

Pattern of Linkages in Oluyole Industrial Estate, Ibadan, Nigeria

Dickson 'Dare Ajayi and Barbara Osaigbovomwan Eguagie

Department of Geography, University of Ibadan, Nigeria

The pattern of linkages among 24 existing manufacturing firms in Oluyole Industrial Estate, Ibadan based on International Standard Industrial Classification (ISIC) was considered in this paper. Data were collected to determine the spatial extent and the level of involvement defined as whether backward or forward linkages. Using the Leontiff input-output analytical technique, the degree of linkages varied among the industry groups and particularly linked to locations outside the country for inputs but very localized in terms of forward linkages to the local economy. However, industries in the estate had strong linkages with the industrial sector of the economy. In particular, there was low level of linkages with the agricultural sector.

Keywords: Industrial linkages, international standard industrial classification, Leontiff input-output model, Oluyole industrial estate, Ibadan, Nigeria

Introduction

The locational choice of an economic activity is very important as it could determine the success, not only of the firm's current activity but also, its future (Strotmann, 2007). Studies have shown that firms tend to locate in places where a variety of facilities exist as is the case of industrial estates and as such, these facilities are perceived as added advantage by the industrialists. With time, the location attracts other firms and eventually, concentration of industrial activities emerge (Oladapo, 2001). The concentration of economic activities may create beneficial externalities via information spillovers. Locations that have an important stock of research and development (R&D) and experience-based 'knowhow', a specialized labour-force or infrastructure etc., are usually in a better position to make innovations and add to their existing stock of knowledge than regions with small initial endowments of such factors (Maskell and Malmberg, 1995). However, it is possible to view most plants as having fixed locations (in the short and medium term) hence it becomes imperative how plants function in a specialized economic world. Of particular geographic importance is how plants interact with others and with firms in other sectors. That is, to bring about linkages (Britton, 1978) and of course with the recognition that the modern firm

is a sophisticated and complex enterprise which critically depends upon communication and active participation as well as technically advanced, comprising several products of almost infinite variety (Karaska, 1978). The spatial concentration of plants in locations, such as planned industrial estates, gives opportunity for linkage among firms, exchange of ideas as well as regional development (Thompson, 1972). This is due to industries seeking to minimize inter-industry transfer costs and maximize accessibility to both suppliers and buyers.

These linkages take place between or among firms in form of operational flows of materials and exchanges of information between separate functional elements of the manufacturing system (Taylor and Wood, 1973). Industrial linkage can be broadly defined as the contacts and flows of information and/or materials between two or more industrial sectors or firms. It may be viewed as an investment opportunity offered by one industry to another (Naerssen, 1980). Linkages are defined in backward and forward directions from an input-output model of the economy. Pertaining to backward linkages, the concern is to identify how some sectors depend on others for their input supplies. Forward linkages on the other hand, identify those key sectors who distribute their outputs as inputs to other industries further down the value added



chain of national production. Linkage assumes that the process of manufacturing involves dynamic features, such as a variety of contacts changing over time, the need for rapid exchange in response to supply requirements, and the maintenance of speed and frequency of contacts (Ajayi, 2003a, b; 2007).

Industrial linkages are powerful elements which sustain industrial agglomerations. They are vital to economic growth and help to widen a firm's knowledge of space. In some instances, they are viewed as the spatial dimension embedded in all power networks (He and Zhu, 2016). Industrial linkage analysis within a geographic perspective no doubt has received attention especially in the western world with the works of Richtig (1969), Taylor and Wood (1973), Lever (1974), Britton (1978), Barr and Fairbairn (1978), Karaska (1978), McAfee (2000), Gordon and McCann (2000), Holl and Rama (2007), and He and Zhu (2016). However, in many developing countries, while the linkage concept has been explored, a lot more needs to be done in terms of understanding the patterns of industrial connectivity and behaviour in space, especially within a developing region. This paper, therefore, investigates the pattern of linkages in Oluyole industrial estate by analyzing the linkages between and among industries. It also analyzes the spatial extent of these linkages in the study area.

Study Area

Oluyole Industrial Estate is one of the industrial layouts of Ibadan located in Ibadan South West

Local Government Area (LGA) of Oyo State. The LGA was carved out of the old Ibadan Municipal Government (IMG) in 1991 with its administrative headquarters located at Oluyole. It is bounded by Ibadan North West and Ido Local Government Areas to the North, Oluyole Local Government in the South, Ido Local Government Area in the West and Ibadan North and South East LGA in the East. There is no serious farming activity in the area being an urban centre and most of the agricultural products planted outside the area are being processed in the Local Government Area. The Local Government area is dominated by the Yorubas and other tribes, who are engaged in different type of economic activities.

Oluyole industrial estate is about 1.5km away from Mobil filling station along Ring Road – Challenge expressway, and lies between latitudes 7° 21' 02" – 7° 21' 48" N and longitude 3° 50' 31" – 3° 51' 28" E (see Fig. 2). It is a home for medium and large scale industries especially food processing and other light manufacturing and it the second most industrialized region of the city after Lagos-Ibadan expressway industrial region (Ibadan SW LG Newsletter). Information obtained from the Manufacturers Association of Nigeria (MAN), Oyo State branch shows that there are 24 industrial establishments (9 medium scale and 15 large scale) in the industrial district. The distribution of these industries is shown in Table 1.

Table 1: Distribution of Firms amongst Manufacturing Groups (ISIC)

S/N	Manufacturing Group	No of Firms	Proportion (%)
1	Basic metal, Iron & Steel	3	12.5
2	Chemical & Pharmaceuticals.	5	21.0
3	Plastic & Rubber	4	17.0
4	Food & Beverages	6	25.0
5	Non-metallic Mineral Products.	2	8.0
6	Pulp & Paper Products	3	12.5
7	Wood and Wood Products	1	4.0
	Total	24	100.0

Source: Compiled from the Manufacturers Association of Nigeria (M.A.N) Industrial Directory, Oyo State Branch (2014)

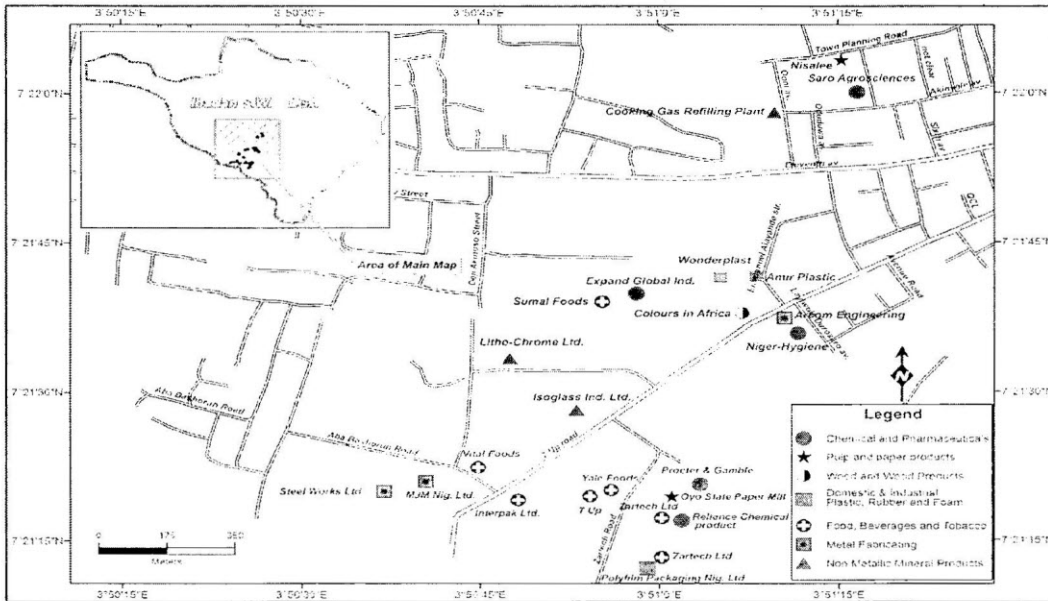


Fig 1: Industries in Oluyole Industrial Estate

Source: Compiled from (i) Ibadan South-West Administrative Map
 (ii) Google Earth Image, 2013
 (iii) Field survey (2016)

Research Method

Firms in the study area were classified into seven groups following the International Standard Industrial Classification (ISIC) codes. These are Basic Metal Iron and Steel, Chemical and Pharmaceuticals, Domestic and Industrial Plastic Rubber, Food and Beverages, Non Metallic Mineral Products, Pulp and Paper Products, and Wood and Wood products. All the firms were considered for this study. However, five of these firms were excluded due to non-availability: three had folded up while the other two declined participation. Therefore, a total of nineteen firms were thus involved while a structured questionnaire was administered to each of the nineteen firms across the seven manufacturing groups. The data collected were subjected to statistical analysis and the results were interpreted to achieve the stated objective. The unit of analysis was the individual firms within the industrial estate. Linkages were measured in terms of the monetary value of items purchased and sold by each firm across all manufacturing groups. The basis for this was that the units of measurement varied across the different groups while the magnitude and direction of activities to other sectors of the economy was determined using the input-output

analysis following Tesafa (2014). Thus, the I-O coefficients for estimating the forward linkage of the manufacturing industries is computed in terms of value of output produced given as:

$$I - O - C_{i,j} = \frac{Os_{i,j}}{\sum_{j=1}^n Os_{i,j}} \text{----- (1)}$$

where,

$I - O - C_{i,j}$ is the input-output coefficient between the *i*th manufacturing sector and *j*th economic sector.

The $I - O - C_{i,j}$ shows the proportion of the value of *i*th manufacturing sector’s total output consumed by the *j*th economic sector either as its input or final consumption.

$Os_{i,j}$ denotes the value of the output of the *i*th manufacturing sector output sold to *j*th economic sector.

$\sum_{j=1}^n Os_{i,j}$ represents the sum of values of total output produced by *i*th manufacturing sector that are sold to *j*=1,2,2,...,n sector of the economy. *i*th and *j*th are the manufacturing sector and economic sector respectively.



Similarly, the Input-Output (I-O) coefficients for backward linkage were also computed based on the value terms as follows:

$$I-O-C_{i,j} = \frac{Od_{i,j}}{\sum_{j=1}^n Od_{i,j}} \text{-----} (2)$$

where:

$I-O-C_{i,j}$ =the input-output coefficient between the *ith* manufacturing sector and *jth* economic sector and it shows the proportion of value of the *ith* manufacturing sector total inputs supplied from output of *jth* economic sector.

$Od_{i,j}$ = the value of the *ith* manufacturing sector's inputs supplied from the *jth* economic sector's outputs.

$\sum_{j=1}^n Od_{i,j}$ = the sum of values of total inputs consumed by *ith* manufacturing sector that were obtained from $j=1, 2, \dots, n$ sectors of the economy.

ith and *jth*= the manufacturing sector and economic sector respectively.

This study also adopts the Pearson Product Moment Correlation Coefficient to determine the degree of linear association between linkages (Y) and the distances (X) separating linked firms given as:

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{n\sum x^2 - (\sum x)^2} \sqrt{n\sum y^2 - (\sum y)^2}}$$

where,

r =Correlation Coefficient

y =Variable 1

x =Variable 2

n =Sample size

The spatial extent of the linkages was determined by identifying the linkages located within the local and regional areas of the study area calculating the distances between linked firms using GIS software

Result and Discussion

The analysis and discussion of the results of the forward and backward linkages among the manufacturing firms and between them and other firms outside the industrial estate, as well as other sectors of the economy are discussed in this section.

Backward Linkages

Generally, values closer to one for both forward and backward linkage effects, indicate that such industries have the ability to support other industries (forward linkage effect), as well as in boosting other industries (backward linkage effect). Conversely, values lower than one for both forward and backward linkage effects, suggests that these industries have difficulty in supporting and boosting other industries (Ling and Chang, 1997; Tesafa, 2014). Backward linkages as shown in Table 2 indicates that import sector accounted for 43.9% and industrial sector 39.4% were the main suppliers of inputs to the manufacturing sub-sector. The service sector and agriculture sector supplied 14.3% and 2.5% of the total inputs of the manufacturing subsectors respectively. This suggests that the manufacturing firms located at Oluyole industrial area of Ibadan depended mostly on importation of materials for the manufacturing of their products.

In the manufacture of basic iron and steel, 60.0% of the inputs were supplied mainly by the industrial sector while the rest were supplied by import sector, indicating a backward linkage with the industrial sector and import sector respectively without linkages with the agricultural sector and service sector. For the manufacture of chemical and pharmaceuticals 75.0% of its inputs were from industrial sector while only 19.0% and 6.0% were from the import and service sectors respectively. Out of this, 80.0% were obtained in the manufacture of silicates service sector and 20.0% from the import sector while manufacture of detergent sourced 50.7% of their inputs from industrial sector and 49.3% from the import sector. In addition, there was a hundred percent backward linkage with the industrial sector in the manufacture of fungicides, pesticides and herbicides as well as the manufacture of disinfectant, bathing soap and after shave. In the case of manufacture of pulp and paper products, the bulk of the inputs accounting for 47.8% were obtained from the import sector, while only 3.8% were purchased from the service sector suggesting that the industry had a weak backward linkage with the service sector.

In the manufacture of non-metallic mineral products such as cooking gas, automobile and

house glass, backward linkage with the industrial sector was high as 80.0% while only 20.0% of its inputs were from the import sector. There was, however, no backward linkage with the agricultural and service sectors of the economy. Manufacture of automobile and house glass sourced 75.0% of its inputs from industrial sector while the 25.0% were purchased from

import sector. For the manufacture of cooking gas, all its inputs were from the industrial with no backward linkage with the other sectors. The food, beverages and tobacco industry obtained 59.3% its inputs from import sector, while the least, which was 17.3%, were sourced from industrial sector.

Table 2: Backward Linkage of Manufacturing Industries with other Economic Sector

S/N	Manufacturing Groups	Industrial Sector	Agricultural Sector	Service Sector	Import Sector
1	Basic Metal Iron and Steel	0.600	0.000	0.000	0.400
(i)	Manufacturing of basic iron and steel	0.600	0.000	0.000	0.400
2	Chemical and Pharmaceuticals	0.750	0.000	0.060	0.190
(i)	Manufacture of Liquid Silicate	0.000	0.000	0.800	0.200
(ii)	Manufacture of Detergent	0.507	0.000	0.000	0.493
(iii)	Manufacture of Fungicides, Pesticides and Herbicides	1.000	0.000	0.000	0.000
(iv)	Manufacture of Disinfectant, Bathing Soap and After Shave	1.000	0.000	0.000	0.000
3	Pulp and Paper Products	0.281	0.204	0.038	0.478
(i)	Manufacturing of Carton of Soap	0.615	0.000	0.385	0.000
(ii)	Manufacturing of Carton	0.247	0.224	0.003	0.526
4	Non-metallic Mineral Product	0.800	0.000	0.000	0.200
(i)	Manufacture of Automobile and House Glass	0.750	0.000	0.000	0.250
(ii)	Manufacture of Cooking Gas	1.000	0.000	0.000	0.000
5	Food, Beverages and Tobacco	0.173	0.000	0.234	0.593
(i)	Manufacture of Pastries	0.036	0.000	0.239	0.725
(ii)	Manufacture of Bread Cookies and Toffee	0.000	0.000	0.000	1.000
(iii)	Manufacture of Bubble Gum	0.125	0.000	0.000	0.875
(iv)	Manufacture of Biscuit and Cake	0.411	0.000	0.054	0.536
(v)	Manufacturing of Soft Drinks	0.257	0.000	0.018	0.725
(vi)	Manufacture of Processed Chicken	0.225	0.000	0.775	0.000
6	Domestic and Industrial Plastic Rubber and Foam	0.613	0.102	0.019	0.266
(i)	Manufacture of Household Material (such as plastic, dust pan etc)	0.552	0.000	0.000	0.448
(ii)	Manufacture of Nylons	0.737	0.263	0.000	0.000
(iii)	Manufacture of Shoe Sole	0.000	0.000	1.000	0.000
7	Wood and Wood Product	0.690	0.103	0.000	0.207
(i)	Manufacture of Furniture	0.690	0.103	0.000	0.207
	Grand Total	0.394	0.025	0.143	0.439

Source: Authors' Analysis (2016)

There was no backward linkage with agricultural sector. This suggests that agricultural sector failed to play a critical role in the production of food, beverages and tobacco. Manufacture of

bread cookies and electronics secured all her input from import sector.

A critical look at the table indicates that in the manufacture of bubble gum, biscuit and cake, as well as soft drinks most firms in this



industry sourced their inputs mainly from the import sector with 87.5%, 53.6% and 72.5% respectively. However, the manufacture of processed chickens obtained 77.5% of inputs from the service sector. It can be observed that industrial sector supplied 12.5%, 41.1%, 25.7% and 22.5% of the inputs of manufacture of bubble gum, manufacture of biscuits and cake, manufacture of soft drinks and manufacture of processed chicken respectively. In addition, only 5.4% and 1.8% of the inputs for the manufacture of biscuits, cake and soft drinks respectively were from the service sector. The domestic and industrial plastic rubber and foam industries obtained 61.3%, 26.6%, 10.2% and 1.9% of its inputs from the industrial sector, import sector, agricultural sector and service sector respectively. Of all these, manufacture of household materials such as plastic, dust pan hanger, etc purchased 55.2% of its inputs from industrial sector while 44.8% were sourced from the import sector. Similarly, the manufacture of nylons secures 73.7% from the industrial sector and 26.3% from the agricultural sector. In the case of the manufacture of shoe soles, all its inputs were obtained from the service sector. In the wood and wood products' industry, particularly the manufacture of furniture received 43.9% of inputs from the import sector, 39.4% from the industrial sector, 14.3% from the services while 2.5% were from the agricultural sector.

Forward Linkages

Table 3 shows the results of input-output coefficients of the demand of other economic sector for the manufacturing sub-sectors output based on the value terms. The largest proportion (38.2%) of the total outputs produced by the firms in the estate is demanded by the industrial sector as its inputs. Closely related to this is the service sector which consumed 35.3% of the total value of output produced by the manufacturing subsector. In the third place was the final consumer which directly consumed 20.7% of the total value of output produced by the manufacturing subsectors. Agricultural and foreign sectors accounted for only 5.4% and 0.4% respectively. The foregoing showed that most of the products from manufacturing subsectors in the estate were consumed by the

industrial sector. This can be deduced from the fact that the sampled companies were manufacturing companies and their products or outputs are likely to be consumed by the industrial sector of the economy. It may be inferred that manufacturing subsectors in the estate played an indispensable role in promoting the economic efficiency. Apart from this, it can also be observed that these companies were not export-oriented as almost all goods produced were for local consumption. This implies that the companies were not playing a significant role in the economies of international communities.

In the manufacture of basic metal iron and steel, whereas the final consumers demanded 65.0%, the industrial sector demands 35.0%. It can be deduced that the firms in this category did not have any linkage with agricultural, services as well as export sectors. In the case of chemical and pharmaceutical products 54.8% of the outputs were supplied to the service sector followed by the final consumers 26.2%. Only 16.4% of the industry's outputs were supplied to agricultural sector of the economy. The fourth and fifth positions were occupied by industrial and foreign sectors with only 1.4% and 1.2% respectively. The only user of silicate was the industrial sector. In other words, firms only have forward linkage with the industrial sector and none with other sectors of the economy. Agricultural sector alone accounted for the total demand for the manufacture of fungicides, pesticides and herbicides. For the manufacture of detergents, the major users included final consumer (50.0%), industrial (20.0%), foreign (20.0%) and service (10.0%) sectors of the economy. There was forward linkage with the agricultural sector. The manufacture of disinfectant, bathing soap and after shave supplied its products to service sector (70.0%) and final consumers (30.0%). There was no forward linkage with the industrial sector, agricultural sector and foreign sector.

In the manufacture of pulp and paper products, all products were supplied to industries. This implied that these companies only had forward linkages with industrial sector. The non-metallic mineral products supplied 80.6%, while 9.7% each were to industrial service and final consumers sectors respectively.

The industry did not have linkages with agricultural and foreign sectors. In this industry, the manufacture of automobile and house glass supplied their products only to industrial sector with no linkages with other sectors of the

economy. In all, 40.0% of the manufacture of cooking glass was demanded by the industrial sector, while 30.0% is demanded by the service and final consumers sectors respectively.

Table 3: Forward Linkages of Manufacturing Industries with other Sectors

S/N	Manufacturing Groups	Industrial Sector	Agriculture Sector	Service Sector	Final Users	Export Sector
1	Basic Metal Iron and Steel	0.350	0.000	0.000	0.650	0.000
(i)	Manufacturing of basic iron and steel	0.350	0.000	0.000	0.650	0.000
2	Chemical and Pharmaceuticals	0.014	0.164	0.548	0.262	0.012
(i)	Manufacture of Liquid Silicate	1.000	0.000	0.000	0.000	0.000
(ii)	Manufacture of Detergent	0.200	0.000	0.100	0.500	0.200
(iii)	Manufacture of Fungicides, Pesticides and Herbicides	0.000	1.000	0.000	0.000	0.000
(iv)	Manufacture of Disinfectant, Bathing Soap and After Shave	0.000	0.000	0.700	0.300	0.000
3	Pulp and Paper Products	1.000	0.000	0.000	0.000	0.000
(i)	Manufacturing of Carton of Soap	1.000	0.000	0.000	0.000	0.000
(ii)	Manufacturing of Carton of other Products	1.000	0.000	0.000	0.000	0.000
4	Non-metallic Mineral Product	0.806	0.000	0.097	0.097	0.000
(i)	Manufacture of Automobile and House Glass	1.000	0.000	0.000	0.000	0.000
(ii)	Manufacture of Cooking Gas	0.400	0.000	0.300	0.300	0.000
5	Food, Beverages and Tobacco	0.212	0.000	0.633	0.155	0.000
(i)	Manufacture of Pastries	0.300	0.000	0.200	0.500	0.000
(ii)	Manufacture of Bread Cookies and Toffee	0.000	0.000	0.150	0.850	0.000
(iii)	Manufacture of Bubble Gum	0.000	0.000	0.100	0.900	0.000
(iv)	Manufacture of Biscuit and Cake	0.000	0.000	0.300	0.700	0.000
(v)	Manufacturing of Soft Drinks	0.000	0.000	1.000	0.000	0.000
(vi)	Manufacture of Processed Chicken	0.300	0.000	0.700	0.000	0.000
6	Domestic and Industrial Plastic, Rubber and Foam	0.731	0.000	0.170	0.099	0.000
(i)	Manufacture of Household Material such as Plastic, Dust Pan etc.	0.000	0.000	0.600	0.400	0.000
(ii)	Manufacture of Nylons	0.800	0.000	0.200	0.000	0.000
(iii)	Manufacture of Shoe Sole	1.000	0.000	0.000	0.000	0.000
7	Wood and Wood Product	0.550	0.000	0.000	0.450	0.000
(i)	Manufacture of Furniture	0.550	0.000	0.000	0.450	0.000
	Grand Total	0.382	0.054	0.353	0.207	0.004

Source: Authors' Analysis (2016)

The food, beverage and tobacco industry supplied the bulk (63.3%) of its products to service sector. This was followed by the industrial sector (21.2%) and the final users (15.5%). The major user of manufacture of pastries was final consumers consuming 50.0% of the products. The industrial sector obtained 30.0% of the company's products while 20.0% is supplied by the service sector. For the

manufacture of bread cookies and toffee, 85.0% and 15.0% of its products were bought by the final users and service sector respectively while there were no linkages with the industrial, agricultural, as well as foreign sectors. Similarly, bubble gum supplied 90.0% of its product to final users while only 10.0% was to the service sector. In the case of the manufacture of biscuit and cake, 70.0% of its products were demanded



for by the final users while 30.0% went to the service sector. The products from the manufacture of processed chicken were shared by the service (70.0%) and industrial sectors (30%) respectively.

The manufacture of domestic and industrial plastic, rubber and foam had very strong backward linkage with the industrial sector (73.1%) while the rest of the products were shared by the service sector (17.0%) and final consumers (9.9%). For the manufacture of plastic, dust pan and hanger, the service sector took (60.0%) while the rest went to the final consumers. In the manufacturing of nylon, 80.0% of its products went to the industrial sector while the rest were to the service sector. However, all the products of shoe soles were sold to the industrial sector. The manufacture of wood and wood product, particularly furniture supplied 55.0% of its products to industrial sector while 45.0% was supplied to the final users. This suggests that this industry played a vital role in the economic efficiency of the industrial sector. However, it lacked forward linkage with the agricultural, service and foreign sectors.

Spatial Analysis of Linkages

The spatial analysis of industrial linkages in the estate shows that firms engaged in production linkages (backward and forward) as well as service linkages within and outside the industrial estate. In terms of backward linkage, this paper shows that a lower percentage of the total materials used across manufacturing groups were sourced from industries within the estate while the bulk of it were from within and outside the country. Forward linkages were largely confined within the country with minimal exports.

The Spatial Extent of Linkages

This section discusses the spatial extent of production linkages in the study area. Backward linkages between and among industries within and outside the study area were identified as materials used in the production activity of firms and measured in terms of monetary value of

items purchased by each firm across all the groups. The locations of linkages were based on where materials were sourced. Table 4 shows the summary of raw materials sourcing across manufacturing groups with food and beverages manufacturing group sourcing 7.5% raw materials from within the estate as against 44.5% of raw materials sourced from foreign countries. This pattern may, perhaps, be attributed to ownership structure of the food processing firms being foreign.

By contrast, the non-metallic mineral product, pulp and paper product as well as the wood and wood product groups had no backward linkage with industries within the industrial district. However, a higher percentage of materials were sourced locally from outside the cluster in the regional areas of the estate while a lower percentage was sourced from foreign countries. This may be indicative of the ownership structure of the firms in categories listed as being indigenous. Suppliers of inputs were from the service sectors, manufacturing companies and foreign countries. In the manufacture of plastic and rubber, the suppliers of inputs were from foreign countries (13%). In the plastic and rubber manufacturing group, a total of 6.7% of materials were sourced from firms within the estate. Backward linkages were with firms in the food and beverages group while 57.0% of raw materials were from linkages from other parts of the country.

Table 4: Material Sourcing across Manufacturing Groups (%)

S/N	Industry Group	Within the	Within	Other states	Foreign
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	Industrial Estate	Oyo State	in Nigeria	countries
1. Metal Fabrication	20.0	60.0	5.0	15.0
2. Chemical & Pharmaceuticals	12.5	0.0	55.0	32.5
3. Plastic & Rubber	6.7	23.3	57.0	13.0
4. Food & beverages	7.5	15.0	33.0	44.5
5. Non - metallic mineral products	0.0	0.0	90.0	10.0
6. Pulp & paper products	0.0	0.0	90.0	10.0
7. <u>Wood and wood products</u>	<u>0.0</u>	<u>0.0</u>	<u>85.0</u>	<u>15.0</u>
Total	46.7	98.3	41.5	14.0
	6.67	14.04	59.28	20.0

Source: Authors' Analysis (2016)

Table 5 shows that 6.7% of total materials used by all plants across manufacturing groups in production were sourced from other firms within the district. While a higher percentage used in various production processes were sourced outside the industrial district but within Oyo state. Some of the states from which raw materials were sourced include Delta, Enugu, Kano, Kaduna, Ogun and Lagos states. Delta State was the major location for the purchase of diesel for powering engines for production, while Enugu state was the dominant source of coal as an input among the plastic manufacturing group. Liquid silicates which served as input for

the chemical and pharmaceutical manufacturing group were sourced from Ogun state by one of the firms in this category.

Lagos state has the highest percentage (42.0%) share of materials sourced by firms across the seven manufacturing groups. By far, the location appears to be a major choice for sourcing all forms of inputs ranging from chemicals, mineral products to intermediate goods. This pattern could be as a result of the historical significance of the state as well as its vantage position near the coast which fosters the influx of commercial activities.

Table 5: Locational Pattern of Material Sourcing (%)

Location	% Share of Material Expenditure
<i>Within the Industrial Estate</i>	6.7
<i>Oyo state</i>	
Ibadan	14.04
<i>Other states in Nigeria</i>	
Delta	2.58
Enugu	4.5
Kano	4.0
Lagos	42.0
Ogun	2.3
Kaduna	3.88
<i>Foreign Countries</i>	
China	14.0
Egypt	0.8
Germany	4.4
South Africa	0.8
Total	100.0

Source: Authors' Analysis (2016)

Materials and equipment were procured from some countries outside Nigeria. Figure 3 clearly

shows the flow of materials from these countries. China, for instance was a major

source of manufacturing equipment which accounts for 14.0% out of the 20.0% of materials sourced from foreign countries. Other sources were distributed among Egypt, Germany and South Africa, accounting for 0.8%, 4.4% and 0.8% of material sourcing respectively.

Germany provided mainly fragrance, lecithin and chemicals for plants in the industrial estate, Egypt supplied equipment, while linkages with South Africa included furniture upholstery for the wood product manufacturing group.

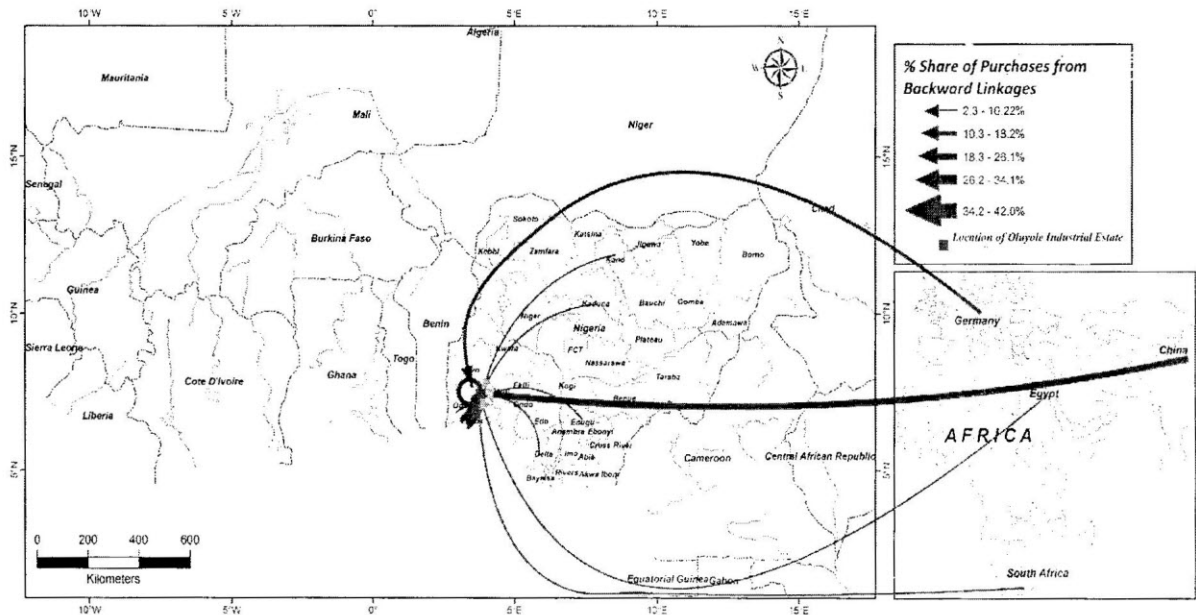


Fig 2: Spatial Extent of Backward Linkages
Source: Authors' Analysis, 2016

In metal fabricating industry group, products were sold within the industrial estate. One firm from the chemical and pharmaceutical group and another from the food and beverages group were major suppliers of machine parts used in their various production processes. For instance, 5.0% of the products from the food and beverages manufacturing group were sold especially to retailers within the locale while a total of 95.0% of products were sold to local markets through distributorship as well as to linked locations in other states. The disproportionate pattern observed could imply that most of the products in this category were for final demands. In other words, due to the nature of the products, they were not used as inputs into another manufacturing activity.

The pulp and paper group sold 25% of their products to forward linkages within the estate for the purpose of light packaging of final

demand flows. This percentage was accounted for by only one firm in the group which had forward linkages with firms in the food & beverages, chemical and pharmaceutical groups, while the other firm had no linkage with any company in the estate but was however linked to one company in the chemical and pharmaceutical group in the south western part of Nigeria. The company reported having forward linkages with companies within the estate but that such linkages ceased to exist as a result of dwindling economy, as at the time of the study which led to increase in the cost of producing package materials with an attendant increase in the price of goods they sold to firms. This led to customers seeking cheaper packaging elsewhere. Other products constituting a total of 75% were sold to industries in Oyo State and to other states within the country.

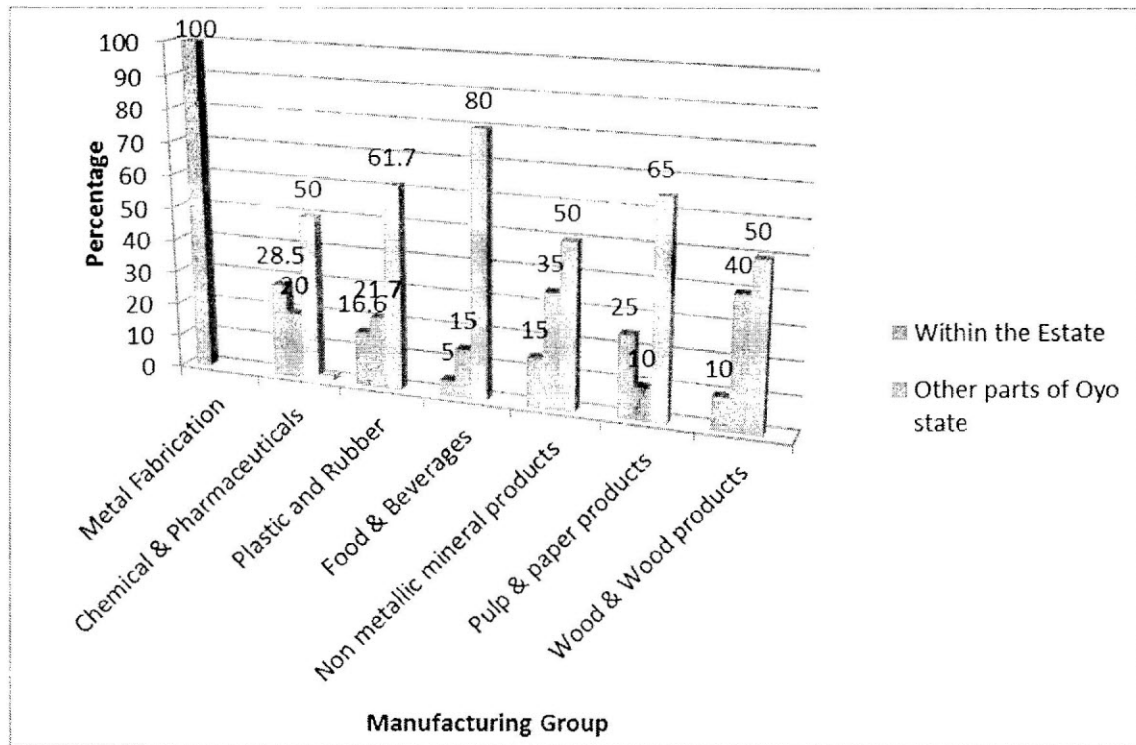


Fig. 3: Location of Markets across Manufacturing Groups

Source: Authors' Analysis, 2016

The plastic and rubber manufacturing group had forward linkages with the food and beverage group. Over sixteen percent of light polythene package materials were sold to two firms in this category. On the aggregate, 29.0% of merchandising sales were sold to industries within the industrial district while 51.0% was sold to other areas within the state and within Nigeria including location of facilities. In addition, industries engaged in minimal overseas export accounted for 1.5%. This implied that majority of the products were consumed within the country.

Table 6 showing the actual percentage of total materials sold to other locations, indicates that 18.0% of products were sold to linked firms in Lagos. This pattern is somewhat similar to the pattern of material sourcing with Lagos having the highest share. The observed pattern could be as a result of the population which would naturally demand more goods and services.

Table 6: Distribution Pattern of Sales (%)

Location	% Share of sales
<i>Within the Industrial Estate</i>	29
<i>Oyo state</i>	
Ibadan	20
<i>Other states in Nigeria</i>	
Aba	4.3
Abuja	5
Bayelsa	0.5
Kaduna	2.1
Kano	2.6
Kogi	0.5
Lagos	18
Ogun	10.5
Osun	2.6
Port-Harcourt	3.4
<i>Foreign Countries</i>	
Benin- Republic	1.5
Total	100.0

Source: Authors' Analysis (2016)

Forward linkages also existed with locations which had no backward linkages with firms within the estate such as Abuja, Aba and Bayelsa. More than four percent of the products sold to Aba were shoe soles from the plastic manufacturing group within the estate. While

Osun, Ogun, Kogi and Lagos states were for the distribution of products mainly from the food and beverage and chemical and pharmaceutical manufacturing groups. Other products were distributed to Port-Harcourt and Benin-Republic. This is further illustrated in Figure 4.

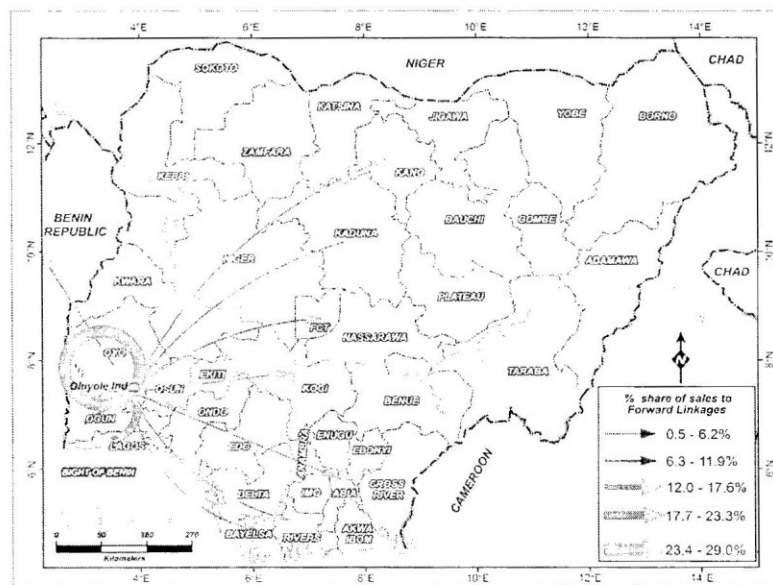


Fig. 4: Spatial Extent of Forward Linkages

Source: Authors' Analysis, 2016

The linkages between firms in the provision and supply of services occurred with firms within

and outside the estate. Industrial services were purchased from companies and individuals that

provided services. These linkages included subcontracting linkages, procurement and servicing of machinery, employment and training, financial and technical advice as well as machine hire and rent (see Fig. 5). The largest share of services purchased across manufacturing groups was raw material

purchase and supply which accounted for 39.0%. The second largest was through subcontracting linkages and procurement and servicing of machinery each accounted for 17.0% of the total share of service provided across manufacturing groups.

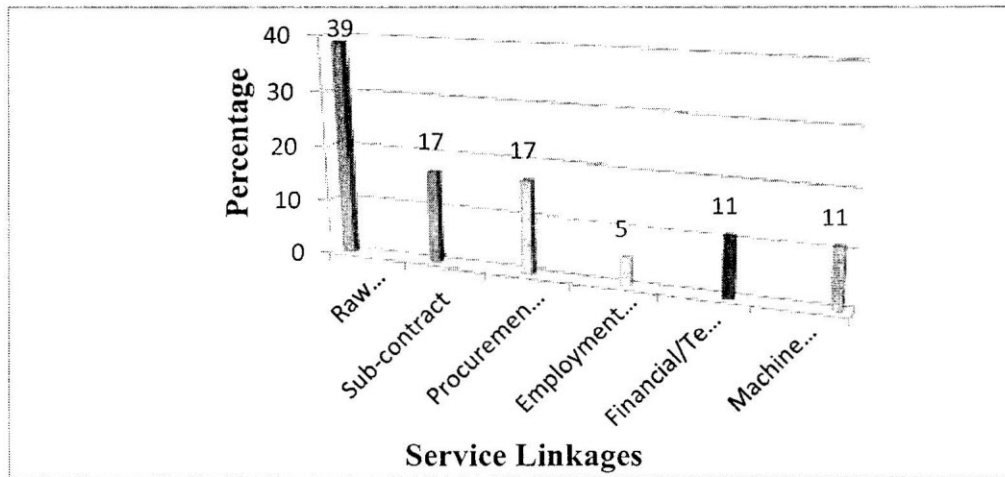


Fig. 5: Percentage Share of Service Linkages amongst Firms

Source: Authors' Analysis, 2016

Financial and technical advice among group formed 11.0% of the total expenditure of firms' service expenditure. Across the manufacturing groups, firms that indicated relationship with others based on raw material purchase and supply included chemical and pharmaceutical groups. The largest share of industrial service was divided amongst seven manufacturing firms which included: chemical and pharmaceutical, and the pulp and paper product industry. Others were non-metallic mineral product industry, food and beverages manufacturing group and plastic and rubber product industry. Firms which engaged in subcontracting were within the food and beverage; and chemical and pharmaceutical groups. A considerable share of service expenditure was on services such as machine hire and rent as well as financial and technical advice. Purchases were by the pulp and paper manufacturing group, non-metallic mineral products and the food and beverages manufacturing groups. Generally, service linkages were in close proximity within the district in Ibadan, other parts of Oyo state and Lagos state. This pattern implies that service

linkages involved close contacts for which proximity was desirable.

Further analysis of the spatial extent of linkages was carried out using Pearson Product Moment Correlation Coefficient to determine the strength of association and the consistency of the relationships between linkages (backward and forward) and distances (km) separating linkages. Forward linkage negatively correlated with distance ($r=-0.125$, $p>0.05$), thus implying that as distance increased, linkage decreased as well and vice versa. On the other hand, backward linkage was found to be positively correlated with distance ($r=0.207$, $p>0.05$).

Summary and Conclusion

The paper revealed that companies located within the estate have strong forward and backward linkages with industrial sector of the economy. This suggests that the manufacturing sub-sector is indispensable to the sustainability of Nigerian economy. It was also discovered that most of the companies depended on the importation of raw materials from other countries for their production, that is, they had a strong backward linkage with



the import sector. This may not be unconnected with the lack of such raw materials within the local economy. However, this scenario may raise their costs of production; create production capacity underutilization, stagnation, unemployment and closure.

In terms of forward linkage, the manufacturing subsector had weak linkage with the foreign countries. In other words, the companies were mainly producing for local consumption. In the case of the service sector of the economy, the manufacturing subsector was indispensable as it had both forward and backward linkages with the sector. Agricultural sector seemed not to have linkages from the manufacturing subsector located at Oluyole industrial estate. This may be due to the fact that most of the products by these companies were not related to the inputs required by the agricultural sector. Apart from this, the outputs of agricultural sector may not be the major input required by these companies. Finally, the companies were also indispensable to the final consumers as they had linkages with the final users. From the findings, it may be concluded that the resources in the local environment have not been sufficient to support the input supplies of firms which necessitated maintaining relationships outside the cluster over long distances. In addition, firms in agglomerations had suppliers and markets found elsewhere other than where they were located. This paper also revealed that external economies of co-location may not be a major factor in the locational choice of firms in the district due to the low level of linkages between firms in the district and as such their existence in the district may depend upon some other factors which determined spatial efficiency.

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