International Journal of Innovation and Scientific Research
ISSN 2351-8014 Vol. 8 No. 2 Sep. 2014, pp. 268-275

http://www.ijisr.issr-journals.org/

The Limit of Clustering in Geographical Innovation, a case study of the Lagos Region, Nigeria

Adejompo Fagbohunka

Geography and Planning Sciences Department,
PMB 001, Adekunle Ajasin University,
Akungba Akoko, Ondo State, Nigeria

ABSTRACT: Regional clusters, the geographical bounded concentration of firms are the best environment for stimulating innovation and competitiveness of firms. This paper therefore underscores the limit or inhibiting factors of industrial cluster in geographical innovation, using the Lagos region as a case study. Primary data were collected through the administration of one hundred and three questionnaires, in the twelve industrial estates (total sampling). The paper has reveals tremendous cluster benefits in form of Transportation economies, Power economies, Raw material purchase/supply, Collaboration in research and development, labour economies, security, telecommunication economies, joint ports and Shipping as well as access to financial institution economies. Apparently, cluster can lead to unlimited and amazing technological development of a region, thereby facilitating diffusion and innovation creation. Despite the astounding advantages emanating from cluster development, the research has found out that its performance in economic development could be limited, hindered or inhibited. The paper further revealed, inadequate water supply and transportation, incessant power supply, research and development inadequacy, security, personal reasons, sales promotion, inaccessible financial institution as well as government policy as inhibiting factors which limit the role of clustering in facilitating crucial geographical innovation.
It is therefore recommended that industrial cluster should be strengthened and encouraged through government investment in the industrial sector, making the location factors to be liberal, ensuring the adequacy of facilities in the industrial estates, giving tax holiday to younger investors, relaxing the laws governing the importation of some raw materials. This will have positive impact on productions and industrial expansion.

KEYWORDS: Industrial cluster, Technological innovation, Economies, Lagos region, Competitiveness.

INTRODUCTION

Agglomeration has traditionally been viewed as central to cluster development, in which geographical proximity has facilitated crucial externalities, particularly those relating to the generation and diffusion of tacist knowledge through the creation of an innovative environment surrounding the industry.

Regional clusters may be used as a catch-word for older concepts like industrial districts, specialized industrial agglomerations and local production systems. A regional cluster may be defined as a geographically bounded concentration of interdependent firms. According to Reference [1] “a cluster should have active channels for business transactions, dialogue and communication”. Without active channels even a critical mass of related firms is not a local production or social system and therefore does not operate as a cluster. It is argued that regional clusters are the best environment for stimulating innovation and competiveness of firms as stipulated in [2]. It has been argued in [3] that concentration is the most striking feature of the geography of economic activities and has its benefits. So having production and resources already concentrated in a region gives a region a competitiveness advantage. Clusters are specialized in a small number of industries, reflecting the mere general point that economic, entrepreneurial and technological activities in specific industrial sectors tend to agglomerate at certain places, according to [4]. Building the regional cluster is even perceived by some as the

way to compete globally, as economic "specialization is (seen as) the only way to overcome the `globalization trap` that is outrunning the risk of being out competed across the board" according to [5]. Indeed, the role which space and distance play in determining the nature and behaviour of the economy is the central departure point which defines the urban and regional economic paradigm. Here, the spatial corollary of aspatial increasing returns to scale is economies of clustering, and the spatial corollary of aspatial decreasing returns to scale is diseconomies of clustering.

It must be noted, however, that once an agglomeration of firms becomes established, progressively more external economies are created through a cumulative process. The propensity to agglomerate (locationally) increases further either when transactions include small-scale, irregular, under standardized, or contact-intensive activities that have high unit linkage costs, or when firms seek to reduce demand fluctuations by improving their customer base through location clustering, as in [6]. Existence of externalities and increasing returns to scale in production is the most important explanatory factor for geographic concentration of firms. Although, the literature has identified two types of externalities the negative and positive externalities, as in [7]. Externalities are costs and benefits of transactions that are not reflected in prices. Pollution is the most commonly used example of a negative externality. Reference [7] first developed a conceptual framework to distinguish two different types of externalities according to how they are mediated.

CONCEPTUAL ISSUES/ LITERATURE REVIEW

The success of some regional clusters has focused attention on the creation of external economics and on the role of knowledge intensive, local environments in stimulating the competitiveness of network of firms. Competition is increasingly seen to occur between clusters, value chains or network of firms rather than just between individual firms. It is also argued that regional clusters are the best environments for stimulating innovation and competitiveness of firms, according to [8]. The first stage in cluster development often involves new firm spin-offs leading to a geographical concentration of firms in nearly the same production stage. The agglomeration is followed by local competition that is an essential driver of innovation and entrepreneurship.

Based on Reference [9], concept of an industrial cluster facilitated a different and more instrumental approach. Clustering is more or less seen as an independent, partial process with its own laws of development, where the laws of successful clusters can be reverse-engineered in order to imitate the success stories as stipulated in [10]. According to Reference [11] companies gain competitive strength in regional cluster because of a better access to specialized and experienced employees, supplier, specialized information and public goods, and by the motivating force of local rivalry and demanding customers. It is the case of external economics strengthened by proximity. In spite of the original contextualization of industrial clusters within a framework of national competitive advantage by Porter, it is the concept of local competitive advantage, which has dominated discussion of cluster development over the past decade. In part, this is due to the longer tradition of research on localizing competitive advantage which linked aspects of the cluster concept specific process and it's embedding in local business networks to spatial considerations. Despite all the advantages that are enjoyed as a result of industrial cluster, it also has negative effects. The negative effects of clustering especially that of congestion, may reach a point where industries start moving away, a process referred to as deglomeration. No matter how bad the situation is, some industries can not move away because of industrial inertia.

THE STUDY AREA AND THE METHODS

The Lagos region covers metropolitan Lagos made up of fifty-seven local government areas among which are, Ikeja, Apapa, Mushin, Ikorodu, Epe and Badagry to mention just a few. This region which is situated along the south west of Nigeria, approximately between latitudes $6^0$27' and $6^0$37' north of the equator and longitudes $3^0$15' and $3^0$47' east of Greenwich meridian, with a land area of about 1,088km^2, covers about 32 percent of the land area of Lagos state. About 20 percent of this area is made up of Lagoons and mangrove swamps. Perhaps it is the strategic position of the Lagos region within the country, which explains why industrial concerns and trading companies, such as 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 Lagos region has two seaports, Tincan and Apapa. The two ports handle about 60 percent of Nigeria's total export excluding crude oil and about 70 percent of imports. Major terminals for both road and rail routes are located in the Lagos region. The strategic location of the Lagos region is further strengthened by the presence of the most important airport. The Lagos state population figure for the 2006 national population census was 8,048,430

The first stage in the collection of primary data involves the reconnaissance survey which was carried out, covering all the twenty industrial estates/areas and outlying firms in the Lagos region. In each of the industrial estates/areas, all the industrial establishments were identified. The purpose of identifying all firms in each estate and other industrial centres was to ensure that none of the industrial establishments was left uncovered during the survey. The questionnaire was designed to elicit information on such issues as the industry group (line of activity), the location (address/industrial estate/area), clustering of firms and the limiting factors. All the firms identified during the reconnaissance survey were covered in the questionnaire administration. The questionnaire was administered such that firms in each of the industrial estates/areas and the outlying firms were visited one after the other. In each case, the questionnaires were left with the industrialist/designated officer to complete. One hundred and three questionnaire were administered in twelve industrial estates; one questionnaire in each of the firm. This connotes that all the firms in the industrial estates were successfully covered in the questionnaire administration, which was administered. All the questionnaires were retrieved.

RESULTS AND DISCUSSION

Table 1.1, indicates that 103 firms exist in the estates. The distribution of these firms varied from one industrial estate/ to another. There were 13(12.6%) in Apapa, 3(2.9) in Matori, 7(6.8%) in Agbara, 24 (23%) in Ikeja, 14(13.6%) in Ilupeju, 3(2.9%) in Ijora, 7(6.8%) in Iganmu, 10(9.7%) in Oshodi/Isolo, 2(1.94%) in Ogba, 4(3.94%) in Ikorodu, 9(8.7%) in Oregun, 7(6.8%) in Surulere/Mushin. This analysis shows that the number of agglomeration firms varied across the estates; however, there were none in Gbagada, Agidingbi, Oyediran/Yaba, Ilasamaja, Lagos South-West, Akowonjo, Kirikiri, Abesan/Ipaja. The twelve industrial estates covered were the core areas of industrial activities in Lagos states. The location of each of these firms is shown in Figure 1.1, while the lists of these firms is provided in Table 1

Table 1 Distribution of firms

S/No	Industrial Estate/Area	Number of Firms	Percentage of Total
1	Apapa	13	12.6
2	Matori	03	2.9
3	Agbara	07	6.8
4	Ikeja	24	23
5	Ilupeju	14	13.6
6	Ijora	03	2.9
7	Iganmu	07	6.8
8	Oshodi/Isolo	10	9.7
9	Ogba	02	1.94
10	Ikorodu	04	3.94
11	Oregun	09	8.7
12	Surulere/Mushin	07	6.8
Total		**103**	**100**

Field Survey, 2013.

CLUSTER BENEFITS AMONGST FIRMS IN THE LAGOS REGION

Table 2, reveals the 103 (100%) firms indicating a saving due to clustering enjoyed. As a result of joint transportation, 27 (26%) firms realized between 21 and 30% savings, whereas 36(35%) firms realized <10% savings due to joint power supply. Also, as a result of joint raw materials purchase/supply, 5 (4.9%) enjoyed between 61 and 70%, while due to collaboration in research and development, 5(4.9%) enjoyed between 71 and 80% savings. Furthermore, as a result of joint labour, 43(41.7%) firms enjoyed <10%, 9(8.7%) realized between 71 and 80% savings. Another, 65(63%) firms realized <10% savings, as a result of joint water supply.

Moreover, due to joint waste treatment, 50 (48.5%) firms realized <10% savings, 3(2.9%) enjoyed between 61 and 70% benefits. Also, 37 (35.9%) firms realized <10% savings, while 5(4.9%) realized between 61 and 70% as a result of joint security. Another, 76 (73.8%) firms realized <10% benefits due to joint telecommunication. Due to joint ports and shipping,

49(47.6%) firms realized between 31 and 40% savings, whereas due to access to financial institution, 9(8.7%) firms each enjoyed between 81 and 90% and <10% savings.

The dominant economies enjoyed is the access to financial institution, Joint telecommunication was the least.

Table 2 The Cluster Benefits (savings) Enjoyed by Firms

% Savings	Joint transport		Joint power supply		Joint raw materials P/S		Collaboration R &D		Joint Labour		Joint Water Supply		Joint waste treatment		Joint security		Joint telecomm		Joint port & shipping		Access to financial institution	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
<10	25	24.3	36	35	34	33	41	39.8	43	41.7	65	63	50	48.5	37	35.9	76	73.8	49	47.6	09	87
11-20	16	15.5	09	8.7	05	4.9	07	6.8	13	12.6	09	8.7	10	9.71	12	11.7	09	8.7	15	14.6	14	13.6
21-30	27	26	30	29.1	13	12.6	02	1.94	10	9.71	20	19	10	9.71	10	9.71	10	9.71	10	9.71	19	18.4
31-40	10	9.71	10	9.71	20	19.4	19	18.4	08	7.8	6	6	13	12.6	14	13.6	06	5.8	02	1.94	12	11.7
41-50	09	8.7	06	5.8	19	18.4	16	15.5	09	8.7	2	1.94	09	8.7	10	9.71	02	1.94	08	7.8	10	9.71
51-60	7	6.8	06	5.8	06	5.8	08	7.8	08	7.8	1	0.97	07	6.8	12	11.7	-	-	07	6.8	15	14.6
61-70	6	5.8	04	3.9	05	4.9	4	3.9	03	2.9	-	-	03	2.9	05	4.9	-	-	09	8.7	10	9.71
71-80	2	1.94	01	0.97	1	0.97	5	4.9	09	8.7	-	-	01	0.97	02	1.94	-	-	03	2.9	05	4.9
81-90	1	0.97	01	0.97	-	-	1	0.97	-	-	-	-	-	-	1	0.97	-	-	-	-	09	8.7
91-100	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	103	100	103	100	103	100	103	100	103	100		100	103	100	103	100	103	100	103	100	103	100

Source: Author's Analysis, 2013

Clustering Economies Variables

Y_1 Joint Transportation (Percentage Savings accruing from joint transportation (transportation economies)

Y_2 Joint Power supply (Percentage Savings accruing from joint use of power (power economies)

Y_3 Joint Raw Material Purchase/Supply (Percentage Savings accruing from joint Raw materials purchase (input economies).

Y_4 Collaboration in Research and Development (Percentage Savings accruing from joint R & D)

Y_5 Joint Labour Supply (Percentage Savings accruing from wage rate (Labour economies i.e reduction in the cost of Labour).

Y_6 Joint Water Supply (Percentage Savings accruing from joint water supply measured as a percentage reduction in the cost of water supply).

Y_7 Joint waste treatment (Percentage Savings accruing from joint waste treatment)

Y_8 Joint Security (Percentage Savings accruing from joint security services).

Y_9 Joint Telecommunication (Percentage Savings accruing from joint telecommunication).

Y_{10} Joint Ports & Shipping (Percentage Savings accruing from joint ports and shipping)

Y_{11} Access to Financial institution (Percentage Savings accruing from access to financial institution).

The Analysis of Variance carried out in testing the hypothesis (i.e. clustering economies do not vary significantly amongst firms, as depicted in Table 3 shows that the result was significant at 5% level (0.000<0.05). Therefore, null hypothesis H_0 above is rejected, which means the acceptance of the alternative hypothesis H_1, connoting that Agglomeration Economies vary significantly amongst the firms. This result tends to confirm Ciccone's (1991) assertion that agglomeration of firms comes about as a result of potential benefits (especially lowering of costs) accruable to firm's close together in space.

Table 3 Summary of the Analysis of Variance (ANOVA) for the Benefits of Clustering

	Sum of Squares	Df	Mean Square	F-Cal.	F-Tab
Between Groups	100142.756	10	10014.276	34.917	1.84
Within Groups	224277.491	782	286.800		
Total	324420.247	792			

Source: Author's analysis, 2013

Table 4 Location limit of clustering

Location factors	**Responses**				
	SA	**A**	**UND**	**DA**	**SD**
Nearness to raw materials	32	25	23	18	15
Market facilities	16	20	22	19	26
Transportation	62	10	15	13	3
Water supply	55	17	16	11	4
Labour	18	21	23	28	13
Power supply	67	20	8	5	3
Government policy	58	18	13	8	6

Source: Author's Analysis, 2013

Table 3 reveals the responses relating to the location limit of clustering. The General Mean Weight Value and the Mean Weight Value or the cut off point for this grouped responses were calculated. It was found that only four factors, out of the seven listed were accepted as significant location (factors) limit of clustering, while other factors were insignificant (Table 4).

Table 4 The summary of location factors

Factors	**Total weight value**	**Mean weight value**	**Decision**
Nearness to raw materials	330	3.20	Rejected
Market facilities	290	2.82	Rejected
Transportation	424	4.12	Accepted
Water supply	417	4.05	Accepted
Labour	312	3.03	Rejected
Power supply	452	4.39	Accepted
Government policy	423	4.11	Accepted

GMWV =25.72/7 = 3.67

Source: Author's Analysis, 2013

Table 4 reveals that transportation, water supply, power supply and government policy were accepted because their respective Mean Weight Values of 4.12, 4.05, 4.39 and 4.11 are greater than the General Mean Weight Value of 3.67. Other factors are counted insignificant because of their Mean Weight Values which are lesser than the General Mean Weight Value. This further lends credence to the fact that only four factors are germane in the clustering limit.

Table 5 Limitation by advantages offered by locating within the Estates

Estate advantages	Responses				
	SA	A	UND	DA	SD
Subcontracting	30	22	10	30	11
Sales promotion	26	29	11	20	17
Security	27	18	15	18	25

Source: Author's Analysis, 2013.

Table 5 reveals the responses relating to the estates advantages limit of clustering .The general mean weight value and the mean weight values or the Cut off points for these grouped estates advantages were calculated and summarize. Apparently, all the three factors listed have their Mean Weight Values greater than the General Mean Weight Value and were subsequently accepted as being significant. This connotes that subcontracting, sales promotion and security significantly contributes to the limit of clustering in the Lagos region (Table 6).

Table 6 Summary of Decisions On Estates Advantages

Estates advantages	**Total weight value**	**Mean weight values**	**Decision**
Subcontracting	335	3.25	Accepted
Sales promotion	338	3.28	Accepted
Security	313	3.04	Accepted

GMWV =9.53/3 =3.15

Source: Author's Analysis, 2013.

Table 6 depicts that the estates advantages; subcontracting, sales promotion and security, have their Mean Weight Values of 3.25, 3.25, 3.28 and 3.04 respectively, these values are higher than the General Mean Weight Value, and are therefore significant contributors to clustering limit.

Table 7 Limitation by Other Factors

Other factors	**Responses**				
	SA	A	UND	DA	SA
Research development	38	32	12	13	08
Personal reasons	33	29	10	18	13
Cheap land	25	17	12	28	21
Port and shipping	20	23	26	15	19
Access to financial institution	45	20	18	12	08

Source: Author's Analysis, 2013.

Table 7 reveals the responses relating to the limit of clustering by other factors. The general Mean Weight Value (GMWV) and the Mean Weight Value (MWV) or the cut off point for this grouped responses were calculated. Three, out of the five listed factors were accepted as significant (table 8)

Table 8: Summary of Decision on Limitation by Other Factors

Other factors	Total weight value	Mean weight value	Decision
Research and development	388	3.77	Accepted
Personal reasons	360	3.50	Accepted
Cheap land	306	2.97	Rejected
Ports and shipping	315	3.24	Rejected
Access to financial institution	391	3.80	Accepted

GMWV = 17.28/5 = 3.46

Source: Author's Analysis, 2013.

From table 8 above, research and development, personal reasons and access to financial institution were accepted because their respective mean weight values of 3.77, 3.50 and 3.80 are greater than the General Mean Weight Values of 3.46, thus evidently signifying to significant clustering limit.

SUMMARY AND CONCLUSION

The research has examined the limit of clustering in geographical innovation of the Lagos region. The research revealed the immense benefit of clustering in the form of various economies enjoyed by firms through maximum proximity locations. Economies such as transportation, power, labour, raw materials purchase/supply, research and development, security, water supply, telecommunication as well as access to financial institution are enjoyed by firms.

The paper revealed three groups in relation to the limit of clustering. The location factors constituted the first group. Seven location factors were considered to be germane, these are; nearness to raw materials, market facilities, transportation, water supply, labour, power supply and government policy. The Mean Weight Values of these factors were determined, it was found that only four factors; transportation, water supply, power supply and government policy were major contributors to the clustering limit. Advantages derived by firms in each of the estates constitute the second group, three factors were identified; subcontracting, sales promotion and security. The Mean Weight Values reveal all the three factors as being significant. The third groups (other factors) are; research and development, personal reasons, cheap land, ports and shipping and access to financial institutions. Three of these factors; research and development, personal reasons and access to financial institution are found to be significant, because their respective Mean Weight Values are higher than the General Mean Weight Values. The limit of industrial cluster constitutes a barrier to industrial, advancement, expansion and upliftment.

Industrial cluster can lead to amazing technological development of a region, thereby facilitating diffusion and innovation creation which will immensely contributes to the economic welfare and improved standard of living. The industrial estates needs to be created and equipped with facilities, because industrialization in this modern world is a determinant of national power, thus, any country that failed in this aspect, will find it difficult to perform effectively in other aspects of the economy.

Clustering if encouraged, will lead to increase economies, these clustering of firms should be made viable, encouraged and strengthened through government investment in the industrial sector. Government should strive to intervene by ameliorating the clustering limit to facilitate industrial expansion, so that the multiplier effect could be maximally exploited. This could be achieved through the liberalisation of location factors, ensuring the adequacy of facilities in the industrial estates, giving tax holidays to the younger investors, relaxing the laws governing the importation of some raw materials, as this will have positive impact on productions.

REFERENCES

[1] Rosenfeld, S.A Bringing Business Clusters into the Mainstream of Economic Development. *European Planning Studies,* 5:3-23, (1997).

[2] Asheim , B.T and A. Isaksen, Localized knowledge , interactive learning and innovation between regional networks and Global corporations in E. Vatine and M. Taylor (eds), The networked firm in a Global world small firms in New environments . Ashgate, Aldershot (163-198), (2000).

[3] Krugman, P. Geography and Trade. The MIT Press. Cambridge, Massachusetts, (1991).

[4] Malmberg, A, O. Solvell, and Zander, I., Spatial Clustering, Local Accumulation of Knowledge and Firm Competitiveness, *Geografiska Annaler 78B: 85-97,* 1996.
[5] Lagendijk, A., Learning in Non-core Regions: Towards 'Intelligent Clusters: Addressing Business and Regional Needs. In Boekema, F.K. Mergen, S. Bakkers and R. Rutten (eds.), knowledge, innovation and Economic Growth. The Theory and practice of learning regions. Edward Elgar, Cheltenham (165-191), (2000)
[6] Leung, C. K., "Personal contacts, sub contracting linkages and Development in the Hong Kong – Zhijiang Delta Region".Annals of the Association of American Geographers, 83 (2), pp. 273-302, (1993).
[7] Scitovsky, T., Two Concepts of external economies. *Journal of Political Economy,* 62, 143-151, (1954).
[8] Reis, A.B. and Traca., "Spillovers and Competitive pressure for long-run Innovation'' *European Economic Review,* 52 (4), PP. 589-610, (2009).
[9] Porter, M., The Competitive Advantage of Nations. Macmillan, London and Basingstoke, (1990).
[10] O' Flaherty, City Economies Cambridge. Massachusetts London, England. Havard University Press, (2005).
[11] Porter, M., Clusters and the New Economics of Competition. Harvard Business Review, November- December: 77-90, (1998a).