prevent firms in the country from patronizing local suppliers.

Key Words: Linkages, Forward Linkage, Backward Linkage, Manufacturing, Sectors

INTRODUCTION

One of the key objectives of the present administration in Nigeria is to engender a virile manufacturing sector which she hopes would help create jobs and reduce her age long dependence on oil. In a recent United Nations' Report, the idea that a strong industrial, especially manufacturing sector is necessary for job creation and general economic development of developing countries was advocated. The report premised this argument partly on the potentials that exist for manufacturing firms to spur the development of local suppliers through formation of backward linkages (United Nations, 2007). We further get the impression that linkage spillover of manufacturing firms is a key part of the Global Value Chain theory as industrial upgrading at the national level requires a paradigm shift from ordinary assembly of imported inputs to a more sophisticated integrated forms of production that would require a more intensive use of both forward and backward linkages.

The above can be interpreted to mean that linkage spillover of manufacturing activities is a key developmental outcome of any industrial and manufacturing development strategy and standard against which success or otherwise of restructuring efforts can be measured.

Despite this importance, our knowledge of how firms behave in linkage formation in developing economies like Nigeria is still scanty. A recent work with focus on the African economy of Lesotho argued and found evidence that supplier capability is a critical determinant of the prospect of local embeddedness of manufacturing firms in the small landlocked economy (Na-Allah, 2015). This work intends to investigate the factors that could be responsible for shaping linkage behavior of manufacturing firms in Nigeria.

The work is divided in to four sections. Section two presents the literature and empirical reviews of the various determinants of linkage development, this is followed by section three which presents the methodology, estimation and results. Section four gives conclusion.

REVIEW OF LITERATURE

Linkage development can be viewed as the creation of a continuous inter-firm relationship between a target firm and others in a region. The extent of dependence of the target firm on other firms in the region is what determines the level of integration in the region. From theory, when a target firm depends on the others in the region to be able to sell the output of the firm, we have what is referred to as forward linkage, while the dependence of the target firm on others for the supply of their inputs for the production of the target firm's output, it is referred to as backward linkage. The concern of this work is to investigate the backward linkage, that is, factors that affect the supply of input to the target firm. For the rest of the paper, this shall be referred to either as linkage development, linkage spillover, linkage formation or simply linkage.

A major feature of the extant literature on linkage development is that both demand and supply factors matter.

Demand oriented hypothesis

The possibility of linkage in any region can be attributable to the following variables that could affect demand for inputs in the domestic economy. They include: foreign affiliation, sectoral affiliation, age of the firm, size of the firm, global conglomerate, size, market orientation, subsidiary autonomy and market price competitiveness.

Foreign affiliation: Local demand linkage is argued to be negatively associated with foreign ownership as these firms may be quite unfamiliar with the local environment. It may also be because of the possibility that exists for them to rely on their parent firm's network of suppliers that are not domiciled within their host economy. However, one condition that can influence foreign firms to patronize local suppliers is age. Studies have found that the longer the foreign affiliate has been established in the host economy, the higher the level of local supply linkages becomes (McAleese and McDonald, 1978; Driffield and Noor, 1999; Görg and Ruane, 2001; Tavares and Young, 2002).

Sectoral lineage: Another factor is the type of sector a particular firm belongs. One criterion for distinguishing sectors more likely to patronize local suppliers from those not likely to do so is complexity of production technology. This in essence implies that linkage is quite weak in high-tech production sector simply because the capability to produce those inputs needed may not be available in the host economy. In a survey of firms in Costa Rica, the Dominican Republic, and Morocco, UNCTAD finds that the relative sophistication of garment sector's input needs inhibits local sourcing by firms (UNCTAD, 2000). On the other hand, productions that require low-tech technologies input are likely to enjoy better relative local patronage. In a study of the determinants of regional sourcing by multinational manufacturing firms in the UK, Crone and Watts (2003) showed that firms producing customer specific products with unstandardized and uncomplicated input requirements had a significantly higher level of linkage formation than firms producing standardized and technologically complex products.

Age: This is also a factor in the consideration of determinants of linkage development potentials of manufacturing firms. The longer a firm operates in a region the more likely it is for its management to understand and become familiar with local suppliers better than younger firms. Therefore, the hypothesis is that age is positively related to linkage spillover (O'Farrell and O'Loughlin, 1981). It is also possible that older firms may find it more difficult to change from the local linkage relationship built over time.

Market orientation: A postulation that has been well researched is that market orientation affects the prospect of local procurement (Pangestu *et al.*, 1992; Supapol, 1995). Firms set up primarily to serve export market are assumed to more likely show less commitment to local input markets. These firms tend to purchase less from the local suppliers especially in developing countries (Belderbos *et al.*, 2001; UNCTAD, 2001). The corollary of this is that firms that manufacture for local consumption should have high demand

propensity for local inputs.

Global conglomerate: Belonging to a conglomerate can facilitate access to global sources of information which somewhat places them in a vantage position to have options of sourcing their inputs from outside the local regions. The hypothesis therefore is that the stronger the network the lower the degree of local embeddedness (Na Allah, 2011).

Market competition and autonomy: Market competitiveness and autonomy of subsidiaries can influence demand for local input. A firm that operates in an environment where there exists price competition is likely to have options of different price offers including and especially global offers (Laurisden, 2004). Similarly, when firms such as foreign firms operate decentralized organization structures where their affiliates are empowered to make a choice of where to source inputs from, they may be more inclined to source more locally (Zanfei, 2000).

Firm size: There is a difference between the sourcing behavior of large and small size firms. Large sized firms may be more disposed towards global market than their smaller counterparts. This is because they may possess more resources that can facilitate such behavior than their smaller counterparts. On the other hand, and for similar reason of resource constraint, small sized firms may show more patronage of local markets.

Supply constraints hypothesis

In view of the structural bottlenecks facing the supply capability of firms in the LDCs, it is not unlikely that one of the major challenges that could impede the linkage development is the supply constraints. Be that as it may, very little attention has been given to that in the literature on linkages. The few studies so far have come to assert that firms in economies with high supply potentials are likely to have stronger local patronage than those with weak supply capabilities. The capability to supply is one thing but the ability to favourably compete with others elsewhere is another.

The positioning of a local firm to meet both the capability and competitiveness criteria is premised on two major criteria; the size and the industrial identity of the region concerned. It is hypothesized that foreign affiliates' degree of local supply linkages differs depending on the level of development of the host economy. An economy that is large enough in terms of its national income and development capacity is likely to have more potential to attract more heavy investors in the upstream sector of the economy where the supply needs to the downstream can be engendered with high hopes of profit. By implication, economies with less potential will attract less investors and that would affect the volume and quality of local input that could be generated to meet the needs of other firms. This hypothesis was confirmed by Twomey and Tomkins (1996) for the UK while a related focus on Japanese plants in the USA by Reid (1995) finds no such evidence (Na Allah, 2011). The sums to indicate that the level of development of an economy determines the strength of local linkage. A number of studies have analyzed the relationship between multinational firms' activities and their impact on host countries' development trajectories (Hood and Young, 2000; Lall and Narula, 2004). These countries also show different degrees of experiences with the FDI. Different government policies and programmes also play a strong role in the development of local embeddedness. For instance, Giroud, et al (2006) asserted that government policies created more favourable environments in Thailand and Malaysia than for Viet Nam and Cambodia.

The above-mentioned size of the economy challenge can be attributable to the structural identity of the economy. Certain economies especially the SSA are so characterized by monoculture economy, whereby the health and the strength of the economy depends entirely on only one or two sectors. It is a common knowledge in the SSA that the economies rely very heavily on unsophisticated and weak income-earning sectors such as agricultural and light manufacturing activities. Consequent upon this scenario, it is quite difficult to find investors of heavy investment coming to such environment simply because the output will not be required as input in the region. Consequently, the type of firms that will be prevalent will be low-tech

and unsophisticated that will be required for the uncomplicated economic activities. This goes to point to the reason why industries like food and garment and foot wares will not have any problem to source their inputs from the local suppliers.

It is also noteworthy that the fact that a firm is locally located within a region does not guarantee full patronage by other firms, except it can meet the criterion of competitiveness in terms of price and quality. Given the environment of the Nigerian economy, it is pertinent to note that most regional suppliers are not competitive internationally due to a number of structural factors such as poor physical infrastructures, unskilled labour, institutional weaknesses, underdeveloped systems of financial intermediations, etc. With these factors steering the Nigerian economy in the face, it is going to be economically correct to believe that there will be a weak local embeddedness in the country.

Empirical Evidence

There is no definite consensus on particular factors that affect linkage formation in the literature. The few works done that attempted to investigate this centered on the developed economies (UNCTAD, 2001). Other relevant works that have come close to what we expect is that of Kirsten and Rogerson (2002) and Barnes and Kaplinsky (2000) which focused on South Africa in addition to that of Arimah (2001) which presented the determinants of the linkages between the formal and informal sectors in Nigeria. Giroud and Mirza (2006) came to the conclusion that through local supply linkages, Transnational Corporations (TNCs) in East Asia potentially generate considerable benefits for host economies, both from value-chain multipliers and technology transfers and spillovers. Studies have shown that the linkage potential of TNCs is higher than that of domestic firms in some developing countries (Potter *et al.*, 2003; Alfaro and Rodríguez-Clare, 2004; Jensen 2004).

METHODOLOGY, ESTIMATION AND RESULT

Data and Variable Construction

Data for the study comes from survey of factors that shape business environment in Nigeria. It was carried out by the World Bank and its partners under the Enterprise Survey exercises that are periodically conducted to assess the quality of investment climate in Developing Countries. The data was collected between April 2014 and February 2015 and included in the pool is a nationally representative sample of manufacturing firms that cuts across food & beverage, garments, fabricated metal products, non-metallic mineral products, furniture, publishing, and other manufacturing. For the purpose of this exercise, the eight variables described below were generated from the dataset:

Linkage: This describes the extent to which firms in the sample integrated with the local economy during the study period. It is captured by the degree of a firm's backward integration as defined by the percentage of material input and supplies that was sourced locally. Following the Ordered Probit framework, the degree of linkage is classified into one of five ordered categories with 0 (no linkage); 1 (weak linkage); 2 (moderate linkage); 3 (high linkage); 4 (very high linkage). The distribution of this categorization in terms of domestic component of input procurement during the reference year is given by:

$$y = \begin{cases} 0 & \text{if } y \leq 10 \text{ (no linkage)} \\ 1 & \text{if } 10 < y \leq 20 \text{ (weak linkage)} \\ 2 & \text{if } 20 < y \leq 50 \text{ (moderate linkage)} \\ 3 & \text{if } 50 < y \leq 75 \text{ (high linkage)} \\ 4 & \text{if } y > 75 \text{ (very high linkage)} \end{cases}$$

Where y is the percentage of the domestic component of input procurement during the period.

Where ‘no linkage’ status refers to firms with less than 10 percent of domestic component in input procurement during the reference period. ‘Weak linkage’ is associated with firms whose domestic share of input procurement is between 10 and 20 percent. But for those firms having values that exceed 20 percent but fall short of 50 percent, status is classified as ‘moderate linkage’. In the category of ‘high linkage’ are firms that sourced more than 50 percent and up to 75 percent of supplies locally. Any firm whose value exceeds this is classified to be of ‘high linkage’ status.

Sector: Four sectors were identified as Machinery & Equipment, Food, Garment and Chemical. Dummy variables were generated to identify each of these viz:

macheequip for Machinery and Equipment;

food for Food and Beverage;

gmt for Garment and

chemical for Chemical sector.

Whereas variable for Food & Beverage is expected to be positively linked with local linkage the direction of other variables is unclear.

Foreign: To determine this variable, firms were asked to state the proportions of shares that foreigners own in their businesses. Ownership value that is up to ten percent or more is considered to be foreign-owned and classified as one. Those with less than ten percent of foreign equity ownership are treated as Nigerian ownership.

Size: Number of workers was used to classify firms into three distinct groups: small, medium and large. Small sized firms comprise of organizations with between 5 and 19 workers. Medium size has a workforce that falls between 20 and 99 workers and any respondent that has up to 100 or more employees is classified as large.

Age: Firms were asked to declare the year in which they commenced operations. This question allowed us to distinguish between older and smaller firms. In accordance with expectations this variable should associate positively with local linkage.

The summary statistics for these variables is presented in Table 1.

Table 1: Summary Statistics

Variable	Observation	Mean	Std. Dev.	Min	Max
link	1016	3.006398	1.52747	-0.094	4
gmt	1401	0.1170592	0.32161	0	1
frgn	1401	0.1213419	0.32664	0	1
age	1267	16.9929	11.9885	1	111

large	1401	0.0720914	0.25873	0	1
Small	1401	0.6331192	0.48213	0	1
machequip	1401	0.0214133	0.14481	0	1
chemical	1401	0.0278373	0.16457	0	1
food	1401	0.194147	0.39568	0	1

Generated by authors

Estimation and Result

Two defining features of the dependent variable in this exercise (linkage) is that it is discrete and ordered. Because it allows dependent variables to assume values which are ordinal in nature, Ordered Probit estimation technique represents one of the best ways to estimate a model of this kind. It is therefore adopted for our exercise. Its argument is presented as follows:

$$link = gmt, frgn, food, large, small, age, chemical, Machequip \dots\dots\dots (1)$$

Where:

link = linkage behavior of firms as captured by the share of domestic component of input procurement

gmt, indicating the Garment Sector

frgn, indicating foreign ownership

food, indicating the Food & Beverages Sector

large, indicating large size

small, indicating small size

age, indicating age of establishment

chemical, indicating the Chemical Sector

machequip, indicating the Machinery & Equipment Sector

Tables 1-2 present result of estimation of Ordered Probit Model of equation 1. The first (Table 1) is the basic regression result while the second (Table 2) is result of Marginal Effect Estimates of Predicted Probabilities that is used to measure *ceteris paribus* effects of changes in the regressors affecting the features of the outcome variable.

In Table 1 two estimated models are presented: Model A and Model B. In order to determine which of these two has a better fit estimates were obtained for both Bayesian information criterion (BIC) and Akaike's information criterion (AIC). Given two models fit on the same data, the model with the smaller value of the information criterion is considered to be better.

Based on this logic Model B with smaller value of information criterion is revealed to be better than Model A and chosen for the analysis.

It turns out that only 4 out of the 7 independent variables that were fitted were statistically significant at 1% level of test. The 4 variables are foreign ownership (*frgn*), small size (*small*), age (*age*) and chemical sector (*chemical*).

The negative sign associated with the coefficients of foreign ownership status, chemical sector conformed to expectation in the same way as the positive sign observed for small size status. However, age factor was expected to associate positively and negatively with linkage performance as revealed. One way to rationalise this paradox is to come to terms with the suggestion that there is generally a dearth of local suppliers in the Nigerian economy.

Table 4: Ordered Probit Regression Results

	Model A		Model B	
Variables.	Coef	P> z	Coef.	P> z
gmt	-0.1	0.47	-0.1	0.46
frgn	-0.74	0.00**	-0.74	0.00**
food	0.08	0.42	0.08	0.42
large	0.08	0.57	0.08	0.57
small	0.2	0.03**	0.2	0.02**
age	-0.01	0.01**	-0.01	0.01**
machequip	0.1	0.29	---	---
chemical	-0.66	0.77	-0.66	0.00**
Number of obs:	921			921
Log likelihood:	-1013.261			-1013.3
BIC:	2115.252			2108.51
AIC:	2052.521			2050.61

*significant at 10%; **significant at 1%.

Table 5: Marginal effect of explanatory variables on domestic linkages

	Linkage 0	Linkage 1	Linkage 2	Linkage 3	Linkage 4
	(No Linkage)	(Low Linkage)	(Mod. Linkage)	(High Linkage)	(V. High Linkage)
frgn	0.1981	0.0097	0.0327	0.0428	-0.2898
age	0.0002	0.0001	0.0004	0.0009	-0.032
small	-0.0055	-0.0028	-0.0103	-0.0198	0.0754
chem	0.0179	0.0087	0.0292	0.0365	-0.2619

To interpret the result, we now turn to Table 2 of marginal effect of explanatory variables. A close scrutiny reveals that foreign presence decreases the probability of the highest level of linkage formation (Linkage 4) by about 28%. Older firms relative to their younger counterparts are also less likely to significantly (Linkage 4) patronize local suppliers by a probability score of 3%. Another evidence of poor linkage behavior is the revelation that firms in the chemical sector have as much as 26% lower probability of being strong on

linkage at the highest level. By contrast, when comparison is made with their larger counterparts the prospect of having small size firms source up to 75% and more of their input locally increases by roughly 8%.

CONCLUSION

Against the background of recent policy move by the Nigerian government to engender a virile manufacturing sector this paper investigated the linkage spillover behavior of manufacturing firms in Nigeria. The success and benefits of industrialization efforts have been argued to be crucially linked to the extent to which firms engage in linkage behavior through stimulation and empowerment of local suppliers.

Models of linkage spillover behavior were specified for the Nigerian manufacturing firms using data obtained from the World Bank Enterprise Survey conducted for the Nigerian economy in 2014. Because of the discrete and ordered nature of the dependent variable Ordered Probit estimation technique was employed.

Results showed generally that manufacturing firms in Nigeria exhibit poor linkage behavior with the local economy. The coefficients of three, out of the four statistically significant explanatory variables; foreign presence, age of the firm and chemical sector was negatively related to local procurement suggesting these firms generally source their input needs from outside the country. Only the size variable revealed evidence of positive linkage with local suppliers. The policy message from here is that the success of the industrialization drive of the present administration would depend crucially on how well it is able to address many of the obstacles that prevent firms in the country from patronage of local suppliers.

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