

Ajayi, D. D. and A. Fagbohunka (2012), Agglomeration and Clustering of Firms in Relation to Innovation and Economic Performance. Journal of Development Alternatives and Area Studies, Vol. 31, No. 2, pp. 5-17.  
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**Agglomeration, Clustering of Firms, Innovation and  
Economic Performance : A Review**

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**Abstract:**

Agglomeration economies has traditionally been viewed as central to cluster development, in which geographical proximity has facilitated crucial externalities, particularly those relating to generation and diffusion of tacit knowledge through the creation of an innovative environment surrounding the industry. The paper underscores the role of agglomeration and clustering of firms in relation to innovation and economic performance.

The paper found out that agglomeration and clustering have tremendous positive effects on regional development. These are economic booster that leads to amazing technological and innovation creation which are driving forces or catalyst for total transformation of social and economic performance of a region. The paper recommends that agglomeration and clustering of firms should be encouraged by government intervention through the provision of infrastructural facilities, credit facilities and implementation of tax holiday.

**Keywords:** agglomeration, clustering of firms, industrial linkages, innovation, economic performance

## 1. Introduction

The development of the agglomeration economies could be traced to Marshall (1890, 1919) and Weber (1929). The key theoretical dynamics of agglomeration are scale effects. 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 (Hover, 1937; Weber, 1929). Such cost saving effects of agglomeration is often called agglomeration economies and can occur within the same industry (localization economies) or across all industries as a consequence of the scale of a city or region (urbanization economies). Agglomeration economies are the benefits enjoyed by firms locating in the same place.

For further discussion of agglomeration and external economics, it is worthwhile to define the concept of externalities in more detail. Externalities are cost 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 firm. Shared knowledge and expertise are the most common sources of externalities. In contrast, pecuniary externalities are purely based on market interaction. Therefore, this type of externalities influences firms only in so far as they are involved in activities that affect price mechanism (Ottaviano and Thisse, 2001).

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 geographically bounded concentration of interdependent firms. According to Rosenfeld (1997) "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 (Rosenfeld 2001; 10). This definition uncovers two main criteria for delimiting regional clusters.

First, regional clusters are limited geographical areas with a relatively large number of firms and employees within a small number of related industrial sectors. Thus, the clusters are specialized in a small number of industries. This reflects the mere general point that economic, entrepreneurial and technological activities in specific industrial sectors tend to agglomerate at certain places (Malmberg, 2000).

Second, although firms in regional clusters may co-operate with firms, R&D institute etc. in many places, the firms are part of local networks, often in the form of production systems. These systems first and foremost tend to incorporate sub-contractors, but may also involve horizontal co-operation between firms at the same production stage. Using a common technology or knowledge base or the same raw material source may also connect the firms in the area. The size of the geographical area constituting a regional cluster depends on where the firms in the local production system are located. Often a regional cluster covers a local labour market area or travel- to –work area.

In the second half of the 1900s, the related concept of a regional innovation system arose as a buzzword in scholarly and policy debates. A regional innovation system (RIS) contains specialized cluster of firms supported by a developed infrastructure of supplier firms and knowledge and technology diffusion organizations, which tailor their service to the specific needs of dominating a regional industry (Asheim and Isaksen, 1997). Building 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 (Lagendijk 2000s:165)

It must be noted that studies on agglomeration have largely focused on the advantage of geographical proximity of industries and the existence of externalities, hence affect the productivity level of firms. This paper seeks to examine agglomeration and clustering of economic activities as it impacts on the innovation and economics performance of a region.

## **2. Agglomeration as a Basis for Integration and Industrial Linkage Relations**

The literature has shown that integration involves all form of collaborative and co-operative ventures among industrial organizations over space. There are two forms of integration, namely vertical integration and horizontal integration. Vertical integration is a process which refers to the extent to which successive stages in production and distribution are placed under a single firm shape by internal economics of scope” (Lee 1994: 292). This involves the amalgamation of productive units at different stages of production. By contrast, horizontal integration is a production system whereby “firms producing related products (competitive complementary or by-products) operate under central control” (Lee, 1994: 292). This involves the firm moving into activities that are closely related to its current activities. Vertical or horizontal integration may offer greater stability or growth of corporate profits and the spreading of risks (Dicken and Lloyd, 1990). This is possible because not all activities in the firm will follow an identical cycle of demand. Integration, thus 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 good and services from, or sells output to another manufacturing firm (Keeble, 1976) which 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 (Ajayi, 1998; 2006).

A great deal of information concerning the geographical impacts of industrial linkages were developed by researchers employing a number of approaches, Britton (1969), Karaska (1969), and Streit (1969) measured the relationship between linked sectors and geographical association in order to appreciate better the role of linkage as an agglomerative force. However, Alokun (1974) noted that despite the fact that Britton (1969) Karaska (1969), Taylor and Wood (1973), Gadd (1975), and Mock (1976) argued that technological growth and improved communication and transportation system freed firms from local inter-firm dependence. They believed that the local linkages still impinges on supposed interrelationship between linkages, external economics. By extension, agglomeration is deemed to indicate presence of linkages.

Urban growth is viewed as continual agglomeration of economic activities responding to external economics and diseconomics created by previous location decisions of firms and individuals (Lichtenberg, 1960; Chintz, 1961). Usually, the industries in such agglomeration have strong functional linkages. Thompson (1972), Glasson (1974), Olateru Olagbegi (1987) and Odugbemi (1992) claimed that the concentration of firms in an area gives opportunity for linkages among firms and exchange of ideas. The metropolitan area contains not only a large number of different industries but also has a final product market, a labour pool, good communication and variety of specialized services.

The study of agglomeration economics emphasizes the linkage relations between economic activities within a relatively restricted geographical area. This is because through such linkages, external economics are transmitted to the individual production units that are linked. Agglomeration/external economics may therefore occur where linkage relationships exist more so within a small geographical area.

### **3. Agglomeration Economics, Clustering and the Economic Performance**

Krugman (1991) have argued that concentration of economic activity has its benefits. So having production and resources already concentrated on region very likely gives region a competitiveness advantage. Marshall (1920) suggested three kinds of benefits from agglomeration.

The first which is spillover of knowledge is particularly important for innovation and R & D activity and related industries. For example, Bottazzi and Peri (1999) have shown that geographical concentration of innovation activity does matter and spillovers are more effective within a region. Linkages can operate through different markets, e.g. labour, intermediate and product markets, but the central notion is that bigger market size increases efficiency and productivity. The cost effects of spatial and industrial inter-dependences are external economics of scale in the sense that they affect cost output relationships, and thus economics performance and competitiveness. This notion of spillovers is conceptually analogous to the localization and urbanization economics that are widely recognized in the urban/regional economics literature. It is also similar to the idea of external returns to scale in, for example the "new" growth and trade literatures, and to agglomeration effects associated with "activity levels" of related sectors in the macroeconomics literature.. Positive spatial spillovers or agglomeration economics, often called thick market effects (Ciccone and Hall, 1996), imply that production is more efficient or cost effective when it is spatially concentrated; firms benefit from the proximity of firms that are in the same industry or are suppliers (demanders) of their inputs (outputs). Negative spillovers, or insufficient density to facilitate economical production, can conversely be called thin market effects.

The existence of externalities and increasing returns to scale in production is the most important explanatory factor for the geographic concentration of firms. Even if individual firms face constant internal returns to scale, agglomeration may generate externalities that create productivity advancements for individual firms in a given locations and therefore lead to increasing returns to scale at an aggregate level. Several studies have shown that agglomeration economics can affect productivity levels of local firms and boost the economic performance of a region (Beason, 1987; Feser, 2001; Fogarty and Garofalo, 1988; Henderson, 1986; Moomaw, 1988). They tested the degree to which productivity increases with industry size (localization economics) or city size (urbanization economics). In addition Wheeler and Mody (1992) and Smith and Florida (1994) found that agglomeration economics are positively associated with firms investment and location decisions. Agglomeration and cluster concepts partially emphasize inter-firm relations that facilitate innovative activity which is recognized as a driving force of sustained economic growth in the new growth theory (Portal, 1990). Cluster policy also encourages the integration of many different aspects of economic development and development policy. Competitiveness of firms 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 2000a).

#### **4. Agglomeration Economies: a Pre-requisite for Technological and Innovation Creation**

More recent studies, following Marshall (1890), have suggested that agglomeration benefits arise from the three well-known factors: the diversity of intermediate inputs for a city's export goods (Abdel-Rahman, 1988), deep local labour markets (Hasley and Strange, 1990), and information as knowledge spillovers (Fujita and Ogawa, 1980; 1982). Among these candidates, knowledge spillovers lie at the heart of the discussion, led by the new industrial geography and the new growth theory. Based on the technological learning literature developed by Lundvall (1992) new industrial geographers emphasize the nature and the role of innovations, technology. Spillovers, knowledge circulation, and workforce learning from the perspective of a larger innovations system (Storper, 1995). They also pay attention to the concentration of innovations within area-based networks as "learning regions" (Braczyk, Coke and Heidenrich, 1988; Maskell and Malmberg, 1999; Simmie, 1997; Storper, 1993). The creation of new technology and innovations involve ongoing interactions among local firms, research institutions, financial institution and other related environments (Wiig and Wood, 1997).

The new growth theory also treats external economics created by knowledge spillovers as the most critical factor for productivity increase and long term regional growth. The original model developed by Romer (1986, 1987), Grossman and Helpman (1991a, 1991b), and Aghion and Howitt (1992), however, did not have any spatial aspects. Geography was introduced into the model later by a group of urban economist, and the theory, with a greater emphasis on geography, lends a new perspective to agglomeration and spillover research. In particular, Lucas (1988), has shown that the accumulation of human capital can generate positive externalities since new skills acquired by each worker can be shared or spillover to others in the same location eventually making the entire labour pool more productive. Later, Black and Henderson (1999) related knowledge spillovers from human capital to spatial agglomeration by combining models in Henderson (1974), Lucas (1988), and Eaton and Eckstein (1997). They argued that localized technology spillovers stimulate urban concentration and that consequent human capital accumulation promotes endogenous growth.

Krugman (1991a) emphasized the important factors other than knowledge spillovers in agglomeration and developed mathematical models drawing upon Marshall (1890). Labour market pooling, intermediate inputs and technology spillovers are considered major sources of agglomeration economies and consequent firm agglomeration. It is worthwhile to note that Krugman's



analysis of external economies and their sources is quite different from that of new industrial geography. The most important distinction between the two is found in the discussion of technology spillovers. Krugman's approach bears a strong resemblance to Marshall (1890) and Weber (1929) in many ways. However, unlike the new industrial geography approach, which is also mostly based on the Marshallian Model, Krugman placed less emphasis on technology spillovers as a source of externalities than on labour pools and specialized suppliers.

The most important aspect of technology spillovers is that they are indeed externalities. Technology spillovers occur when a firm receives economic benefit from another firm's R & D activity without sharing any cost. There is a potential endogenous relationship between technology spillover and agglomeration. That is, they influence each other and therefore should not be examined as stand-alone issues. Previous studies confirmed that technology spillovers are the most important sources of agglomeration economies. Therefore, firms seeking such benefits will locate in proximity where they can interact more easily with one another. In other words, the presence of technology spillovers in a region is likely to result in geographic concentration of economic activities.

On the other hand, if firms indeed locate in proximity to take advantage of cost saving information spillovers from other firms, they are likely to develop measures to facilitate formal as well as informal information flows among them. Accordingly, the agglomeration of firms in urban area often leads to the development of localized innovation networks through which information about newly developed technologies and innovations is diffused. Such localized diffusion of new knowledge and innovations in the pace of new technological discoveries in local firms thereby attracts even more firms that seek the latest information on new innovations. Well-developed innovation networks and localized technology spillovers are indeed good reasons for firms to locate where other related businesses are present. Therefore, the relationship between technology spillovers and agglomeration is not unidirectional, they reinforce each other.

Such potential interdependence is, not in fact, augmented by a third factor—the rate of technological change. In industries where R & D is powerful and complex, new technologies are developed so fast that firms tend to locate in proximity to keep up with rapidly changing complex knowledge (Nelson, 1980). In such cases, information on R & D activity, new technologies, and innovations is not easily shared formally and is transmitted mostly through informal contacts. The proximity to other firms is therefore a crucial factor for keeping up with the pace of technological changes and surveying the competition because the value of the latest information about new technologies last only for a short period of time and firms want to obtain knowledge through

personal interactions. As a result, fast technological advancements are likely to lead to a high level of geographic concentration of firms.

The concentration of firms can also affect technology spillovers and the rate of technological change because interaction among technicians, researchers, and entrepreneurs are facilitated by geographic proximity and therefore spur innovative activities (Jacobs, 1969; Ricardsson, 1976) of course, a high level of firm density is not a necessary condition for more technology spillovers or faster technological changes, firms located in such area are more likely to interact with one another (indeed, that is why they are co-located). Accordingly, such interactions facilitate the spillover of knowledge and thereby accelerate the rate at which new technology is developed. For example, Kalsson (1995), utilizing survey data on the diffusion of IT application in Sweden, found that innovation networks and the density of firms in a region affects the rate of technological change.

Absorbing technologies and effecting technical change require a wide variety of stocks of production, design and innovative resources. This is brought about by technological accumulation or technical learning. Dodgson (1991) defines learning as “the ways firm build and supplement their knowledge bases about technologies, products and processes, and develop and improve the broad skills of their work forces”. Learning can set a firm or industry on three broad types of technical change trajectories (Malerba, 1992). At the level of the firm, production may be increased through dynamic efficiency increases as well as yield improvements. This may come about by actual plant modifications and incremental innovation as well as through organizational changes in production.

### **5. Measures to stimulate Dynamism and Innovation Activity in Regional Clusters**

First measures to stimulate dynamism and innovation activity should be context sensitive (Storper and Scott, 1995), and suit varying needs in individual clusters, as clusters are very different. Regions have diverse socio-cultural features, are embedded in different national economies, and different industries, in terms of branch, size and forms of organization, and have their specific requirements and innovation obstacles. Then, “individual and collective needs of firms in different sectors and/or regions should be targeted. Thus, there is no ‘one-size fits-all’ cluster policy instrument or policy portfolio, ‘rather, it is precisely regional diversity that is an asset for regional innovation to build upon” (Landabaso, 2000:85).

The need to adopt policies to specific regional circumstances means placing great awareness on the local and regional level in policy design and implementation. Landabaso (2000: 90); further notes that “the regions are the most appropriate level for action on innovation”. This may be the case

especially for SMEs, as ' smaller firms particularly those that lack resources and incentives to develop their own training, research or engineering departments-depend heavily on local sources' ( Rosenfeld, 1997:20 ). Regions may, however, under-invest in policy instruments where the benefits significantly spillover to other regions.

## **6. Conclusion and Recommendation**

Agglomeration and clustering of firms are panacea to social and economic development, through which impulses are transmitted not only in the region of clustering but also in the neighbouring regions. It has a multiplier effect aiding the development of other aspect of the economy. Agglomeration and cluster policies are instruments to promote regional economic development and structural changes more generally, often through enhancing regional innovation capabilities. Agglomeration and cluster concept partially emphasizes inter-firm relations that facilitate innovative activities which is recognized as a driving force of sustaining economic growth in the new growth theory. Cluster policy also encourages the integration of many different aspects of economic development and development policy.

The economies of scale that are enjoyed by the manufacturing establishments in the metropolitan areas accounts for the concentration of industries in the city. These economies of scale are both internal and external. The internal economies enjoyed by the firms that are concentrated in an area may include managerial economies, which are likely to be those derived from specialization. That a firm locates in the midst of other manufacturing firms, allows it to employ specialist each of whom by devoting all his attention to a relatively small part of the company's work, may do much to increase productivity. Collaboration in research and development also help the firms that agglomerate especially in the design and development of new products, which may seem to be a protracted and expensive when undertaken by a single firm. Also, the provision of specialist maintenance services or training facilities or the development of a pool of labour with the skills appropriate to the industry has been made possible by the agglomeration of firms over space. External economies are also realized through trade associations. These are association of producers, corresponding to, though not normally parallel to, a trade union. An example is the Manufacturers Association of Nigeria (MAN). Economies obtained from membership of a trade association include joint advertising. Similarly, the MAN advertisements' injunction to 'Buy made in Nigeria Goods' is aimed at increasing the sales of manufacturers, not those of a single firm. This aspect of marketing economies is possible because of the concentration of firms in the city. Technical information and market trends may also become available through the association, which may be able to

organize trade fairs or other marketing facilities beyond the scope of any single manufacturer.

No doubt, business firms find it profitable to cluster together spatially with firms in their own and other industries. The metropolitan area contains not only a large number of different industries, but also has a final product market (because the threshold requirement is obtained in the city), a labour pool, good communication and a variety of specialized services. The concentration of industries with functional linkages in industrial agglomerations as earlier stated brings about financial savings on the part of the industries concerned. Such savings are achieved because agglomerated firms can and do share common services such as water, communication facilities, security, transport facilities, diffusion of know-how, research and rapid circulation of capital commodities and labour. Individual industries are thus saved from the cost of providing these services for themselves. Such financial savings are referred to as external economies of scale. Agglomeration also has the advantage of concentrating labour, managerial skill, capital and customers in specific places, thereby making such places still more attractive to industries. This is one reason why agglomeration tends to grow once they come into being. A new industry attracts related industries as well as social services which in turn make the area more attractive for more industries in a chain reaction referred to as the multiplier effect. Considering the tremendous and overwhelming impacts, agglomeration and clustering of firms, if encouraged will serve as a panacea for socio-economic development. Government participation in agglomeration and clustering of firms is therefore recommended through the provision of an enabling environment, infrastructural facilities, offering of credit or loan facilities to interested investors and implementation of tax holiday policy.

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