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Page

Editorial Comments

Research for Development Volume 19 Nos. 1 & 2, December 2003

RESEARCH for DEVELOPMENT

Page

Editorial Comments

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Spatial Patterns of Production Subcontracting in Nigeria

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Abstract

Studies on production subcontracting have usually been conducted within the transaction costs perspective. This has tended to hinder an understanding of the networks of interfirm relationships, which could be better understood through a spatial perspective. This paper, which analyses the spatial relationships amongst places through subcontracting, introduces the spatial perspective. In a broad sense, this study analyses the spatial relationships amongst places through production subcontracting. The case study is based on the relationship within the Lagos region and those between the region and other towns within Nigeria.

This paper shows that production subcontracting is concentrated in a few locations. The analyses of the spatial distribution of production subcontracting in the step-wise multiple regression model is highly statistically significant. While the number of subcontractors and volume of subcontracting calculated in naira were the dependent variables, the size and structural characteristics of the locations where subcontracting is found are the independent variables. The results of these analyses show that the number of industrial establishments is the only significant explanatory variable. The implication of this study is that, if encouraged, production subcontracting could be used to enhance the industrial development of Nigeria.

Expressions/Key *capital accumulation, spatial division of labour, integration and industrial linkage, production subcontracting, Lagos region, Nigeria*

Introduction

Previous studies on production subcontracting have usually been approached from the transaction costs perspective. The transaction costs perspective developed by Coase (1937), and later espoused by Williamson (1975; 1979; 1984; 1985); Scott (1988); and Storper and Scott (1990) observed that production subcontracting promotes locational agglomeration because external transaction costs between firms in the markets, including transportation and communication costs, increase with distance. The propensity to agglomerate (locationally) increases further either when transactions include small-scale, irregular, unstandardised, or contact-intensive activities that have high unit linkage costs, or when firms seek to reduce demand fluctuations by improving their customer base through locational clustering [Leung, 1993]. This locational tendency, according to Storper and Scott (1989: 21) "is associated with a flexible regime of capital accumulation or mode of corporate organisation characterised by intense external transactions between firms (external economies of scale) as a result of unstable market conditions.

A major flaw associated with the transaction costs perspective is the heavy reliance on cost considerations. Perhaps, this explains why the literature suggests that the locational structure is either agglomeration on one hand or dispersal into the hinterlands and across national boundaries on the other hand. Our knowledge of production subcontracting, especially in relation to pre-existing spatial structures, especially the characteristics of specific places, merits attention. Contemporary thinking in industrial geography places a lot of emphasis on the understanding of the networks of interfirm relationships. Through the networks of interfirm relationships, one can probably overcome the problem created by the imposition of transaction costs perspective on the economic reality in other parts of the world. An activity perspective has been suggested to explain the spatial organisation of the networks of interfirm relationships (Christensen *et al.*, 1990).

The choice of a network of relationships with its spatial pattern is argued to be more germane to the strategic positioning of the firm (Yeung, 1994). It is on this basis that this paper posits that the spatial pattern of the networks of interfirm relationships, through production subcontracting, can be better understood through the pre-existing size and structural characteristics of specific places. This is as opposed to the transaction costs perspective within which previous studies have been conducted. It is obvious from the literature that the spatial relationships amongst places (locations) through subcontracting activities based on the pre-existing characteristics of locations have not attracted much attention. This paper takes the position that the size and structural characteristics of the locations where subcontractors are found significantly explain the spatial patterns of production subcontracting.

While several studies on production subcontracting have been conducted in the western world, especially the United States and Great Britain, studies on industrialization in sub-Saharan Africa, and especially Nigeria, have largely focused on the examination and analyses of single components of industrial activities or the spatial distribution and development of manufacturing industries (e.g. Schatzl, 1973; Aboyade, 1973; Onyemelukwe, 1974, 1982; 1983 Vegale et al, 1974; Arikawe-Akintola, 1986; Ighalo, 1989; Lewis, 1973; 1974; and Oyebanji, 1978, 1980). In some cases, explanations have usually been offered in terms of factor endowment. In other words, there is no known study on

as a whole are discussed here. The Lagos region, located along the southwest part of Nigeria, is situated approximately between latitudes 6°27' and 6° 37' North of the equator and longitudes 4° 15' and 3° 47' East of Greenwich Meridian (see Figure 1). The Lagos region, with an area of about 1,088km², covers about 32 per cent of the land area of Lagos State. About 20 per cent of this area consist of lagoons and mangrove swamps. Apart from being the industrial nerve centre of Nigeria, the Lagos region is also the leading centre of commerce. Some 60 to 70 per cent of all commercial transactions are carried out or finalised, while about 70 per cent of the total value of industrial investments in Nigeria are in the Lagos region. Over 65 per cent of the country's industrial employment are concentrated in this region, leaving the remaining 35 per cent to other parts of the country. It is, in part, the recognition of this marked concentration of industries in the Lagos region that motivated its choice as the study area for this work.

Perhaps, it is this strategic position of the Lagos region within the country which explains why most major industrial concerns and trading companies, such as the United African Company (UAC), Union Trading Company (UTC), Patterson and Zochonis (PZ), have their head offices located in this region. In addition, major financial centres, such as the Nigerian Stock Exchange, and the head office of major banks, insurance companies and other financial institutions are located in this region. The implication is that the Lagos region, more than any other part of the country, is likely to have stronger industrial links with the other parts of the country. The subsidiary study area (Nigeria) lies between latitudes 4° 00' and 14° 00' North of the equator, and longitudes 4° 00' and 14° 00' East of Greenwich Meridian. Nigeria is a leading industrial nation in the West Africa sub-region.

Figure 1: Lagos Region
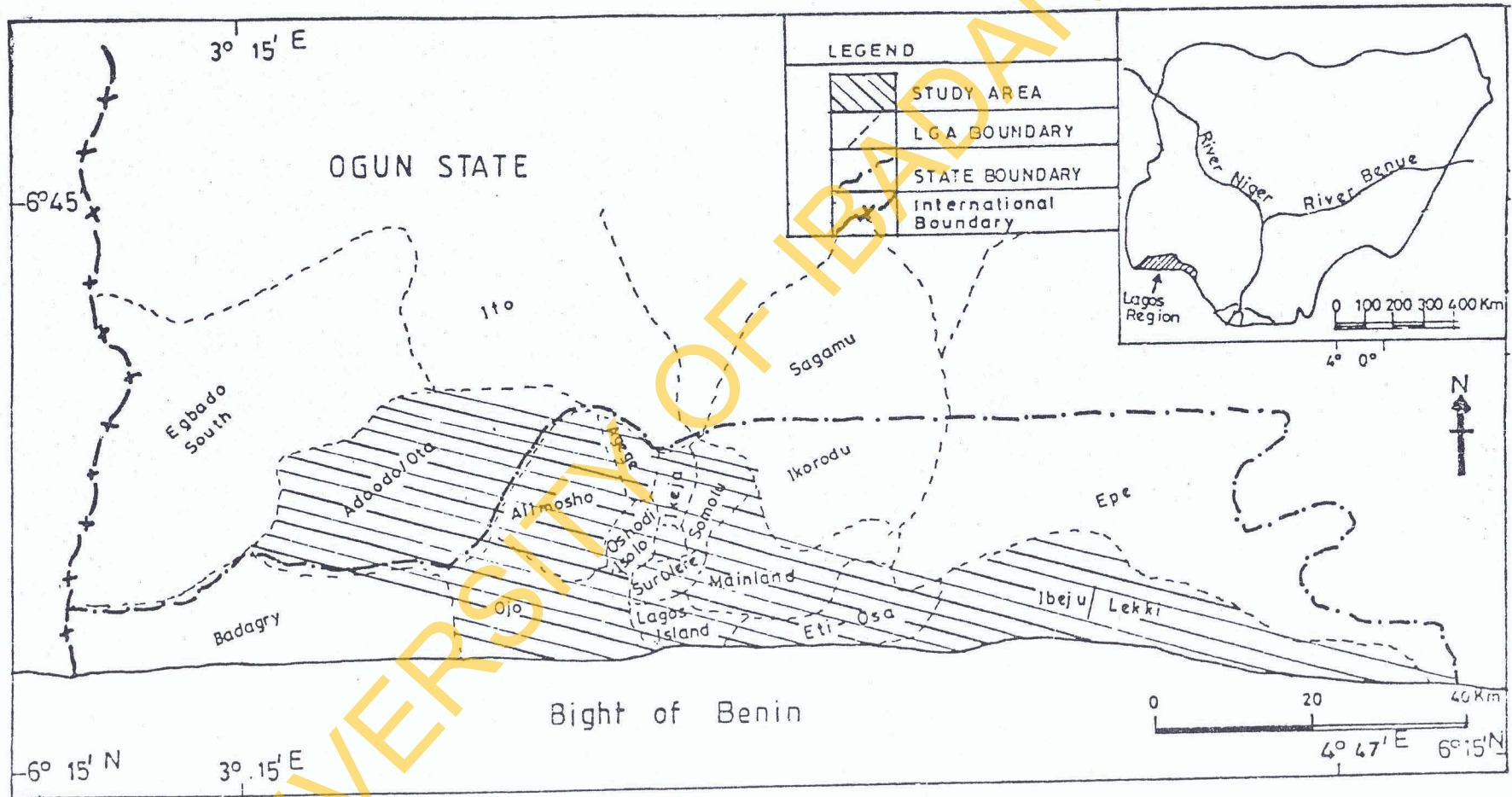
Conceptual Framework

The relevant concepts are integration and industrial linkage, production subcontracting, post Fordist flexible specialisation and spatial division of labour. Integration involves all forms of collaborative and co-operative ventures among industrial organisations over space. There are two forms of integration, namely vertical integration and horizontal integration (Lee 1994, Dicken and Lloyd, 1990). Integration involves the linkage of firms in a chain of production. In general terms, this is what is referred to as industrial linkage. Industrial linkage is a process whereby one manufacturing firm purchases inputs of goods or services from, or sells output to another manufacturing firm (Keeble, 1976). "Industrial linkage includes all forms of contacts and flows of information and/or materials between two or more individual firms" (Johnson, 1994: 334). This term is most widely used in industrial geography to indicate the interdependence among firms and its effects on locational choice.

Linkage is possible over a wide range of distances. However, strong or complex linkage ties usually operate only over short distances. Wood (1969: 34), notes that "on a national scale, the systematic ties of a plant to others have locational significance. Plants located primarily in relation to raw materials or markets form a small proportion of total industrial activity. On the local scale, connections to adjacent or nearby plants do exist, but such connections do not account for the concentration of heavy industrial areas". The foregoing suggests that linkage reflects a distance decay function.

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. The literature suggests that the measurable attributes of firms' size, such as manufactured inputs consumed, sales volumes, and intensity of intra-regional inter-industry linkages are fundamental determinants of the way a manufacturer perceives the production environment (Barr and Fairbain, 1978). In addition, Linkage is facilitated by certain basic factors. The importance of flows of commercial, technical, and administrative information into the links of

communication – both internal and external between functional units of the firm's organisation enhances linkage (Hagerstrand, 1964; Imrie, 1986; O'Farrel and Loughlin, 1980). Exchange on levels of supply and demand, the optimum price levels, and the technical characteristics of products to be exchanged also facilitate industrial linkage (Klein *et al* 1982; Townroe, 1969).

Inter-industry linkage may be facilitated by the existence of relatively well-developed infrastructure, such as highways, railroad lines and terminus, airports, utilities, commercial facilities, research organisations; and many other services that might not exist or would be less well developed (Scott and Bergman, 1995). A city or region specialising in one industry will often have machine workers and repairers suppliers of component, ancillary to a main one and those producing goods and services for it. These services often express themselves directly, through the reduced cost of specific inputs. Certain materials and supplies may be cheaper in larger cities than in small ones, by virtue of local production, or good transportation facilities, and economies of scale can make power cheaper as the size of the local market increases. Furthermore, linkage may be facilitated by the existence of an industrial concentration, which may contain a pool of labour with particular skills, or special educational institutions to support industrial activities, both of which will reduce the cost of training workers.

Production subcontracting being considered in this paper, is the arrangement of production process wherein firms externalise their manufacturing activities to other independent firms. The contractor provides the orders and the subcontractor furnishes the work or services for the processing of materials or the production of parts, components, subassembly or assembly of products according to the production specifications and the marketing arrangements of the contractor (UNIDO, 1974; Leung, 1993). For instance, the field survey shows that in the food, beverages and tobacco industry group, Plastic crates are received from subcontractors in Ibadan, Ilorin, Kaduna, Kano and Sagamu, PVA/Aerosol, and industrial carton and starch are subcontracted by firms in Ibadan in the pharmaceuticals industry group. In the domestic and industrial plastic and rubber industry group, aluminum plates, and plastic components are received from

subcontractors within the Lagos region. Whereas translucent sheets, paints and solvents in basic iron, steel and fabricated metal products are received from subcontractors within the Lagos region, aluminum coils are produced by subcontractors in Port Harcourt. Production subcontracting is thus a form of industrial linkage.

Production subcontracting has been encouraged by at least two fundamental spatio-economic developments. These are post-Fordist flexible specialisation of production, and the emergent 'marked' spatial division of labour. The post-Fordist flexible specialisation of production came to replace the Fordist regime of capital accumulation by the end of the 1970's and more importantly by the early 1980's. The Fordist regime of accumulation refers to the era during which industrial production was characterised by widespread mass production of standardised goods using inflexible, dedicated machinery, and exploitation of internal scale economies (Massey, 1984, Storper and Scott, 1989; Martinelli and Schoenberger, 1991; Ernste and Meier, 1992; Storper and Scott, 1992; Storper, 1992; Swyngedouw, 1992; Gertler, 1994; Yeung, 1994. Rowley, 1996; Echeverri-Carrol, 1996).

Spatial division of labour implies the specialisation of certain districts in the production of some products, and certain parts of a product, that is, the way different tasks in production are allocated to particular groups of people in particular locations (Storper and Walker, 1983; Smith, 1989; Massey, 1984). Three alternative sets of factors, that is, (i) industrial organisations and corporate strategy (ii) pre-existing characteristics of specific places, and (iii) the uniqueness of the labour factor, are emphasised as responsible for the continual structuring and restructuring of the division of labour (Storper and Walker, 1983). It is the pre-existing characteristics of specific places as they attract productive activities that is of interest in this paper.

Data Collection Procedure

Both primary and secondary data were required in this study. While primary data were collected from contracting firms, secondary data were collected from published sources. The collection of data from the primary source was done in two stages. These are the reconnaissance survey, and questionnaire administration. The reconnaissance survey was carried out during the months of November and December 1995. It covered all the fifteen industrial estates/areas and outlying firms in the Lagos region. In each of the industrial estates/areas, all the industrial establishments were visited to determine whether or not they are involved in production subcontracting. The visit entailed personal interview with the industrialists or designated officers. The result of the reconnaissance survey indicates that 68 (representing 10.7%) of all the 637 operating firms in the Lagos region were involved in production subcontracting (Ajayi, 1998).

All the sixty-eight contracting firms identified during the reconnaissance survey were covered in the questionnaire administration carried out from January to August 1996. The questionnaire sought information on such issues as the industry group (line of activity), the location (address/industrial estate/area), the size and structural characteristics of the firm and activities relating to production subcontracting. The distances separating subcontracting partners were however, determined with the aid of the road network maps. The questionnaire was administered such that contracting firms in each of the industrial estates/areas and the outlying firms were visited one after the other. In each case, the questionnaire was left with the industrialists/designated officers to complete. All the contracting firms satisfactorily completed the questionnaire by the end of the fieldwork.

The Industrial Directory of Nigeria, 1993 edition, published by the Manufacturers' Association of Nigeria (MAN), served as the basic source of secondary data. The 1993 edition was the most recent and up-to-date at the beginning of the fieldwork. The directory contains a list of manufacturing establishments employing at least 10 workers. Other publications consulted include the Nigerian Vanguard Yellow pages (1991 edition) a publication of the

Vanguard Newspaper, which is the directory of business enterprises in Nigeria; the Nigeria Year book (1992 edition); and the Directory of Incorporated Companies (1993 edition). These other sources were used to supplement information provided by the MAN industrial directory. Information pertaining to the name, location, and addresses of firms were obtained from these sources. However, these publications did not contain all the required information. Other sources were therefore consulted to fill the gaps.

Information on population figures for instance was collected from the National Population Commission (NPC) provisional census result, 1991. The National Medical Directory (1993 edition) provided the required information on the number of hospitals/medical facilities. Information on the distance (km) between Lagos and other locations where subcontractors are found, availability of rail link, and type of road link (whether dual carriage, trunk road or others) was determined from the Nigeria road network map (1994 edition), published by Macmillan Press PLC and from other existing road network maps of Nigeria. These sources of secondary data (publications) were the most recent and comprehensive editions at the time of the fieldwork.

Analyses and Discussion of Results
Pattern of Subcontracting Linkages

The spatial distribution (number of subcontractors and volume calculated in naira of subcontracting) and the determinants of the spatial distribution of production subcontracting are analysed in this section. The basic analytical technique involved the use of proportional circles. The choice of this technique hinges on the advantage of visual clarity it possesses in spatial distribution over other types of analysis.

Figure 2:   Spatial Distribution of Production Subcontractors, 1994
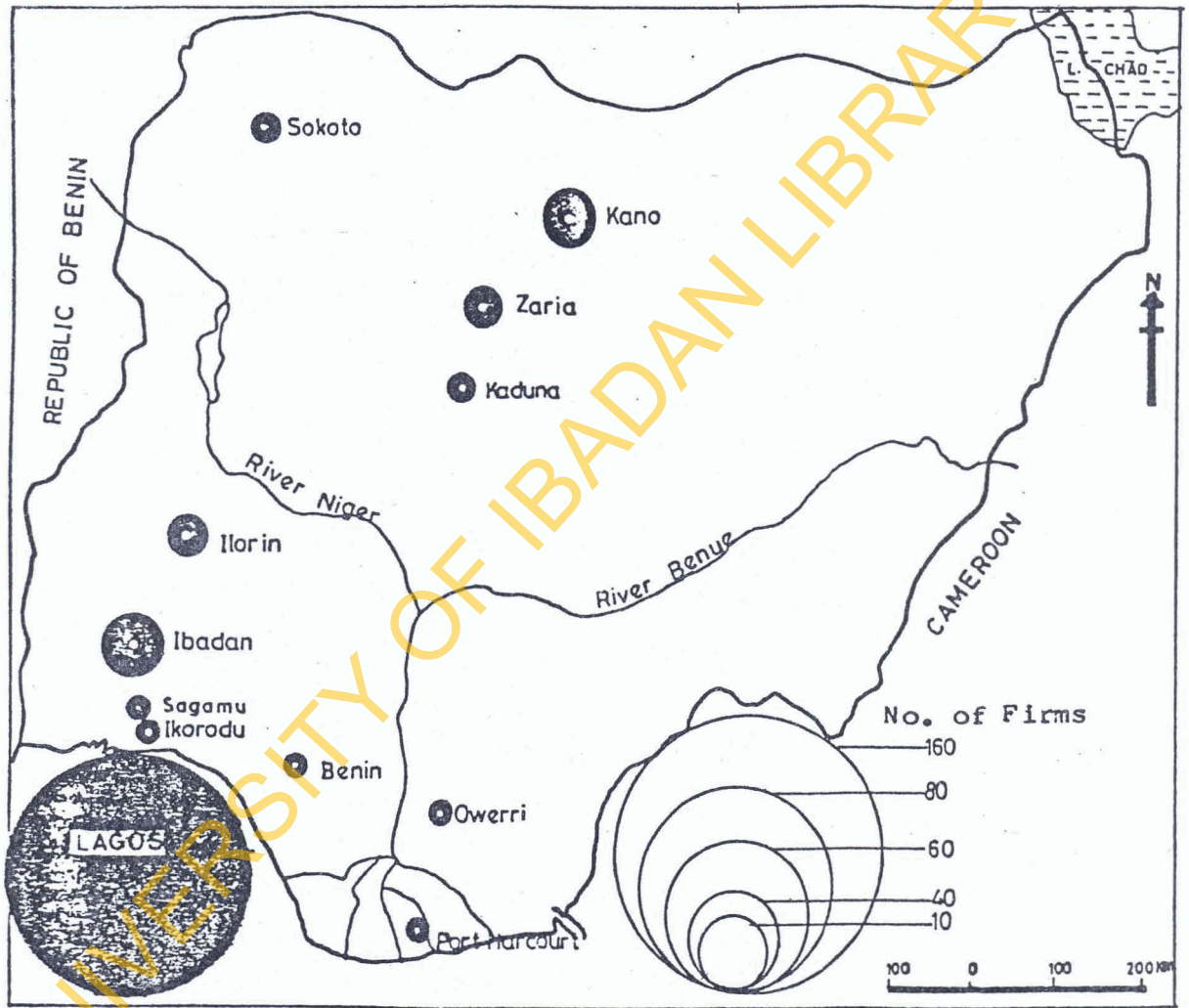
Spatial Distribution (by number) of Production Subcontractors

The spatial distribution of production subcontractors from 1990 to 1994 show that subcontractors engaged by the contractors are concentrated in Lagos, Ikorodu, Sagamu, and Ibadan in the southwest; Jos, Kaduna, Zaria, Kano and Sokoto in the north and a few other locations such as Benin, Owerri, Port-Harcourt and Ilorin. Lagos had the largest concentration of subcontractors in each of the years. For instance, out of the total 149 subcontractors in 1990, 127 (85.2 per cent) were in Lagos alone. The figure for Lagos rose to 133 subcontractors by 1991, 145 by 1993, and 148 by 1994. In relative terms, the percentage for Lagos rose to 85.8 by 1991 and 86.3 by 1993, but fell slightly from the 1993 figure to 86.1 by 1994.

Apart from Lagos, Kano that is next in importance had only six subcontractors, representing about four per cent in each of the years. Ibadan, Ilorin and Zaria in that order are next in importance. The number of subcontractors in each of these three locations ranged between two and five in most of the years. Each of the other locations had one subcontractor, representing 0.67 per cent of the total in each year. Jos did not have any subcontractor in 1974. However, Sagamu in the southwest and Port Harcourt in the southeast have subcontracting links with contractors in the Lagos region only in 1994. The spatial variation in the distribution becomes more evident when the number in Lagos is compared to those of other locations. The situation in 1994 is shown in Figure 2.

Spatial Distribution (by Volume) of Production Subcontracting

The spatial distribution of the volume of production subcontracting calculated in naira from 1990 to 1994 shows that in each of the years, Lagos had the largest volume of production subcontracting. For instance, in 1990, out of the total volume of production subcontracting, which was N191,372,930, Lagos alone accounted for 66.5 per cent. Kano, Zaria, Sokoto, in that order, accounted for 12.25 per cent, 10.35 per cent, and 5.64 per cent respectively. In each of the years, Lagos alone accounted for over 65 per cent of the total volume of

production subcontracting. The share of Lagos rose to as much as 77 per cent in 1993, but decreased to about 73 per cent in 1994. Port Harcourt and Sagamu, in that order, accounted for 8.6 percent and 0.97 percent of the aggregate volume of production subcontracting only in 1994. The share of Zaria, which was 10.35 per cent in 1990, decreased to 8.85 per cent by 1994. Locations such as Benin, Ikorodu, Kaduna, Owerri and Sagamu each had less than one percent of the aggregate volume of production subcontracting in any of the years. It must be stated that while Jos did not account for any volume of subcontracting in 1994, Sagamu and Port Harcourt, which had just appeared in the subcontracting scene accounted for 0.97 percent and 8.6 percent of the volume of production subcontracting during this year. The pattern in 1994 is displayed in Figure 3.

Determinants of the Spatial Patterns of Production Subcontracting
Procedure
The determinants of the spatial patterns of production subcontracting are analysed using the stepwise multiple regression model. The choice of this analytical technique is informed by the fact that "it is a search procedure for identifying which independent variables, previously thought to be of some importance, actually have the strongest relationship with the dependent variable" (Hauser, 1974).

Figure 3:   Spatial   Distribution   of   the   Volume   of Production
Subcontracting 1994
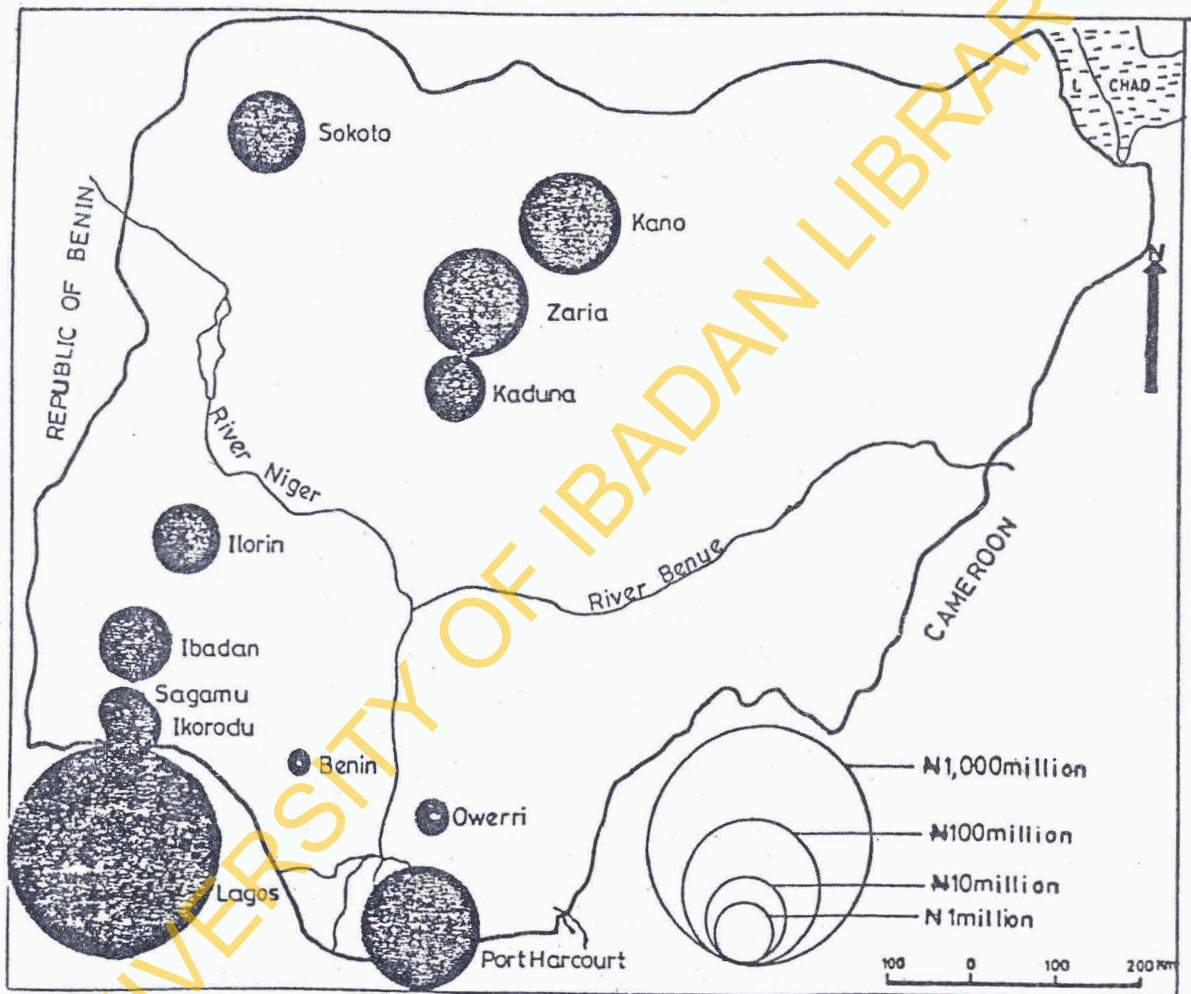
Choice of variables

The aggregate number of production subcontractors and the volume of subcontracting calculated in naira in identified locations in 1994 are used as the dependent variables in the analyses. The independent variables measure the size and structural characteristics of the various locations. These variables are (1) population of the centres where subcontractors are found, (2) number of industrial establishments, (3) number of educational institutions, (4) number of advertising agencies, (5) number of banks and allied institutions, (6) number of insurance/allied companies; (7) number of registered hotels/restaurants, (8) number of hospitals/medical facilities; (9) distance (km) by road from Lagos to subcontracting locations, (10) availability of airport, (11) availability of railway, (12) type of road link (measured as dual-carriage-way = 3, trunk road = 2, others = 1), (13) number of registered transporters/haulage companies, and (14) number of telephone lines. Availability of airport and railway are measured in binary, that is, 1 if available and 0 otherwise.

The choice of these variables is based on the premise that industrial linkage stresses the importance of the existence of relatively well-developed infrastructure, such as highways, railroad lines and termini, airport, utilities, commercial facilities – such as banks etc. and research organisations such as educational institutions, as determinants of spatially linked industrial activities (Smith 1981; Scott and Bergman, 1995). Spatially linked industrial activities tend to converge locationally around points that are maximally accessible. This is because linkage ties operate only over short distances. Good transportation facilities are of importance especially in places of existing industrial concentration, which may contain the pool of labour with particular skills. In addition, the spatial division of labour stresses the importance of pre-existing characteristics of specific places, and the uniqueness of labour factors as determinants of spatially linked economic activities [Sargant, 1961; Massey, 1984; Scott and Bergman, 1995].

Apart from the population, which directly measures the size of the various subcontracting locations, the next seven variables measure the socio-economic status of the locations. The other six variables measure the accessibility of these locations. It is expected that the size, that is, the population of locations will be

directly related to the level of subcontracting activities. In other words, places of large population concentration are likely to have more production subcontracting activities undertaken in them while smaller places are likely to have less production subcontracting activities undertaken in them. The basis for this expectation is that, the literature on industrial linkage suggests that certain materials and supplies may be cheaper in larger cities than in small ones by virtue of local production, or good transportation facilities, and economies of scale which can make power cheaper as the size of the local market increases and the existence of relatively well-developed infrastructure as determinants of spatially linked industrial activities. The socio-economic variables are the industrial support services. It is expected that places that have high scores in these variables are likely to have high incidence of production subcontracting activities. Except the variable which measures the distance (km) between Lagos and other locations where subcontractors are found, because linkage ties are said to operate only over short distances [Wood, 1969], it is expected that all other measures of accessibility are likely to have direct relationship with the spatial distribution of subcontracting activities.

Test for Multicollinearity

The independent variables used in these analyses are subjected to the "zero-restriction" analysis. This is to solve the probable problem of multicollinearity in the data. Table 1 shows that nine of the independent variables have pairwise correlation values more than 0.8. This suggests that multicollinearity exists among these independent variables. Only four variables, that is, distance (km) from Lagos to subcontracting locations, availability of airport, availability of railway, and type of road link, have very low correlation values. Indeed, there is a negative relationship between distance (km) from Lagos to subcontracting locations and the dependent variables. The relationship between each of the independent variables and the other ones is such that apart from those variables that have low correlation values with the dependent variables, all the other variables have high correlation values. This suggests that there is a serious problem of multicollinearity among these variables.

Table 1:   Correlation Matrix Amongst Variables

	Variable	Y_1	Y_2	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}
Y_1	Volume (%) of Production Subcontracting	1.000															
Y_2	Number of Production Subcontracting	0.990	1.00														
X_1	Population Figures	0.968	0.980	1.000													
X_2	No. of Industrial Establishments	0.974	0.986	0.876	1.000												
X_3	No. of Educational Institutions	0.933	0.948	0.935	0.951	1.000											
X_4	No. of Advertising Agencies	0.978	0.994	0.885	0.944	0.972	1.000										
X_5	No. of Bank Allied Institutions	0.972	0.982	0.890	0.982	0.993	0.983	1.000									
X_6	No. of Insurance Companies	0.904	0.930	0.933	0.930	0.981	0.949	0.966	1.000								
X_7	No. of Registered Hotels Restaurants	0.875	0.895	0.855	0.894	0.939	0.911	0.945	0.901	1.000							
X_8	No. of Hospitals Medical Facilities	0.977	0.987	0.871	0.987	0.958	0.984	0.994	0.399	0.919	1.000						
X_9	Distance(Km) from Lagos to Subcontracting Locations	-.318	-.383	-.395	-.370	-.315	-.378	-.292	-.294	-.274	-.290	1.000					
X_{10}	Availability of Airport	0.198	0.205	0.301	0.205	0.400	0.270	0.319	0.417	0.451	0.254	0.229	1.000				
X_{11}	Availability of Railway	0.294	0.248	0.419	0.238	0.364	0.344	0.332	0.357	0.448	0.277	0.294	0.501	1.000			
X_{12}	Type of Road Link	0.344	0.333	0.419	0.333	0.467	0.381	0.364	0.418	0.419	0.190	0.224	0.339	0.141	1.000		
X_{13}	No. of Registered Transporters/Hauliers	0.876	0.885	0.720	0.885	0.898	0.891	0.923	0.916	0.844	0.902	0.000	0.390	0.372	0.590	1.000	
X_{14}	No. of Telephone Lines	0.970	0.986	0.923	0.986	0.983	0.922	0.988	0.962	0.938	0.943	-.389	0.25?	0.593	0.408	0.881	1.000

Multicollinearity exits among the independent variables only where the pairwise correlation is more than 0.8. In addition to these variables, Hamburg (1977), suggests the exclusion of one of a pair of variables, which is collinear from consideration using the so-called "zero-restriction". These other variables are distance (km) from Lagos to subcontracting locations, availability of airport, availability of railway, and type of road link that do not have the problem of multicollinearity. The number of industrial establishments is entered into the regression model. The choice of the number of industrial establishments among the variables is based on statistical reasoning.

Results and Discussion

The result of the stepwise multiple regression in Table 2 shows that only two steps are possible The criterion for selecting variables in the analysis is set at 0.05 level. The result shows that only the number of industrial establishments is significant. The level of significance is as high as 0.001. The level of significance for each of the other variables, that is, availability of airport, type of road link, availability of railway, and distance from Lagos to subcontracting locations are 0.316, 0.660, 0.566, and 0.691, respectively. The R-value in the first step is about 0.97per cent while R^2 is 0.98per cent. In the second step, R is 0.99146, while R^2 is 0.98300. This implies that the number of industrial establishments alone accounts for about 97 per cent of the spatial distribution of production subcontractors in step one while the number of industrial establishments and other variables account for about 98 per cent of the spatial distribution of production subcontractors in step two. The percentage change in R is 0.1137. This represents about one per cent change. In this case, the difference between the first and second step in the analysis is only one per cent. The significance of the number of industrial establishments in explaining the spatial distribution of production subcontractors is further shown by the t-values. In step one, when only the number of industrial establishment is significant, the t-value is 19.40. In step two, when number of industrial establishments and all the other variables were entered into the step-wise multiple regression model, the

t-value for number of industrial establishments alone is 16.712. The t-value for availability of airport, type of road links, availability of railway, and distance (km) of Lagos from subcontracting locations are 1.081, -0.459, -0.602, and −0.415 respectively.

The result of the stepwise multiple regression model for the volume of production subcontracting in Table 3 also shows that only two steps are possible. Only the number of industrial establishments is significant. The level of significance is 0.0001. The level of significance of the other variables, that is availability of airport, type of road link, availability of railway, and distance (km) from Lagos is 0.3127, 0.8967, 0.9366, and 0.3683, respectively. The R-value in the first step is 0.97754, while R^2 is 0.95559. In the second step, R is 0.98609 while R^2 is 0.97237. This implies that the number of industrial establishments alone accounts for about 96 per cent of the spatial distribution of the volume of production subcontracting. In Step two, the number of industrial establishments and other variables account for about 97 per cent of the spatial distribution of the volume of production subcontracting. The percentage change in R^2 is 0.01672. This represents about two per cent change.

The significance of the number of industrial establishments in explaining the spatial distribution of the volume of production subcontracting is further clearly shown by the t-value. In step one, when only the number of industrial establishments is significant, the t-value is 15.385. In step two, when number of industrial establishments and all the other variables were entered into the step-wise multiple regression model, the t-value for number of industrial establishments alone is 13.412. The t-value for availability of airport, type of roadlink, availability of railway, and distance (km) of Lagos from subcontracting locations are −1.701, -0.135, -0.082, and 0.9455 respectively.

Whether in terms of the number of production subcontractors or the volume of production subcontracting, it is obvious from the analyses that the number of industrial establishments is the only significant explanatory variable for the spatial patterns of production subcontracting. The results are significant at 0.0001 per cent level. This implies that the hypothesis, which states that the

spatial pattern of production subcontractors is significantly explained by the size and structural characteristics of the locations where subcontractors are found, is true. This implies that in seeking to explain the spatial relationship among places through production subcontracting, the pre-existing characteristics of locations, especially the number of industrial activities and the existence of relatively well-developed infrastructure are crucial. Distance, which is a very significant determinant of the relationships amongst places, is overshadowed by the size and structural characteristics of the cities. This is evident from the significance of the number of industries as compared to the distance from Lagos.

Table 2: Summary of the Stepwise Multiple Regression Model for the Number of Production Subcontractors

Step	Variable Description	b	Standard Error of b	t	Level of Signifi cance	R	R^2	R^2 Change
1	No. of Industrial Establishments	0.204252	0.010523	19.409	0.000	0.98571	0.97163	
2	No. of Industrial Establishments	0.211379	0.012648	16.712	0.000			0.1137
		-5.770680	5.338824	1.081	0.316			
	Availability of Airport	-1.740372	3.794095	-0.459	0.660	0.99146	0.98300	
	Type of Road Link	-2.976729	4.947093	-0.602	0.566			
	Availability of Railway	-0.002483	0.005983	-0.415	0.691			
	Distance (km) from Lagos (Constant)	2.004579	6.198138	0.323	0.756			

Table 3: Summary of the Stepwise Multiple Regression Model for the Volume of Production Subcontracting

Step	Variable Description	b	Standard Error of b	t	Level of Signifi-cance	R	R²	R Change
1	No. of Industrial Establishments	193.1240.6527	125524.2978	15.385	0.000	0.97754	0.95559	
2	No. of Industrial Establishments	2075940.7384	154777.3241	13.412	0.000			0.01678
		-110422741.3	64910708.27	-1.701	0.1327			
	Availability of Airport	-6204841.669	461061724.7	-0.135	0.8967	0.98609	0.97237	
	Type of Road Link	-4957555.583	60143837.84	-0.082	0.9366			
	Availability of Railway	69900.286678	72698.65537	0.962	0.3683			
	Distance (km) from Lagos (Constant)	-5337116.822	75325988.15	-0.071	0.9455			

Conclusion

The research findings have implications for the industrial development of Nigeria in general. Although production-subcontracting linkage is weakly developed and concentrated mainly in and around the Lagos region, the increasing rate of production subcontracting could be used to strengthen the industrial development of Nigeria.

The policy implication of this study is that production subcontracting strategy could be used in effecting a more even distribution of industrial activities in all parts of Nigeria. No doubt, the development of transport and communication facilities will enhance the development of hinterland subcontractors. This is because such transport facilities will enhance the operations of such subcontractors located in the hinterlands. In addition, government's initiative at encouraging the local manufacture of industrial products, hitherto imported, could be enhanced through the encouragement of production subcontractors. The subcontracting of specialised aspects of industrial production could be better explored for the development of indigenous entrepreneurship. Such arrangement could take the form of either vertical integration or horizontal integration.

As a part of the privatisation and liberalisation schemes, subcontracting of components or sub-assembly of products could further be harnessed to launch Nigeria into the desired goal of industrialisation. The development of the Export Processing Zone (EPZ) will facilitate the development of production subcontracting. No doubt, the encouragement of production subcontracting, especially in the hinterlands, will encourage the local sourcing of materials. Production subcontracting is in fact, a strategy for mobilising both human and material resources for industrial development.

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