



CLUSTER DYNAMICS: A CASE STUDY OF LOCK, POTTERY AND GLASSWARE INDUSTRY OF NORTHERN INDIA

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Abstract

Aligarh's lock industry, Khurja's pottery industry, and Firozabad's glassware and bangles industry are all in India's northern state of Uttar Pradesh. In their different towns and cities, these industries established clusters. The study examined the theoretical contexts in which these industries arose and grew, as well as the competitive advantages that aided their establishment and growth. The Michael Porter diamond model is used to assess the clusters' success. A critical examination was conducted to determine the current state of the respective industries, as well as the causes for their poor performance in recent years.

Keywords: Industry Cluster, Small Business, Competitive Advantage of India.

JEL Codes: F0, F2, F6

1. INTRODUCTION

Clusters refer to the physical and industry-specific grouping of businesses, especially Small and Medium-Sized Enterprises (SMEs), that are facing similar challenges and opportunities. These clusters have the potential to: Promote the development of specialised technical, administrative, and financial services; Give rise to external economies (such as specialised suppliers of machinery, raw materials, and components); and Provide sector-specific skills. In India, there are projected to be 2000 rural and artisanal clusters and 400 contemporary SSEs. Up to 60% of India's exports of manufactured goods are contributed by SSI and MSMEs.

In India, it is predicted that SSE clusters generate a large amount of jobs. The Small-Scale Industry (SSI) sector has made substantial contributions to India's economic development, accounting for 40% of the country's industrial output and 35% of direct exports. The numerous clusters that have existed for decades, if not centuries, play an essential role in the SSI industry. There are 350 SSI clusters in India, according to a UNIDO assessment conducted in 1996 (and then updated in 1998) In addition, India has roughly 2000 rural and artisanal clusters. These clusters are thought to be responsible for 60% of India's exports of manufactured goods. Millions of SSI clusters are thought to exist in India.

2. RESEARCH METHODOLOGY

The study uses qualitative method for collection data on clusters .Audio recordings and in-depth interviews were conducted in area of Aligarh, Khurja and Firozabad clusters.

The research is also based on input from secondary sources, academic literature and scholarly articles. Michael porter diamond model is applied to all three clusters Our research makes two main contributions to academic literature. First it explains cluster dynamics and second reasons for success and decline of these clusters. Section 1 talks about three clusters, Aligarh lock industry, khurja pottery industry and Frozabad Glassware industry. Section II gives a brief literature review. Section III talks about clusters and Miachel poter diamond model. Section VI talks about challenges and suggests directions for future research by way of conclusion



3. ALIGARH LOCK MANUFACTURING CLUSTER

Aligarh is around 90 miles (140 kilometres) south of India's capital, New Delhi. Aligarh is a large business centre noted for producing locks.

Aligarh is also known as India's "Tala Nagri." The lock industry in Aligarh is divided into small and medium-sized businesses. The city's Rs4000 crore lock business is well-known. Hundreds of miles distant, in Aligarh, a 5-square-kilometer area from Upper Court to Gonda road is devoted to lock-making by workers and owners of small businesses, the most of whom are Muslim. According to the most recent information provided by the District Industries Centre, Aligarh has around 5,000 registered lock manufacturing units. Edwin Brown Hardware Company, Allen and Heath, and others are some of the major participants in the lock industry. Among the products that the company manufactures are solid brass hardware, which includes door, window, and cabinet fittings; black iron; numerals; fireplace furnishings; and curtain hardware in brass, aluminium, copper, steel bronze, and zinc. About 130 years ago, a business by the name of Johnson & Co. started bringing locks from England and selling them in Aligarh, which is when the lock industry in Aligarh started. Thousands of suppliers, producers, and exporters were drawn to the locks of brass, bronze, iron, and aluminium. Europe, the Middle East, Africa, the United States, and the United Kingdom are among the nations that import Aligarh locks. In addition to locks, Aligarh is renowned for its sculptures and brass hardware. Eighty percent of Muslims are employed in the locksmith industry.

Hardware made of solid brass for doors, windows, and cabinets There are roughly 10,000 units in this industry, including micro and small firms. The industry generates around Rs. 4000 crores in revenue annually. Products from this industry are exported to the UK, Australia, Africa, Asia, Europe, and the United States. While small enterprises in the lock sector usually only sell within India, some of the larger ones export well beyond the nation's borders. The lock industry in Aligarh faces many challenges and is struggling to survive. The viability of the lock industry also depends on the availability of key raw materials like copper, brass, and zinc that are needed to make locks. Chinese locks are already flooding the Indian lock market, which has caused a significant impact on small and medium-scale lock manufacturers in Aligarh. According to recent estimates, Indian manufacturers supply only 20% of the Indian market, with the balance provided for by imports primarily from China and Italy.

3.1 Challenges Confronting the Aligarh Lock Industry

The lock manufacturing sector is beset with numerous issues, especially for small businesses in Aligarh, Uttar Pradesh. These obstacles are impeding the expansion of the lock industry and interfering with certain units' efficient workflows. The following are a few problems that the Aligarh Lock company has encountered lately.

Aligarh was renamed Tala Nagri by the administration. Businessmen were given access to industrial sites by the government at cheap cost, but subsequently, another party in power sold the land at a considerably higher price, treating the transaction like a real estate transaction. The growth of the lock industry in Aligarh was not greatly aided by the creation of the National Small Scale Industries Corporation. Cost-effectively fast advancements in technology and cautious lock preparation techniques are to blame for the lock industry's downfall. Recent increases in the cost of manpower, steel, and other raw materials have made it harder to invest in lock businesses. The lock industry needs a consistent supply of energy at a reasonable cost in order to develop into an internationally competitive manufacturing hub, which Aligarh.

Even though Aligarh has been a hub for manufacturing for more than 115 years, not much has been done to develop the Aligarh lock industry globally. To tackle this issue, neither the public



nor private sectors have developed an organised approach. High-end technology for ground-breaking products and market expansion for global awareness need finance. This small business doesn't have sufficient funds to operate.

3.2 Competition from Chinese Lock

On top of coping with a dearth of basic necessities like power, the majority of cottage, tiny, and small lock production here is being squeezed out of the market by a rush of cheap Chinese locks. No one in the world, not even India, can match the incredibly competitive prices in the Chinese industry.

4. KHURJA POTTERY INDUSTRY

The Khurja pottery makers association and the state export commissioner have registered Khurja as a geographical identifier for items with a logo mark. The production region is the Khurja Subdivision of the Bulandshahar district in Uttar Pradesh. Khurja, often known as the Pottery City, is India's largest ceramic goods manufacturing centre.

During Mohammed-bin-rule Tughlak's in the 14th century, potters from Persia established in Khurja and a few other areas. They began by manufacturing terra-cotta pots with blue paint on them, which became known as 'Blue Pottery.' Khurja's 'Blue Pottery' is still a distinct characteristic. They later began producing glazed Blue Pottery. Khurja potters began with red clay pottery and progressed to blue glaze, enrobed red clay products in white clay, painted floral motifs with cupric oxide, and applied a soft glaze incorporating glass, borax, and other ingredients.

For standard ceramic goods made in Khurja, the Indian Standard and BIS are utilised as benchmarks. There are around 500 small-scale ceramic production businesses in the area. The revenue generated by these units is Rs. 180 crores per year, with Rs. 45 crores coming from pottery exports. Over 29000 craftspeople are employed directly, while 17500 workers and artisans are employed indirectly through these units. Pottery from Khurja is exported to the United Kingdom, France, Japan, Germany, Australia, Nepal, and Turkey.

4.1 Major problems of khurja ceramic cluster

As analysed from the conversations we had with the owners and managers of the organizations, we found the following major issues currently faced by the cluster:

1. **Unorganized Sector:** Being an unorganized sector, it is difficult to work with high efficiencies and gain good profits. It might turn into red ocean when the firms start competing aggressively with each other.
2. **Technical know-hows:** Many firms are still struggling with the adoption of new technologies due to the high investments required initially.
3. **Tax charges:** After introduction of GST, even handcrafts are also being taxed which wasn't there earlier. This has recently created a lot of problems for the cluster as higher prices have resulted in decreased sales.
4. **Rising Fuel, raw materials, labour charges:** With ever increasing fuel charges are a big pain to the manufacturers of ceramics in khurja They want subsidised fuel for the production. They are facing tough competition as a result of the spiralling rise in the cost of fuels, raw materials, and labour costs, as well as the globalisation of the market in India. As a result, they are confronting serious issues for survival.



5. Loan terms: Specialized Loan plans aren't available for the manufacturers
6. Lack of infrastructure: In the competitive market of the city, a lack of resources and organisational structure becomes a significant disadvantage. They don't have the marketing or sales apparatus to handle large orders.
7. Demonetization: Industry has suffered as a result of the late demonetization. Our business has come to a halt as a result of the restriction. The supply of raw materials has ceased. Factory owners can't afford to pay their employees. While industrial owners have dealt well with the effects of demonetisation, workers have been left in the lurch. Demonetisation has caused a chain reaction among labourers involved in the complicated chain of ceramic product manufacturing.

5. FIROZABAD GLASS INDUSTRY

Firozabad, an Indian city in Uttar Pradesh, has been renowned for its exquisite glassmaking since the 17th century. An alternative name for it is the "Glass City of India." With 70% of the total glass output, the MSME (Micro Small and Medium Enterprises) cluster holds a special place in the MSME sector. The glass sector at Firozabad is India's largest cluster for glass manufacturing, directly employing about 5-6 lakh people and indirectly employing many more.

With an annual turnover of about Rs 2000 crore, the cluster is unique in that it consists of Micro, Small, and Medium Businesses all in one area, and it is capable of producing a wide range of glass products, from art ware to chandeliers to multicoloured bangles. Small-scale enterprises that create hollow objects, decorative items, glass beads, and other items abound in this town. Approximately half of the production of these units is exported to different countries.

Glass toys, candle stands, Christmas hangings, flower vase glass, chandeliers, bangles, automotive ware, street ware, scientific lab products, and other glass products are created. Firozabad is also known around the world as the world capital of bead manufacture. These beads are utilised in garments, shoes, and other items outside of India. Firozabad's glass industry accounts for more than 70% of India's total unorganised glass output and is the country's largest glass manufacturing cluster, employing about 5-6 lakh people directly and many more indirectly. The cluster is unique in that it houses Micro, Small, and medium units all at one site, allowing it to produce a wide range of glass products such as art ware, chandeliers, and multicoloured bangles. A large number of trained and skilled workers are readily available in the cluster. There are an estimated 1,000 registered skilled artisans whose families have been involved in the skilled heritage of creating glassware for generations. Because there are specialised units for each type of value addition, the cluster has the advantage of great work specialisation.

5.1. Problems of Firozabad glass industry

Lack of technology

Due to an evident lack of availability of most recent technologies, promotion, and a lack of product innovation/variation, Firozabad has been unable to create a significant reputation in the international market. In glass melting, forming, and sculpting, archaic technology is still used. Clearly, there is a scarcity of capital in the industry.

Plastic industry and Chinese impact

The glass sector is under pressure from plastic and Chinese products. These products rule in many categories such as illumination, cutlery, head light, and tumbler. The challenges are



enormous now, and the plastic business has nearly forced several of us to close our doors. "Glass was the only eco-friendly material and was used for a variety of applications from the kitchen to the living room," says the plastic industry. But in many things, inexpensive plastic has replaced glass throughout the previous ten to fifteen years. Customers choose plastic over glass because it is more affordable, easier to get, and—most importantly—unbreakable.

Poor quality raw material and rise in price

Fuel and raw materials account for 35 percent of total operating costs, with labour accounting for the remainder. Soda ash, a raw ingredient, is very expensive and has risen in price. Soda ash is produced by a small number of enterprises, including Tata, Birla, and Gujarat Heavy Chemicals. To improve the quality of glass production, there is an obvious demand for higher-quality raw materials.

Thus, the crisis facing the Firozabad industry is being caused by a number of factors, including a lack of funding money, an absence of trained labour a lack of basic supplies, an absence of electricity or power, a lack of energy conservation, a lack of cutting-edge technology, employee inadequate management, a propensity for labour turnover (mobility of labour), a lack of training and education, and government disinterest.

Because it is in the TTZ region, the largest problem for the market is to relocate factories. Second, there is a scarcity of competent personnel, and third, factory workers labour in harsh conditions, such as high temperatures and toxic gas, which can lead to a variety of ailments. Another issue that businesses are combating is the cost of natural gas fuel.

The Taj Trapezium Zone (TTZ), which includes Firozabad, dealt more hit to the glass business. TTZ is a 10,400-square-kilometer area set aside to safeguard the Taj Mahal from pollution in the districts of Agra, Firozabad, Mathura, Hathras, and Etah in Uttar Pradesh, and Bharatpur in Rajasthan. The SC's grasp on the situation is only getting tighter as pollution levels rise. Firozabad units are being reprimanded for pollution. The Supreme Court outlawed the use of coal in TTZ industrial units and ordered that natural gas be used instead. Bottles, decorative goods, chandeliers, and other glassware became more popular when gas became an alternative fuel.

6. ANALYSIS OF CLUSTERS

According to Paul Krugman (1991), three factors contribute to industrial localization: the availability of trained labour, supporting and complementary trades, and technical spillovers. These three variables apply to Aligarh, Khurja, and Firozabad industries. Their labour resources were productive and professional in all three fields. Information spillovers in the manufacturing of locks, pottery, and glassware were another factor. This contributes to the creation of clusters.

A cluster, according to Porter (2000), is a physically close community of interrelated enterprises and associated organisations linked by commonalities and complementarities in a certain sector.

Any cluster is made up of both governmental and non-governmental groups that offer advanced education, research, training, information, and technical support. Examples of these organisations include universities, think tanks, trade associations, standards-setting bodies, and vocational training providers.

Associations and other collective organisations that incorporate cluster members are common in many clusters. Finally, multinational corporations can and do join clusters, but only if they invest in a strong local presence on a long-term basis. These three industries were clearly



thriving as a result of their advantageous geographic position. Porter used a structure he calls a "national diamond model" to address this issue.

The proximity of enterprises is what causes location clusters to form. The main benefit that has been identified is the information exchange that occurs as a result of proximity. Direct observation can transmit tacit knowledge and skill in geographic clusters. A 'bazaar' area is a classic example of a location cluster (ibid.). 'Imitation' is the primary technological dynamic. According to Van Dijk and Sverrisson (ibid.), this form of cluster is rare today; historical specimens can be discovered in rural areas and small cities. Location clusters are more of an analytical construct in this typology. The Local network clusters are a simple way for enterprises to divide their labour. The most significant advantages are related to specialisation. Complementarities are a technical dynamic in which enterprises complement one another and build networks. The development of locally developed novelties distinguishes innovative clusters. In innovative clusters, reverse engineering, an advanced type of imitative adaptation coupled with local product creation, splits processes to produce flexible production systems and inventions (ibid.). Finally, institutionalised cooperation is a feature of the industrial district. Satyajit Majumdar and Nia Choi (2012,). Proximity of several similar firms is what defines a local market cluster.

It comprises six components, according to Porter (1990): factor conditions, home-country demand, linked and supporting sectors, home industry competitiveness, public policy, and chance. The degree to which a country's or region's endowments match an industry's traits and requirements is the reason why various geographies attract specific businesses. Natural endowments (climate, minerals) as well as created endowments are examples of such elements (skill levels, resources, infrastructure). Porter's second consideration is the kind and degree of demand in his native nation.

Large home markets act as a driver for industry expansion. When a large home market expands before taking root anywhere else in the world, experienced enterprises have ample motivation to do business abroad when domestic saturation sets in. The existence of connected and supporting industries is the third aspect of Porter's theory. This is similar to our previous clustering discovery. Firm strategies, structure, and rivalry in the domestic business make up the fourth part of the "global diamond" model. This feature encapsulates the previously mentioned "five powers" competition structure. The stronger and more successful domestic rivalries are, the more likely corporations are to compete on a global scale.

Large home markets serve as a catalyst for industry growth. When a large domestic market expands before taking root anywhere else in the world, experienced businesses have plenty of incentive to expand internationally once domestic saturation sets in. The third aspect of Porter's theory is the existence of related and supporting industries. This is similar to the clustering discovery we made previously. The fourth component of the "global diamond" model is domestic business strategy, structure, and competition. This feature encapsulates the "five powers" competitive framework that was previously discussed. Domestic rivalries that are stronger and more successful are more likely to compete on a global basis.

The notion of leaning by doing is another important cause for the success of some lock businesses.

The learning curve affects future expenditures and market position and links unit costs to overall volume. Plotting the relationship between cumulative output as well as input consumption—with input units falling as production increases—is a common method for calculating the learning curve.



The impact of the learning curve on company entry, position in the market, and profitability are simulated by Spence (1981). Intermediate learning curves contain the biggest entry barriers, comparable to economies of scale, where typical costs decrease slowly relative to production, creating hurdles. Companies with high levels of competition and low entry barriers are those that learn very slowly or very quickly.

7. CONCLUSION

Firozabad, the glass business, which is a historic sector and an important element of Indian culture, is in jeopardy of being shut down. Many artisans have lost their jobs as a result of the downturn. Due to an evident lack of availability of most recent technology, advertising, and product innovation, Firozabad has been unable to create a strong reputation in the international market. In glass melting, forming, and sculpting, archaic technology is still used. It is also losing its appeal in the worldwide market due to a lack of original design, adaptation, and variation in handmade products. As a result, there is a tremendous need for utility and decorative item design development and quality enhancement. Clearly, there is a scarcity of capital in the industry.

It must modernise its infrastructure and participate in more severe marketing and brand-building operations in order to compete in the global market. In comparison to other markets such as China and Thailand, the industry must be cost competitive. India's products are not competitive with Chinese items due to pricing and regulatory discrepancies. As a result, innovative utility and ornamental item design and quality enhancement are in high demand.

The rising cost of gasoline is another issue. The government should lower fuel prices. People should be made aware of the benefits of using glass rather than plastic for various purposes through public awareness campaigns. Technology is one of the most significant areas for future development and collaboration, which can lead to advancement in other fields. A comprehensive plan for the future growth of the Firozabad glass industry, focusing on new technology, skill development, improved raw material composition, and the establishment of a glass training school.

The Aligarh industry cluster is in decline as exports and yearly exports decline. The data on turnover are unmistakable. China, which has far superior lock manufacturing technology, is posing a serious threat to the business. Chinese locks are substantially less expensive than American locks, while being of comparable or higher quality.

The industry clusters of Khurja and Firozabad have a path-dependent growth in common. These aren't declining clusters; instead, they're what's known as 'sustaining' clusters. The distinction between the lock business and these two industries is that the lock industry relies less on technology because they make handmade goods. Ceramic pots and glass bangles, for example, are less likely to be displaced by multinational technology rivals.

Local network clusters and Miachel Poter diamond model can be attributed to the three Indian clusters examined in this paper. The geographic concentration of units of the same industry has been established by all the three industries outlined above. In the cases of Aligarh, Khurja, and Firozabad, the clusters formed spontaneously.

The natural conclusion of our discussion is that technological advancements are critical in improving the industry clusters in Aligarh, Khurja, and Firozabad. Other critical issues that demand immediate attention include working conditions, child labour, and the environment.



Note on Conflict of interest

The authors declare that they have no conflict of interest for this paper.

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