Industrial Agglomeration and Environmental Problems Severity Perception, in the Lagos Region, Nigeria

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ABSTRACT

Despite all the advantages derived from agglomeration economies, it also has negative effects. This paper therefore underscores the severity of these environmental problems (negative effects) arising as a result of industrial agglomeration.. Data were collected in two different stages; first was the reconnaissance of the study area and second was the questionnaire administration. Information on the severity of agglomeration impact measured through responses was obtained through a questionnaire survey administered to the heads of the household. The choice of heads of household was done through a spatial systematic sampling procedure; on the whole 120 individuals were covered. This sample was chosen to portray the relationship between firms distance and perception of environmental problems resulting from firms. The paper has found out the negative effects arising from agglomeration of firms, which includes: land pollution, vibration, irritating fumes, heavy traffics, overcrowding, noise pollution, increase in house rent and crime rate. The paper revealed that of the ten impacts indicated by the respondents, air and noise pollution were the most significant. The research also shows that the environmental problems were severe; there is a distant decay effect in the impact. A correlation analysis between the severity of impact and distance resulted in a value of minus 0.641 which is significant at 5% level. It is however recommended that government should invest in the industrial sector and encouraged agglomeration, while the negative impacts of agglomeration also should be adequately curtailed by government, through its laws and regulations which need to be enforced on these firms, so that the immediate environment will not unnecessary suffer the consequences of the actions of these industries.

Keywords: Industrial agglomeration, Environmental impact, Environmental problems severity, Distance decay, Lagos region.

Introduction

The development of agglomeration could be traced to the works of Marshall (1890, 1919) and Weber (1929), the key theoretical dynamics of which are scale effects. Agglomeration economies are the benefits enjoyed by firms locating in the same place. The concentration of the production facilities of a single firm or across multiple firms in a single location generates cost-saving scale effects and often leads to further agglomeration of firms through an industrial location process (Weber, 1929; Venables, 2008). Such cost saving effects of agglomeration is often called agglomeration economies. Agglomerative activity can take many forms (Drake,1997) and is often considered to result in either "localization "or "urbanization " (external) economies dependent upon the industrial composition of the cluster or complex. Localization economies involve economies amongst similar firms, while economies amongst unlike firms are known as urbanization economies. The latter form of agglomeration has received greater attention in the literature, often providing a mechanism for analyses of differential urban growth and optimal city size.

Locating a firm in close proximity to similar types of firms or suppliers/demanders may have economic motivations in terms of enhanced

productivity or reduced costs. The implied agglomeration, externalities or economies across firms in an industry or sector may be due to various forces, including a conglomeration of specialized inputs and informational or knowledge spillovers. Externalities are costs and benefits of transactions that are not reflected in prices. Pollution is the most commonly used example of a negative externality. Scitovsky (1954) first developed a conceptual framework to distinguish two different types of externalities according to how they are mediated. First technological externalities arise from non-market interactions among firms in proximity and affect the production sets of firms. Shared knowledge and expertise are the most common sources of externalities. In contrast, pecuniary externalities are purely based on market interactions. Therefore, this type of externalities influences firms only in so far as they are involved in activities that affect price mechanism (Landabaso, 2001).

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. 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 (Leung, 1993; O' Flaherty, 2005). Existence of externalities and increasing returns to scale in production is the most important explanatory factor for geographic concentration of firms.

Conceptual Issues/Literature Review

Industrial agglomeration refers to the concentration of several industries in a given place or area. Such a concentration takes place because the area in question has the greatest location advantage over other areas, including the advantage of proximity to related industries. As stated earlier, manufacturing firms' agglomerate in an industrial estate because of the infrastructural facilities like good roads, electricity and water supply, transport and communication well located industrial site with needed utilities, factory premises and other supportive facilities. The traditional location factors such as transportation and power have become more equally available among cities of various sizes, but the metropolis has retained its attraction, capitalizing on its role as a rich source of information and professional talent (Vernon, 1962; Aghion
and Dewatripoint, 2010).

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 (Asheim and Isaksen, 2000; Reiss & Traca, 2008). 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. Despite all the advantages that are enjoyed as a result of agglomeration economies, it also has negative effects. Agglomeration cause overcrowding, pollution, high cost of land and traffic congestion. Despite the difficulties in quantifying the costs to health or property arising from air pollution impacts generated by different distributions of industry relative to the surrounding population, there is evidence that general planning strategies for the location of industry have been formulated in several countries upon the basis of intuitive judgments regarding the balance of social costs and benefits arising from further development in existing agglomerations as compared with policies of dispersal (Porter, 1980).

The Study Area and Methods.

The Lagos region is situated along the south west of Nigeria, approximately between latitudes $6^027'$ and $6^037'$ north of the equator and longitudes $3^015'$ and $3^047'$ 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
Lagoons and mangrove swamps. The strategic position of the Lagos region within the country, 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. According to the post-independence census in 1963, a population of 1,122,733 was recorded for metropolitan Lagos while a population of 665,246 was recorded for the city of Lagos and 457,487 for the settlements outside Lagos. The population of the Lagos region was 5,525,261 in 1991. The Lagos state population figure for the 2006 national population census is 8,048,430 the provisional result released generated much controversy, Lagos state government believed that the result needs to be authenticated.

The questionnaire elicited information on the impacts and severity of impacts of agglomeration on the immediate environment. Information on the environmental impact of agglomeration measured through responses was obtained through a questionnaire survey administered to heads of household. The choice of heads of household was done through a spatial systematic sampling procedure. The head of the household nearest to each of the estates was first sampled. Thereafter, heads of household located at intervals of 10 houses were interviewed. On the whole, 120 individuals were covered. This sample was chosen to portray the relationship between firms distance and the perception of environmental problems resulting from firms'. However, distances of the residences to the firms were determined.

Data Analysis
Table 1   The Environmental Problems.

Effects	Frequency	Percentage
Land pollution	15	12.5
Heavy traffics	10	8.3
Vibration	10	8.3
Air pollution	24	20
Water pollution	7	5.8
Irritating fumes	10	8.3
Noise pollution	24	20
Over crowding	9	7.5
Increase in house rent	5	4.2
Crime rate increase	6	5
Total	120	100

Source: Author's analysis, 2013

Table 1 reveals that 24(2%) respondents each were affected by air pollution and noise pollution, whereas 15(12.5%) respondents were affected by land pollution. Another 10 (8.3%) respondents each were affected by heavy traffics, vibration and irritating fumes, while 9(7.5%) were affected by water pollution. Also, 7(5.8%) were affected by water pollution, while 6(5%) were affected by crime rate increase.

It must be noted that all these negative impacts of agglomeration industries are caused solely by the industrial activities; noise and pollution poses the greatest impact.

Table 2   Perception about the Severity of these Environmental Problems

Perception	Frequency	Percentage
Very severe	17	14.2
Severe	57	47.5
Not severe	28	23.3
None	18	15.5
Total	120	100

Source: Author's analysis, 2013

Table 2 shows the perception of the respondents about the severity of the environmental problem, 17 (14.2%) opined very severe, 57(47.5%) opined severe, while 28 (23.3%) believed that the problem is severe, another 18(15.5%) believed that the agglomerated firms have no environmental consequences on their well-being. Majority of the respondents however, attested to the severeness of the environmental problem.

The hypothesis which states that: Distance from the firms is not significantly related to the pattern of perception of environmental problems is tested using the Pearson Product (Moment) Correlation statistical analysis.

The Pearson Product (Moment) Correlation   equation is given by:

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

Y = Perception of environmental problems, i.e. the independent variables, where
X = distance in km., i.e. the dependent variables, where

The analysis of Pearson Moment correlation carried out in testing the hypothesis which states that: the pattern of perception of environmental problems is not significantly related to the distance from the firms was depicted in table 3. The dependent variable is the perception of environmental problems, while the independent variable is the distance from the firms.. A correlation analysis between the severity of impact and distance resulted in a value of minus 0.641 which is significant at the 5% level Therefore, null hypothesis Ho above is rejected, and the Hi is accepted. This implies that the pattern of perception of environmental problems is significantly related to the distance from the firms. There is a distance-decay effect in the impact..

Table 3   Analysis of the Correlation for the Perception of Environmental Problems and Distance from the Firms.

Correlations

Correlations

		INTENSITY OF IMPACT	DISTANCE(Km)
INTENSITY OF IMPACT	**Pearson Correlation**	1	-.641[*]
	Sig. (2-tailed)		.034
	N	11	11
DISTANCE(Km)	**Pearson Correlation**	-.641[*]	1
	Sig. (2-tailed)	.034	
	N	11	11

*. Correlation is significant at the 0.05 level (2-tailed).

Sex and the Perception of Environmental Problem.

Table 4 shows that 11(9.2%) male opined that environmental problem is very severe, whereas 6(5%) female opined it is very severe. Also, 45(37.5%) male believed that environmental problem is severe, while 12 (10%) female believed it is severe. Another, 10(8%) male opined that environmental problem is not severe, whereas 18(15%) female believed it is not severe. Furthermore, 15(12.5%) male believed that environmental problem has no effect, while 3 (2.5%) female opined it has no effect. It can be concluded that both sexes believed that the firms operation has a severe effect on the environment.

Table 4   Cross Tabulation of the Sex with the Perception of Environmental Problem

Sex of the respondents.	Environment problem perception									
	Very severe		Severe		Not severe		Not effect		Total	
	No	%	No	%	No	%	No	%	No	%
Male	11	9.2	45	37.5	10	8	15	12.5	81	67.5
Female	6	5	12	10	18	15	3	2.5	39	32.5
Total	17	14.2	57	47.5	28	23	18	15	120	100

Source: Author's analysis, 2013

Table 5 shows the summary of the chi-square analysis between the sex and environmental problem perception, this was obtained through the cross tabulation of the variables, i.e. sex and environmental problems perception

Ho: there is no relationship between the sex and environmental problems perception.

The chi-square test was carried out at 3 degree of freedom and 0.05% significance level, the calculated value is 14.418 while the tabulated value is 7.815, since the calculated value is greater than the tabulated value, the Ho is rejected while the H1 is accepted. This connotes that there is relationship between the sex and environmental problem perception.

Table 5   Summary of the Chi-Square value showing the Sex and Perception of Environmental Problems

Variables	Df	A	Calculated Value	Tabulated Value	Decision
Sex					
	3	0.05	14.418	7.815	Accept H1
Perception of Environmental Problems					

Source: Author's Analysis, 2013

6.1.8   Ages and the Perception of Environmental Problems.

Table 6 shows that the respondents each <20years and between 31 and 40 years perceived the environmental

problem as very severe, whereas 3(2.5%) each between 21 and 30 years, 41 and 50 years perceived the same. 2(1.7%) between 51 and 60 years perceived it is very severe, while only 1(0.8%) above 60 years perceived the same. Another 18(15%) between 31 and 40 years perceived it is severe, while 12 (10%) between 51 and 60 years perceived it is severe. Also, 10(8%) each between 21and 30years; 41 and 50 years perceived it is severe, whereas 6(5%) above 60 years perceived same. Furthermore, 15(12.5%) between 41 and 50 years perceived not severe, while 4(3%) between 21 and 30years perceived same. Another 10(8%) above 60 years perceived the environmental problems as having no effect, while 6(5%) between 41 and 50 years perceived same. 3(2.5%) between 21 and 30 years attested that environmental problem has no effect, whereas 2(1.7%) between 51 and 60 years opined that the environmental problem has no effect.

Table 6 Cross Tabulation of Ages with the Perception of Environmental Problems

Age of respondents	Very Severe		Severe		Not Severe		No Effect		Total	
	No	%	No	%	No	%	No	%	No	%
< 20	4	3	1	0.8					5	
21 – 30	3	2.5	10	8	5	4	3	2.5	18	
31 – 40	4	3	18	15	4	3			26	
41 – 50	3	2.5	10	8	15	12.5	6	5	34	
51 – 60	2	1.7	12	10	4	3	2	1.7	20	
>60	1	0.8	06	5			10	8	17	
TOTAL	17	14.2	57	47.5	28	22.5	18		120	

Source: Author's analysis, 2013.

Table 7 shows the chi-square analysis between the age and perception of environmental problems. This was derived form the cross tabulation of the variables.

Ho: there is no significant relationship between the age and perception of environmental problems.

The chi-square test was carried out at the 15 degree of freedom and 0.05 level of significance. The calculated value is 51.298, while the tabulated value is 24.996. Since the calculated value is greater than the tabulated value Ho is rejected and H1 is accepted. This indicates that, there is significant relationship between the age and perception of environmental problems

Table 7   Summary of the Chi-Square value showing the Age and Perception of Environmental Problems

Variables	df	α	Calculated Value	Tabulated Value	Decision
Age					
	15	0.05	51.298	24.996	Accept H1
Perception of Environmental Problems					

Source: Author's Analysis, 2013

6.1.9   Marital Status and Environmental Problem Perception

Table 8 reveals that 12(10%) married respondents perceived the environmental problem as severe, whereas 3(2.5%) single perceived same. Another 32(26.7%) married perceived the environmental problems as severe, while 14(11.7%) single perceived same. 6(5%) divorced perceived it is severe, while 5(4%) separated also perceived same. Furthermore, 19(15.8%) married perceived it is not severe, whereas 9(7.5%) single perceived the environmental problems as not severe. Also 6(5%) divorced perceived the environmental problems as not have effect, while 5(4%) respondents each, married and separated perceived it has no effect.

Table 8 Cross Tabulation of Marital Status with the Perception of Environmental Problems

Marital Status	Very Severe		Severe		Not Severe		No Effect		Total	
	No	%	No	%	No	%	No	%	No	%
Married	12	10	32	26.7	19	15.8	5	4	68	57
Single	3	2.5	14	11.7	9	7.5	2	17	28	23
Divorced	2	1.7	6	5			6	5	14	12
Separated			5	4			5	4	10	8
Total	17	14.2	57	47.5	28	22.5	18	15	120	100

Source: Author's analysis, 2013.

Table 9 shows the chi-square analysis between the marital status and environmental problems perception. The cross tabulation carried out between the variables; marital status and environmental problems perception.

Ho: there is no relationship between marital status and environmental problems perception.

At 9 degree of freedom and 0.05 level of significance, the calculated value is 28.713 while the tabulated value is 16.919. Since the calculated value is greater than the tabulated value, the Ho is rejected and H1 is accepted. This connotes that there is relationship between the marital status and environmental problems perception.

Table 9   Summary of the Chi-Square value showing the Marital Status and Perception of Environmental Problems

Variables	Df	α	Calculated Value	Tabulated Value	Decision
Marital Status	9	0.05	28.713	16.919	Accept H1
Environmental Problems Perception					

Source: Author's Analysis, 2013.

Educational Qualification and the Perception of Environmental Problems
Table 10 reveals that 6(5%) respondents with secondary education perceived the environmental problems as severe, whereas 5(4%) with tertiary education perceived same. Also, 4(3%) having no formal education perceived the environmental problem as very severe, while 2(1.7%) with primary education perceived same. Furthermore, 19 (15.8%) having secondary education affirmed the environmental problems as severe, while 17(5.8%) with no formal education affirmed same. Another 21(17.5%) possessing tertiary education perceived the environmental problem is severe, whereas 10(8%) with primary education perceived same. Furthermore, 6(5%) respondent each possessing no formal education, having secondary education perceived the environmental problems as not severe, whereas 10(8%) having primary education perceived same. Moreover, 2(1.7%) respondents each with primary and secondary education perceived the environmental problems has no effect, while 5(4%) with tertiary education also perceived the environmental problem as having no effect.

Table 10 Cross Tabulation of educational Status with Perception of Environmental Problems

Educational Qualification	Very severe		Severe		Not Severe		No Effect		Total	
	No	%	No	%	No	%	No	%	No	%
No Formal Education	4	3	17	5.8	6	5			27	22.5
Primary Education	2	1.7	10	8	10	8	2	1.7	24	20
Secondary Education	6	5	19	15.8	6	5	2	1.7	33	27.5
Tertiary Education	5	4	21	17.5	5	4	5	4	36	30
Total	17	14.2	57	47.5	27	22.5	9	7.5	120	100

Source: Author's analysis, 2013.

Table 11 shows the summary of the chi-square analysis between the educational qualification and environmental problems perception. The chi-square test was revealed as a result of the cross tabulation carried out between the variables Educational qualification and environmental problems.

Ho: there is no significant positive relationship between educational qualification and environmental

problems perception

At 9 degree of freedom and 0.05 significant levels, the calculated value is 16.945 while the tabulated value is 16.919. Since the calculated value is greater than the tabulated value, Ho is rejected and H1 is accepted. Indicating that there is significant positive relationship between educational qualification and environmental problems perception.

Table 11 Summary of the Chi-Square value showing the Educational Qualification and Perception of Environmental Problems

Variables	Df	α	Calculated Value	Tabulated Value	Decision
Educational Qualification	9	0.05	16.945	16.919	Accept H1
Perception of Environmental Problems					

Source: Author's Analysis, 2013

Summary and Conclusion

Industrial agglomeration 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. Despite all the advantages that are enjoyed as a result of agglomeration economies, it also has negative effects, such as land pollution, heavy traffics, vibration, air pollution, water pollution, irritating fumes, noise pollution, overcrowding, increase in house rent and crime rate. Of the ten impacts indicated by the respondents, air pollution and noise pollution, each accounting for twenty percent of the responses, were the most significant. Increase in house rent with a percentage of four was the least significant. Seventy five percent of the respondents reported that the firms are not doing enough to address the impact. This negative impact is capable of causing a lot of discomforts to the people living in such environment. There is a distance-decay effect in the impact. Most of the respondents agreed that the environmental impact of industrial agglomeration was severe as revealed by the various cross tabulation of socio- demographic characteristics of the respondents with severity of environmental problems. A correlation analysis between the severity of impact and distance resulted in a value of minus 0.641 which is significant at the 5% level.

Apparently, this study has revealed the impact of agglomeration of firms on the immediate environment, and found out that an agglomeration firm has impacted negatively. It is however recommended that government should invest in the industrial sector and encouraged agglomeration of firms which will lead to increase agglomeration economies, these agglomeration of firms should be made viable, encouraged and strengthened through government investment in the industrial sector and making the location factors to be liberal, while the negative impacts of agglomeration also should be adequately curtailed by government, through its laws and regulations which need to be enforced on these firms, so that the immediate environment will not unnecessary suffer the consequences of the actions of these industries. It is therefore, further recommended that government should put in place monitoring teams in order to monitor the activities of these firms, ensure and enforce compliance of the laws and regulation of industrial and environmental safety. This will lead to industrial environmental harmony.

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