Urban Development and Industrial Clustering in Pakistan: A Study Based on Geographical Perspective

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Abstract: The urban clusters serve as powerful magnets of economic opportunities and facilities for a large number of population. The only space they are able to grab are shanty town which are either very closely located or adjacent to major industrial zones in large cities of the world including Pakistan. Certainly these industrial estates capture the labor markets located nearby. These shanty towns have emerged as a result of in-migrant influx from the interior of the country and provinces. The clusters are geographical and sector wise concentration of numerous producers and ancillary agents, engaged in production, supply or trade activities. These are directly associated with the manufacturing of a specific product or set of products hence clusters constitute the core of industrial districts. An industrial district can now be defined as a geographical and spatial concentration of firms whose organization of products is marked by a dense network of local inter-firm relations. In order to investigate the urban development and geo-spatial agglomeration in Pakistan PCA has been run using eleven variables representing urban industrial infrastructure. The results reveal the significant role played by large industrial clusters contained in various urban centers of the country. This role is well reflected in the population potential of each of these urban centers.

Keywords: Geo-spatial agglomeration, industrial clusters, PCA and population potential.

INTRODUCTION

The process of industrialization and development have often been treated as synonymous ever since the Industrial Revolution enabled the third world countries to raise their industrial production in the present century. The issue of industrial concentration has been very popular among economic geographers who have also been engaged in pursuing research on this topic for several years using different terminologies. It is argued that industries when clustered together in a geographically defined and sector wise specialized industrial district, can be competitive, show signs of technical dynamism, and can grow on grounds other then cheap labour. Ellison and Glaeser [1] explained that either agglomeration of industries is based on localized industry specific spillovers or an industry will be agglomerated if firms locate in areas that have natural cost advantages. For example, energy coast may have a large effect. In addition to this, existing concentrations of employment is expected to matter a great deal.

Today the world economy is dominated by all type of clusters in particular fields at specific location like Silicon Valley of USA, sports industry at Sialkot,

Pakistan. Location plays a fundamental role in forming a cluster – as comparative advantage is accessibility to firms of that specific locality in the form of inputs like cheap labour, relaxation in taxes, and utility costs such as electricity fuel and gas or agricultural raw material, low transaction cost etc. Industrialization and agglomeration is accompanied by urbanization because many efficiencies and external economies are obtained by an industry located near others.

Clusters provide the basis on which various forms of agglomeration advantages arise, spatial proximity and facilities inter-firm production networking boost industrial concentration. Developing countries already recognized the importance and many advantages of clusters but lack well developed clusters. Due to lack of advanced technology and infrastructure and abundance of natural resources and cheap labour good results are attained in competing in the world market. In developing economies, it is commonly seen that clusters mostly form near the capital cities due to the availability of infrastructure facilities, therefore, economic activities tend to concentrate near major, developed cities. Mainly because the distant areas may not have good infrastructure, institutions and supplies to name a few, they are geographically concentrated near big cities or even capital cities. The example of such concentration of industries in northern and central Punjab, investigated by Mahmood [2] provides a good picture. The same phenomenon is also found in advanced economies.

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The benefits of industrial clusters have been measured using manufacturing value added, urban industrial labour force and transportation network (etc.) as a measure of economic productivity and the growth of total employment in an industry. Industry is an intensive user of unskilled labour and faces tremendous competition from imports, hence it is expected that these are located in areas (districts) where wages are comparatively low. In order to understand the impact of location, there is a need to categorize industry. It is important to find how a location may impact on performance of these firms due to natural advantages of the specific location. Natural Advantages may include a number of geographical and locational attributes, harbours, and proximity to important natural resources. Locational complimentarily is an important attribute of places which provide natural growth to different nodes to develop into larger geo-spatial agglomeration.

SIGNIFICANCE OF STUDY

With the growing interdependence of the world economy, much attention has been given to the concept and the role of the industrial clusters in regional economic development. The concept of industrial clusters is an important phenomenon for the description of an effective public intervention in the economies of developing city-regions [3]. The works of Porter [4], Krugman [5], Saxenian [6] and Enright [7] have attracted widespread interest in the field of industrial agglomeration and regional development. The main reason has been the rising importance of inter-regional and international competition in the increasingly globalized world economy. Earlier also Weber [8] created a location theory within a comparative state microeconomics environment.

Much of the cluster studies have focused on advanced economies while agglomerations are also a significant feature of developing economies [9]. Khan and Ghani [10] also discussed that clusters are prevalent both in developed and developing economies. It is increasingly argued thatthe clusters are a significant feature of the developing economies [11] and many of the developing country clusters dominate world markets [12].

Chaudhry [13] explains the benefits of cluster that groups of firms which are specialized by sectors, located in close geographic proximity and consist of mostly small and medium sized enterprises. A firm working in a cluster has greater access to the market and skilled workers, greater technological spillovers, specialization and low transportation cost and can enhance its production by entering into product marketing.

The issue of industrial concentration has been very popular among economist and geographers who have been engaged in pursuing research on this topic for several years using different techniques. It is also narrated that industries when clustered together in a geographically defined and sector wise specialized industrial district, can be competitive, show signs of technical dynamism and can grow on grounds other than cheap labour. Among the determinants which have been identified by the researchers, specific attention has been paid to regional endowments and raw-material intensity, comparative advantage, localization externalities, or more recently, transport cost and market potential are also given importance.

ATTRIBUTES OF INDUSTRIAL CLUSTERS

When a locality or region constitutes the site for an expansion of the common pools of labour, capital and infrastructure, or when pecuniary externalities can be traced to new investments made by a firm in some particular place, then the lower unit costs of production facing firms in that place are called agglomeration economies. This term invokes the image of clustering in geographic space of direct producers (firms, manufacturing plants, shops), pools of labour and finance capital and physical as well as social infrastructure. Producers located in such an environment will, at least up to some point in the local's expansion, face lower unit production costs than would be the case if they were situated in some less well-endowed place. To put it in the other way round, to the extent that the firms in such highly developed, more densely packed places enjoy relatively lower unit costs of production than they would elsewhere. Hence we may say that agglomeration has conferred on them a variety of external economies associated with location.

Rural-urban migration represents an essentially spatial concomitant of the economic development of a region. Indeed, it has been suggested that one of the basic goals of economic development is to reverse the situation wherein large parts of the population is in agriculture and live in rural areas while less is in non-agriculture activities and lives in the cities. Rural-urban migration represents the spatial flow component of such a reversal. It is a complex phenomenon which involves not only the migrants but also a number of

institutional agencies, and it gives rise to significant and highly adjustments everywhere in a region. It can be argued with a great deal of justification that few of the theoretical models provided so far have considered migrations, especially rural-urban migration, as a spatial whose dynamics and spatial impact must form part of any comprehensive understanding of the phenomenon. In this paper an attempt is made to define major components and relationship in a formal, mathematical manner. The emphasis here is on a verbal analysis of the ways in which the system of migration operates. It is hoped that this will enable us to identify areas where present knowledge is fragmentary and where future research may be concentrated with some profit.

Migration from rural to urban areas is generally the most important form of internal migration especially in countries experiencing industrialization. Rural-urban migrations are primarily a response to economic motives. In the areas of departure population pressure, modernizations of agriculture (especially the mechanization and methods of commercial production) as well as the traditional systems of land tenure have been the key push factors while the rapid increase of employment opportunities (often with better working conditions) in urban areas is the major pull factors. The role of transportation facilities, especially the railways, in breaking down traditional rural isolation has been primordial in many parts of the world. The spatial dimensions involved in migration carry special significance in social sciences especially economics. The economists are interested the pattern, causes and the impact of migration on origin and destination areas. They also emphasize on volume and composition and the variation in it through time. As far as the volume and composition of migration is concerned a number of cultural, social, economic and geographical factors are involved in it. To a large extent the factors determine the number of migrants who move from one location to another.

Volume of population that migrates from one area to another depends upon the strength of pull factors in the receiving area and the severity of push factors in the areas of origin. To put in a more generalized way we can say that the degree of spatial imbalance in term of push and pull factors between two ends of migration stream, to a certain extent, determine the amount of flow between them. The significance of urbanized districts that include large urban centers offers a variety of opportunities to the migrants. The migration itself has played a key role in contributing to the further

growth of urban centers in various districts. It is this inter-district migration, which has played a vital role in determining the growth of urban centers included in these districts [14].

INDUSTRIAL CLUSTERS IN PAKISTAN

Industrial agglomerations are concentration of economic activities which exhibit a set of forces which tend to bind together various elements required for the development and growth of certain industries. It is evident that urbanization is associated with a high level of market potential here the term population potential has been used to show the large cities as great markets [15]. Cities themselves reflect large local market promoting economies of scale that facilitate the capturing of markets in other locations in the hinterlands. Large urban centers also facilitate the characteristics of spill over mechanism related with agglomeration economies [16].

The most successful forms of agglomeration are those with the notion of clustering underlying the models of new economic geography [5] and [17]. The space in these new economic geography models of agglomeration is essentially urban space as urbanization and industrialization are two sides of same coin.

At the time of independence Pakistan was among the poorest countries in the world and had no industrial base, almost no industrial raw materials and no significant industrial or commercial groups. There was hardly any manufacturing capacity. However, there were few cotton textile and sugar mills and some tea processing and cement manufacturing capacity to name a few [18]. The country had a predominantly agrarian economy, exporting primary commodities such as raw jute and cotton. Recognizing the need for promoting industrialization for economic growth, governments, since independence continued the implementation of economic policies such as exchange rate policy, trade policy etc. due to which the country reached the decade of development between 1958 and 1968. This was the period when growth rates in agriculture, large scale manufacturing and GDP showed quite astonishing trends. Since then with casual ups and downs and few exceptions due to different governmental policies Pakistan's manufacturing sector moved in the right direction towards growth and success. In Pakistan every government has accorded priority to the promotion of industrial development and worked for the

establishment of industrial estates in all major cities of the country. Recent establishment of a few industrial cities in Punjab is a positive action in this direction.

Figure **1** depicts two existing sets of industrial agglomerations in Pakistan. First, the coastal strip focusing around Karachi-Winder-Hub and Hyderabad-Dhabeji-Nooriabad which are agglomeration of multiple varieties of industries. The large scale urban growth and development process of DHA city and Bahria Town on Karachi Hyderabad Super Highway show future regeneration of Nooriabad industrial zone.

The second emerging industrial agglomeration in Pakistan is the Northern Corridor from Lahore-Faisalabad to Peshawar comprising Gujranwala Wazirabad, Sialkot, Rawalpindi, Texila, Haripur, Nowshera. This corridor is certainly growing at a fast pace. Large cities play a vital role in promoting growth and development. These catalyze development process to the adjacent regions.

Figure **2** showing the population potential in various areas of Pakistan that reflects the higher values in the magnitude of these industrial agglomerations. Population potential has been used to measure the accessibility between various urban centers. The measure of population potential is strictly used to show the possible spatial interaction between each city and its area of influence encompassing the whole country. This has been obtained by the following formula:

$$P = \Sigma \ (pp/d)$$

Where; P stands for population potential, p for market measured in terms of population of various centres and d for direct distance measured in kilometers. Population has been used as a measure of market and direct distances measured in kilometers between each urban centers and the rest of the area as a representative of cost of transportation.

Karachi stands at the top forming coastal fringe showing its population potential. Large cities are associated with a high level of population potential. The size in term of population itself is a reflection of market growth. Karachi is covering the entire coastal area of Sindh and Balochistan also encompassing Hyderabad, Thatta district in the interior of Sindh [19]. Next important apex of population potential is formed at Lahore and Faisalabad showing the industrial agglomerations existing there followed by Rawalpindi located at the vicinity of the national capital Islamabad.

The set of industrial agglomeration which is a manifestation of industrialization and urbanization emits attracts pull forces from all around the country. The dynamic movement of people from the backward interiors towards these clusters of industrial-urban centers explains this phenomenon. Such migration involves the less fortunate once; at least it has been beneficial in correcting labor surpluses and
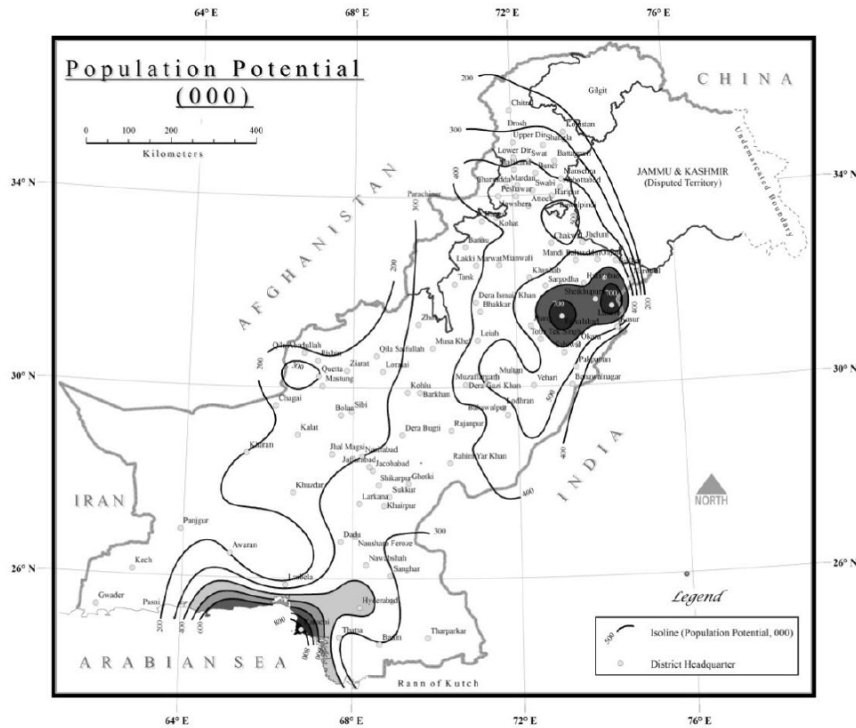

Figure 1:

Figure 2:

employment. In tern the economic impact will go to those family members living in rural areas. This fundamental change in occupational structure is one of the main results of migration from deprived areas to the industrial clusters as depicted by Figure **3**.

The graphical presentation of urban population and number of immigrants in selected districts of Pakistan is clear manifestation of how urban population is related to immigrants coming from the other districts of the country (Figure **4**). Karachi shows the highest degree of urbanization as well as the number of
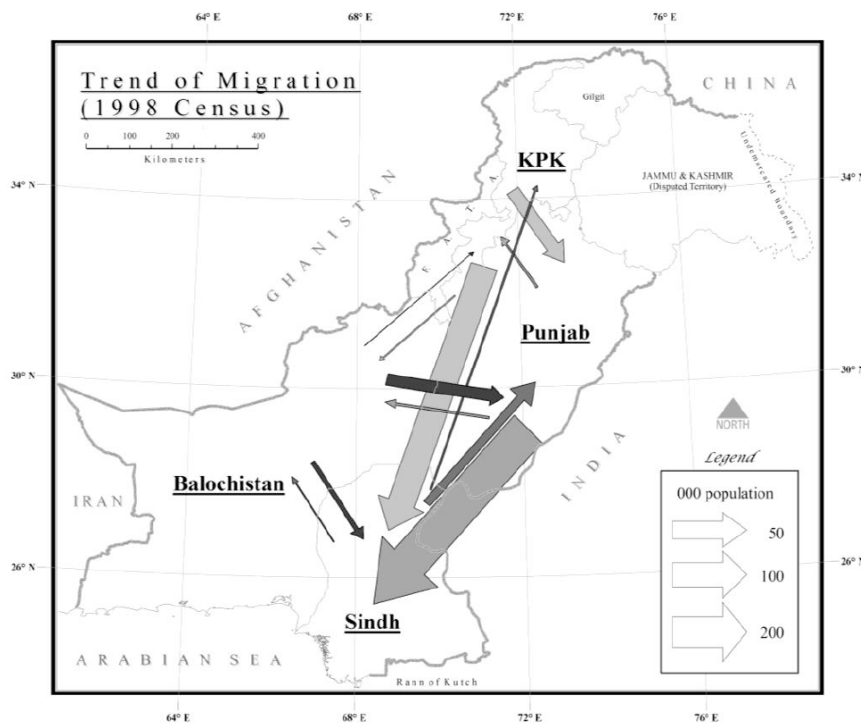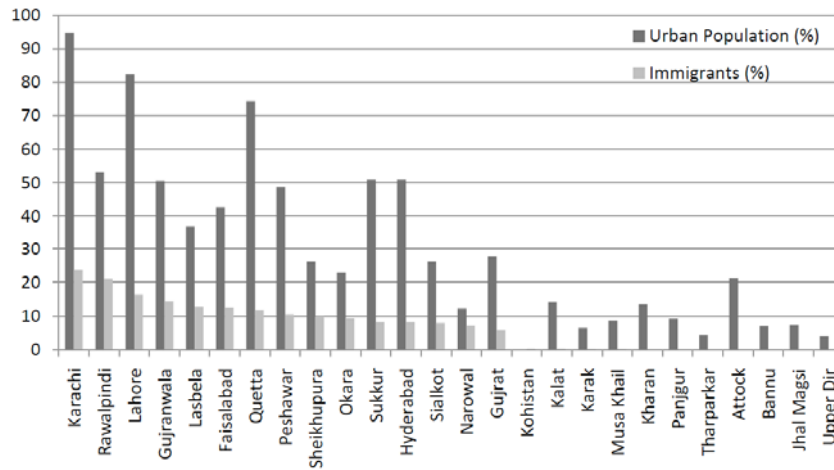

Figure 3:

Figure 4:

migrants. Lasbela though a smaller urban center has substantial attraction for immigrants which is totally attributed to the growth of industrial clusters at Hub and Winder. The figure reflects the less attraction districts for immigrants like Kohistan, Kalat, Karak, Tharparkar and Upper Dir that are also low in urban population.

Urban clusters serve as powerful magnets of economic opportunities and facilities for a large number of poor people. The only space they are able to grab the urban region are shanty town which are either very closely located or adjacent to major industrial zones. Certainly these industrial estates capture the labour markets located nearby. These shanty towns, a characteristic of Afro-Asian economies, have emerged

as a result of in-migrant influx from the interior of the country and provinces. As far as the clusters of these economies are concerned the industrial districts become an important part of the discussion. All industrial zones in Pakistan have shanty towns in their vicinity such as Bilal Colony, Gujar nala, Future Colony, Pathan Colony, Rexer Colony, Quaidabad and Orangi Town as represented by Figure **5**.

The major causes for the concentration of economic activities' agglomeration are very important to discuss. Among the determinants which have been identified by the researchers, specific attention has been paid to regional endowment, raw material and resource intensity, localization externalities, comparative
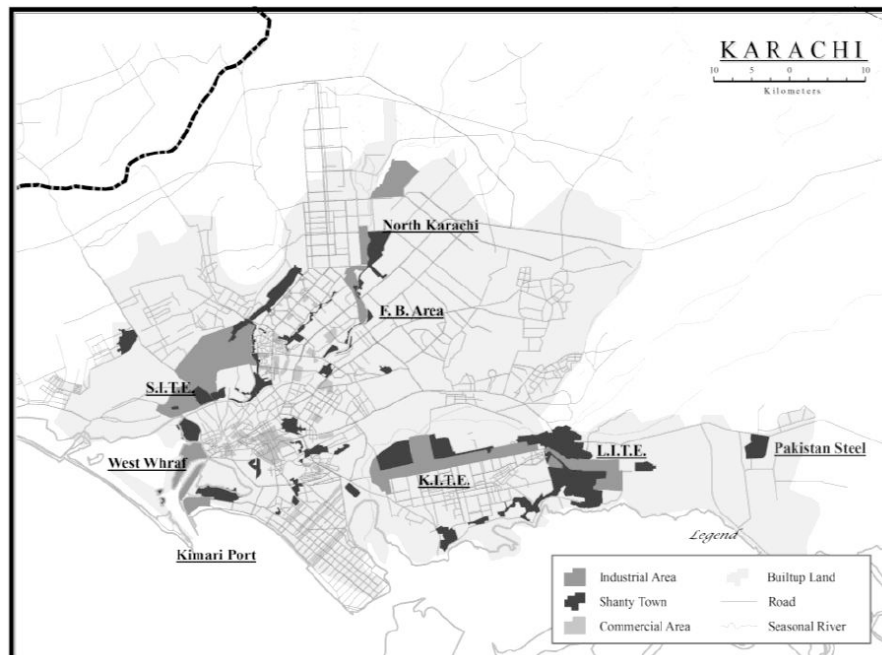

Figure 5:

Table 1:   Total Variance Explained

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	5.317	48.337	48.337
2	1.205	10.950	59.287
3	1.045	9.500	68.787
4	.916	8.330	77.117
5	.630	5.728	82.845
6	.567	5.156	88.001
7	.408	3.709	91.710
8	.342	3.110	94.820
9	.255	2.314	97.135
10	.195	1.774	98.909
11	.120	1.091	100.000

advantage, transport etc. In this study population potential has been given importance to examine the geo-spatial component of such developmental issues. In order to investigate the process of urban development and geo-spatial agglomerations in Pakistan, Principal Component Analysis has been conducted using following eleven selected variables representing urban-industrial infrastructure:

1.   Manufacturing value added per urban capita (Rs.)

2.   Dependency ratio

3.   Female to male labor force ratio

4.   Urban industrial labor force (%)

5.   Non agricultural labor force (%)

6.   Share of urban population (%)

7.   Population potential (000)

8.   Population density (person per square kilometer)

9.   Immigrants (%)

10.   Metalled road per 100 square kilometer

11.   Length of railway per 100 square kilometer

These variables have been collected from various census and reports of Government of Pakistan.

The study reveals that more than 68.787% of the variance was accounted by the first three principal components (Table **1**) which means that these components reflected very strongly the characteristics of agglomeration of industries. Table **2** explains the communalities of selected eleven variables

Table 2:   Percentage of Variance (Communalities) of Eleven Variables Accounted by First Three Components

Metalled Road	1.000	.839
Population Potential	1.000	.789
Manufacturing Value Add	1.000	.788
Urban Population	1.000	.769
Immigrants	1.000	.736
Railway	1.000	.676
Population Density	1.000	.641
Urban Industrial Labour Force	1.000	.620
Dependency Ratio	1.000	.617
Non Agricultural Labour Force	1.000	.616
Female Labour Force	1.000	.476

The first three components explain for 48.33%, 10.95% and 9.50% variation in data, respectively.

Component 1 combined a majority of the variable of the data set, six out of eleven variables of urban population, population density, migration, non-agricultural labour force, industrial labour force and dependency ratio (Table **3**).

This component is a clear manifestation of the significance of industrial agglomeration and

urbanization. The variables that load high on this component show the correlation among the variables of urban population proportion, population concentrations of cities, the labour force working in non-agricultural sector, the influx of migrant to urban centers and urban industries labour force. This is definitely a component of urbanization, industrialization and agglomeration of industries, a mark of urban development. Certainly component captures the effects of modernization and urbanization. The high loading of the variable of migration is closely seated with urban facilities showing that district with well-developed infrastructure and batter services attract influx of people from loss privileged areas of the country. Due to agglomeration economies, industries tend to acquire a certain dynamism that attracts other services like employment opportunities in industries or other services sectors. The association of such functions with possible employment opportunities encourages migration on a large scale. Pasha and Hassan [20] obtained similar results. The first component can thus be identified with geo-spatial agglomeration.

Table 3:   Component 1

Primary Variables	Component Loading
Urban Population	.851
Immigrants	.780
Dependency Ratio	-.767
Non Agricultural LabourFroce	.726
Population Density	.635
Urban Industrial LabourFroce	.627

Three variables load heavily on component 2, belonging to population potential and transportation and accessibility (Table **4**).

Table 4:   Component 2

Primary Variables	Component Loading
Metaled Road	.878
Railway	.801
Population Potential	.699

This component emerges out in continuation of component, which is the component industrial of agglomeration and urbanization. Population potential is a measure of spatial interaction and thus accessibility. It can be interpreted as capturing the various levels of spatial interaction and location complimentarily of places and overall development, as reflected by provision of basic goods and services largely by the public sector, indicated by Mahmood, [2]. This component captures the significance of transport and communication, an important part of public sector infrastructure that is the responsibility of the government.

Component 3 represents manufacturing value added along with female labour force. These two variables load heavily on this component (Table **5**).

Table 5:   Component 3

Primary Variables	Component Loading
Manufacturing Value Add	.856
Female Labour Force	-.583

This component reflects the importance of industrial income and female participation in industrial labour force. This is a component showing the industrial output. And reflects the female labour input in the different industries.

CONCLUSIONS

The study reveals that the urban growth significantly serves as strong sources of economic and employment opportunities for a large number of population and local as well as migrated from other areas. The unchecked influx of working migrants from the interior of the country becomes the reason of emerging shanty towns in urban centers like Karachi. The results reveal the importance of spatial interaction, population potential, manufacturing value added and urban population which are all the variables of agglomeration and industrial clustering.

Geo-spatial agglomeration comes out as an outcome of industrial clusters supported by related infrastructure and relevant industrial development. The economic benefits of urban clusters encompass a large number of people in a developing society benefiting not only the local economy but also to all population living in the far off interior of the country. These clusters also serve as catalyst which distributes these benefits to the neighborhood nodes and areas also.

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