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A Study on Industrial Agglomeration in Manufacturing Sector of Pakistan Using Ellison–Glaeser index

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Abstract
This paper explores the geographic concentration in manufacturing sector of Pakistan. Census of manufacturing industries CMI-data set is used for the period of 2000 to 2012. It is found that the extent of industrial agglomeration in Pakistan has diversified magnificently in recent years. Ellison–Glaeser index has been applied in the study and its values have increased steadily throughout the sample time period. Pakistan's various regions obstructs the process of geographic concentration of manufacturing industries due to some social, political and economic problems, involving improper management of resources and failure in the achievement of policy objectives. The location decisions of two business units in the same industry are very important in their spillover gains through internal and external concentration of economies of scale. Along with some primary and traditional industries, some high technology industries are highly localized, which supports the view that technological spillovers may be important. A time period understanding of industrial transformation is developed along with extent of industrial agglomeration in this study with several implications for policy makers.
Keywords: Industrial agglomeration, Manufacturing Industries, Spillovers, Pakistan.

1. Introduction

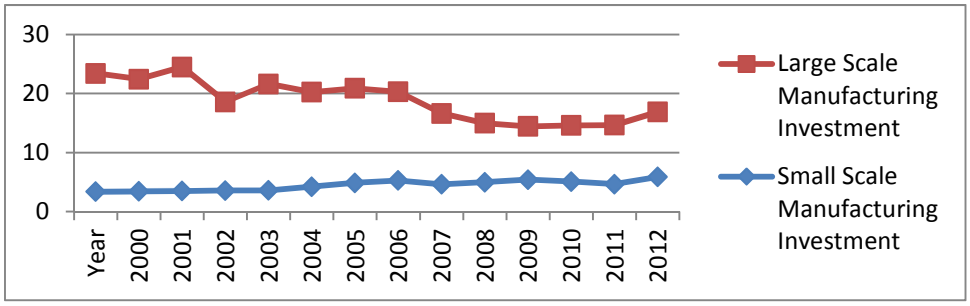
Since, independence in 1947, Pakistan has undergone dramatic economic and industrial transformations. Along with this there have been significant changes in the geography of economic activities. These changes were not necessarily drawn according to market forces but rather influenced by political considerations resulting in unbalanced regional growth and some times over crowdedness in some industrial areas. For example, in the late 1960s, there was a drive to relocate production of key industrial products from coastal areas to interior provinces. Industrial agglomeration should have the diversity of economic activities so that it may play an important role in determining Pakistan's new economic geography.

The most prominent feature of economic activity in Pakistan is the geographic concentration or clustering and location of factors of production in few urban places, including unequal spatial distribution of resources. The economic activity aggregation in few areas epitomizes the coexistence of development and underdevelopment within and between the regions. We examine the economic geography of Pakistan by agglomeration of manufacturing industries. There are several models of economic geography which may lead to different predictions regarding the location of industrial activity. In developing countries we can see that jobs and industries are highly clustered in a limited number of regions. Also the variation in investments in large and small scale manufacturing sectors are quiet significant.

1.1 Small and Large Scale Manufacturing Investment

Empirical evidence shows that the social and economic returns of manufacturing investment are higher compared to investment in other areas. Investment in the manufacturing sector results in value addition, employment generation and expansion of the productive capacity of the economy. Foreign direct investment has impact on GDP growth in Asian economies and higher growth effects for economies receiving FDI in manufacturing sectors (Wang, Miao, 2009).

Fig. 1. Percentage Investment share of LSM and SSM



Source: Economic Survey of Pakistan (2000-2013)

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Manufacturing sector commands the highest investment share in total industrial investment. Investment in social infrastructure and physical infrastructure is highly concentrated in metropolitan cities, and their surrounding districts while districts located away from these urban demand centers are lagging behind.

2. Organization of Literature

In general, increasing returns to scale is described as primary factor for industrial spatial concentration. Geographic concentration of industries is one of the most prominent features of economic activity in both developed and developing countries. A lot of literature from developed countries suggests that firms and workers are unevenly distributed across spatial units; they agglomerate in some regions more than others; making that place a hub or ultimate resort for the specialized activities (Ellison, G., E. Glaeser, 1997).

Given that the firms are not uniformly distributed across regions, it is important to know the consequences of industry concentration on overall economic activity. This is really important to know if the economic and geographical agglomerations are useful for the industry and they can really contribute in fostering the rate of growth and development. Likewise the changes in production technology which relates output to primary inputs are having its spillover effects on the industry. The estimation of a vector of economic geography variables as sources of agglomeration economies will help us in understanding the importance of industrial concentration (Lall, S.V., S. Chakravorty, 2005).

Firms would benefit by locating at concentrated places where they could enhance production to cater increasing demand. Increasing returns tend to decrease per unit cost due to specialization of labor and improvements in technology leading to internal economies (Lall, S.V., et al., 2004). The phenomenon of localized versus dispersed industries is explained by the centripetal and centrifugal forces. The centripetal forces of increasing returns lead to concentration of activities arising from internal and external economies from interaction, while the centrifugal forces lead to dispersion of activities arising from over concentration of firms in an area that increases costs of immobile factors, e.g., higher land prices and land rents, higher wages and higher commuting time for workers. Rising costs of agglomeration deter further concentration of firms in the surrounding areas and pull economic activities in the opposite direction (Krugman, P. 1991a).

In recent years, progress been made in successfully modeling increasing returns to scale to possibly analyze the economics of agglomeration (Dixit, A. K., J.E. Stiglitz, 1977). In general, increasing returns to scale play an important role in explaining why economic activities are spatially concentrated. The 'folk theorem' of spatial economics says that under non-increasing returns when high transportation costs are present, industry would locate at diversified places to minimize cost of reaching consumers. In this case, many firms would operate at small scale to produce for the available market. However, when increasing returns to scale are present, firms would benefit by locating at concentrated places where they could enhance production to cater increasing demand. Increasing returns tend to decrease per unit cost due to specialization of labor and improvements in technology leading to internal economies (Fujita, M., J.F. Thisse, 2002).

The agglomeration economies consist of localization economies and urbanization economies. Localization economies refer to within-industry or intra-industry benefits accruing through knowledge-diffusion, buyer-supplier networks, subcontracting facilities and a pool of skilled workers. Urbanization economies arise from across industry spillovers such as supply of other complementary services, e.g., financial institutions, marketing and advertising agencies, and other cheap infrastructure, etc (Lall, S., J. Weiss, 2004).

3. Agglomeration of Manufacturing Industries in Pakistan

Since Krugman's identification of geographic economy, significant progress has been made in theoretical models on the New Economic Geography, but empirical studies, especially from the developing countries are limited (Lall, S.V., et al. 2004). We intend to measure industrial concentration in manufacturing industries in Pakistan.

3.1 Measuring Geographic Concentration by Ellison-Glaeser index

To measure the extent of geographic concentration we follow the method proposed by Ellison and Glaeser. Ellison and Glaeser assume that plants make location decisions to gain from internal and external economies peculiar to a particular location (Wang, Miao, 2009). Because the industrial structure in Pakistan consists of many small, medium and large plants, proper weights are required to correct for the diverse sizes of plants and this is taken care of in the Ellison and Glaeser index. They present the following estimator to measure the agglomeration;

$$\varepsilon=\Sigma(s_{ij}-x_i)^2/(1-\Sigma x_i^2) \quad (1)$$

where ij s is the share of industry j's employment located in district i ; x_i is the share of industry's overall manufacturing employment in district i, We find that the most highly concentrated industry is other

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manufacturing (PSIC) with the EG index of 1.05 and raw concentration of 0.97 indicating that the industry is located in only one district. In Pakistan, the Census of Manufacturing Industries (CMI) is the only source of detailed enterprise level data on firm characteristics and covers all registered manufacturing firms employing over 10 workers in the country. The CMI data for 3-digit classifications under the Pakistan Standard Industrial Classification (PSIC) according to geographic subdivision at the district, the province and the national levels is used.

Table. 1 Industry rankings using EG-Index

Industry	Rank	Plants	Districts	EG Index
Other manufacturing industries	1	31	1	1.051
Sports and athletics goods	2	55	5	0.891
Furniture and fixtures	3	38	8	0.267
Scientific instruments	4	97	7	0.171
Pharmaceutical industry	5	221	8	0.174
Wearing apparel	6	247	7	0.136
Handicrafts and office supplies	7	47	22	0.149
Printing and publishing	8	49	12	0.133
Pottery and clay products, etc	9	96	12	0.157
Paper and paper products	10	143	5	0.134
Ginning and bailing of fibers	11	584	7	0.098
Electrical machinery	12	253	27	0.097
Non-ferrous metals	13	44	19	0.094
Fabricated metal, aluminum products	14	77	7	0.087
Non-electrical machinery	15	211	15	0.055
Petroleum refining, petroleum products	16	33	12	0.044
Other non-metallic mineral products	17	321	25	0.038
chemical products	18	160	24	0.036
Plastic products	19	144	20	0.034
Copper and brass industrial products	20	121	17	0.033
Made-up textiles, knitting mills	21	273	23	0.031
Leather and leather products	22	37	22	0.021
Dairy products and processed food	23	1232	55	0.016
Transport equipment	24	194	15	0.015
Glass and glass products	25	38	13	0.009
Spinning and weaving of cotton	26	1191	44	0.006
Footwear manufacturing	27	37	10	0.004
Wood and cork products	28	16	10	0.003
Industrial chemicals	29	129	21	0.001
Iron and steel industries	30	223	18	-0.005
Tobacco industry	31	17	6	-0.012
Beverage industry	32	33	16	-0.021
Rubber products	33	31	10	-0.031
Animal feed & ice factories	34	64	20	-0.035

Source: Economic Survey of Pakistan (2000-2013)

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4. Data Results

Following is the classification of 3-Digit industries from PSIC using Ellison-Glaeser index.

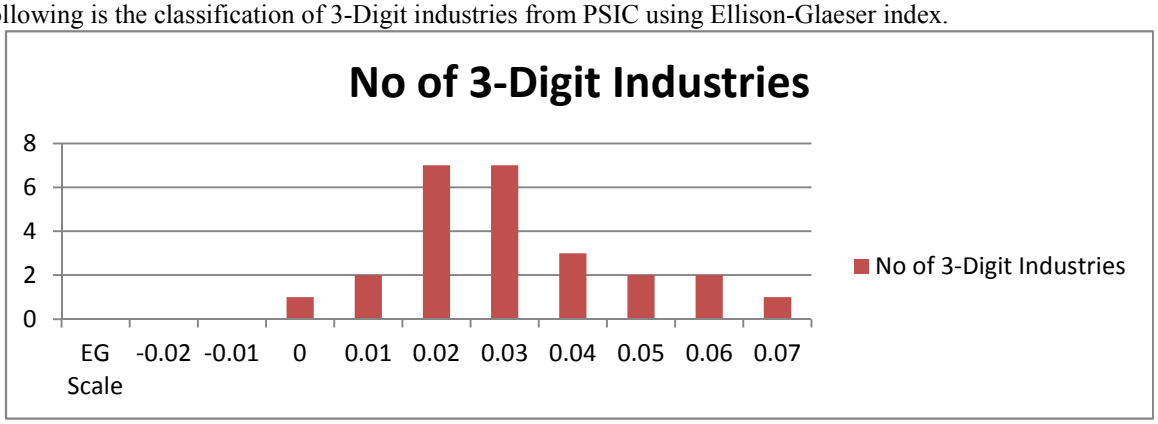

Fig. 2. EG Scale for Industrial Agglomeration
Source: Economic Survey of Pakistan (2000-2013) & PSIC Database

From the results summarized below we find that agglomeration of the 3-digit manufacturing industries is widespread in Pakistan while a small number of industries fall in the category of low concentration industries. For example, 36% of the industries are highly agglomerated, 37% are moderately concentrated and only 24% industries are not agglomerated.

5. Conclusion and Discussion

Firstly, we find that in Pakistan, as in some developed countries, there is much less role for technological spillovers and inter-industry learning. Secondly, a key feature of the industrial geography of Pakistan is that industries that offer highest local scale economies are also the most agglomerated industries. On the whole, the findings of this paper are that geographic concentration of manufacturing industries is widespread in Pakistan, but it was declining over time. Perhaps the facilities like infrastructure, population, increase in road density in a district, and increase in the pool of technically trained workers in a district all help promote agglomeration of manufacturing industries. However, a range of policy instruments can be been applied in Pakistan as well as other developing countries, e.g., tax holidays, building infrastructure in industrial estates, free trade zones, export processing zones, etc to promote favorable industrial agglomeration.

References

Dixit, A. K., J.E. Stiglitz (1977). Monopolistic Competition and Optimum Product Diversity. American Economic Review, 67, 297–308.

Ellison, G., E. Glaeser (1997). Geographic Concentration in U.S. Manufacturing Industries: A Dartboard Approach, Journal of Political Economy, 105, 889–927.

Fujita, M., J.F. Thisse (2002). Economics of Agglomeration: Cities, Industrial Location, and Regional Growth. Cambridge: Cambridge University Press.

Krugman, P. (1991a). Geography and Trade. Cambridge: MIT Press.

Lall, S.V., S. Chakravorty (2005). Industrial Location and Spatial Inequality: Theory and Evidence from India, Review of Development Economics, 9, 47–68.

Lall, S.V., Z. Shalizi, U. Deichmann (2004). Agglomeration Economies and Productivity in Indian Industry, Journal of Development Economics, 73, 643–673.

Lall, S., J. Weiss (2004). Industrial Competitiveness: The Challenge for Pakistan. Seminar Paper No 2. Islamabad: Asian Development Bank Resident Mission and Asian Development Bank Institute.

Wang, Miao (2009), Manufacturing FDI and economic growth: evidence from Asian economies, Applied Economics,41(8), 991 — 1002