

Growth Engines of Delhi-NCR: The Changing Nature and Pattern of Industrial Complexes

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Abstract Delhi-National Capital Region (NCR) is an economic development-based region conceived to absorb the huge migration into Delhi and accommodate employment requirements and civic necessities. It is a planning region with a cumulative economy of USD 370 billion and pulls in nearly a quarter of India's total foreign direct investment. The role of agglomeration effects and the economy of scale is pivotal in shaping this region as an economic hub. Although the service sector-related activities constitute a staggering 66% of its total GDP, only 26% is contributed by the NCR's secondary sector. This secondary sector is a large employer in the region and has huge potential and scope for further development. This review paper explores the literature related to the changing nature and pattern of the industrial sector, which comprises of approximately 17% and 6% of the total economy of the NCR and Delhi, respectively. It also intends to assess the infrastructure, migration, and income types and patterns; the current status of industries; and growth and its role in employment generation in the region. There is a need to replace conventional polluting industries with more technological skill-based industries. This paper peers through the policy domain and identifies the lacunas that are hindering the potential growth of the industrial sector in this planning region.

Key words industrial sector, economy of scale, growth, employment, Delhi-NCR

I. Introduction

The National Capital Region (NCR) acts as a crucial engine of the Indian economy. The latest Oxford Economics data has established the NCR as India's economic capital, amounting to a GDP of approximately USD 370 billion (The Financial Express, 2016). Its emergence as a major economic hub is fuelled by agglomeration effects and the economy of scale. There are several studies that focus on agglomeration economies through their natures, sources, and roles in performance, the revenue generation capability of firms and industries, and the intricate relationships responsible for agglomeration effects on product innovation and the consequent regional growth (Okada and Siddharthan, 2007; Breschi and Lissoni, 2001; Breschi and Malerba, 2001; Saxenian, 1994; Rosenthal and Strange, 2004). Various scholars have shown how both knowledge spill-overs and the creation of knowledge bases have spiralled increasing returns (Grossman and Helpman, 1999; Romer, 1986; Krugman, 1991). There is much empirical evidence that suggests that innovation and research and development benefits are shaped by the distance between the space from the sources or centres of knowledge creation (Feldman, 1994; Acs et al., 1994; Belderbos and Carree, 2002). The NCR is a major recipient of 21% of the total foreign direct investment (FDI) in India (Department of Industrial Policy and Promotion,

2019). Studies suggest that FDI is a strong determinant in shaping the agglomeration effect and its spatial pattern, and this is particularly revealed in the context of low-income countries, where factors of unity and of diversity favour the uneven distribution of wealth (Canfei, 2002; Kathuria, 2002; Karlsson et al., 2005). With a given distance from the core or centre, firms prefer sites with higher agglomeration—meaning that they are closer to the centre—in order to have a higher probability of an agglomeration effect (Tuan and Linda, 2003; Audretsch and Feldman, 1996; Baldwin and Martin, 2004; Fujita et al., 1999; Hattori, 1996; Breschi and Malerba, 2001). The NCR is rapidly evolving as the largest metropolitan global region and is becoming a power magnet for agglomeration. Regarding its historical context, the origin of the NCR can be traced back to when the first Master Plan for Delhi prepared by Delhi Development Authority in 1962 recommended its genesis. The National Capital Region Planning Board (NCRPB) was formed under this direction with the objectives of both reducing the pressure of the huge influx of people and congestion in Delhi and to effectively manage the growing requirement for space in order to accommodate the increasing number of establishments and settlements. Studies have shown that there is a critical role for economic drivers of land-use changes in urban ecosystems, as shown in the case of the NCR (Kumar, 2009). Grover and Singh (2015) analysed the

newly-developed urban heat island effect in Delhi due to this fast pace of land-use change. Land-use change has also been found to result in an inter-seasonal variation in temperature and can cause health issues (Singh et al., 2014; Encarnation, 1989). The scale factor is also a major component of the economic structure and is visible in the NCR. This indicates that both the development and its characteristics being exhibited within a major sector can be identified in terms of the characterisation and development of the medium, small, and micro unorganised units (NCRPB, 2015).

II. Study Area

The study area is the NCR—a developmental region comprising of the entire National Capital Territory (NCT) of Delhi—and focus is on five districts in the Uttar Pradesh sub-region, nine districts in the Haryana sub-region, and one district in the Rajasthan sub-region (Figure 1). The entire region covers an area of approximately 54,984 km² (NCRPB, 2018), of which the NCT of Delhi covers 1,483 square kilometres area (Anand, 2010)

and has 11 administrative districts and a population of 16.8 million (Census of India, 2011). The NCR region is characterised by high population pressure, a high level of urbanisation, and development activities that are rapidly changing the land use (Anand, 2019). The highest population (36%) resides in the NCT of Delhi, followed by 32% in the Uttar Pradesh sub-region, 24% in the Haryana sub-region, and 8% in the Rajasthan sub-region (Table 1). There is a total of 15,734,929 workers in the NCR as per the census report (Census of India, 2011), of which approximately 26% work in Haryana, 29% work in Uttar Pradesh, 11% work in Rajasthan, and 34% work in Delhi’s sub-region. There is a total of 6,226,491 rural workers in the NCR (Anand, 2019). There are 7 major metro centres with a population of 1 million and above (Gurgaon-Manesar, Ghaziabad-Loni, Noida, Sonapat-Kundli, Greater Noida, Faridabad-Ballabgarh, and Meerut), and 11 major regional centres with a population between 300,000 to 1,000,000 (Palwal, Rewari-Dharuhera-Bawal, Hapur-Pilkhuwa, Bulandshahr-Khurja, Baghpat-Baraut, Alwar, Greater Bhiwadi, Shahjahanpur-Neemrana-Behror, Bahadurgarh, and Panipat) (NCRPB, 2018).

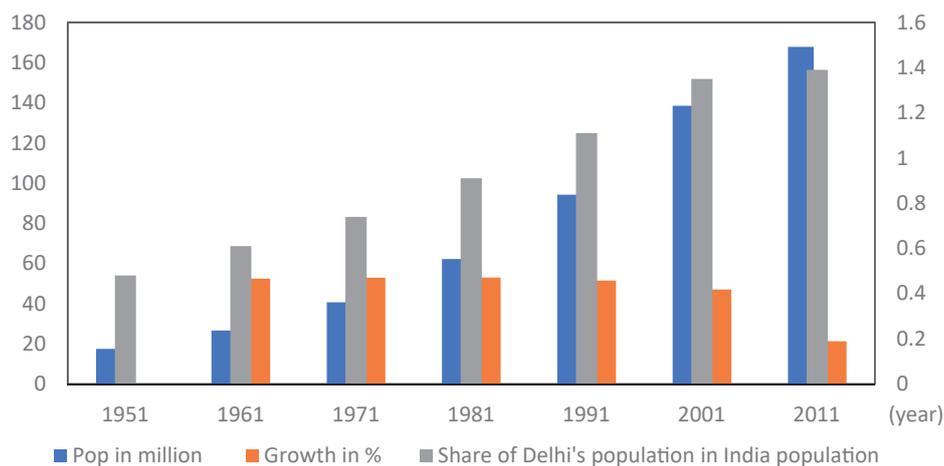


Figure 1. The NCR
Source: NCRPB (2015).

Table 1. Year-wise trend of population growth in the NCR

Year	Population				Decadal Growth Rate			Share of Population in %			
	1981	1991	2001	2011	1981–1991	1991–2001	2001–2011	1981	1991	2001	2011
NCT of Delhi	6,220,406	9,420,644	13,850,507	16,787,941	51.45	47.02	21.21	31.28	34.43	37.33	36.44
Rajasthan	1,755,575	2,296,580	2,992,592	3,674,179	30.82	30.31	22.78	8.83	8.39	8.07	7.98
Haryana	4,938,541	6,643,604	8,687,050	11,031,515	34.53	30.76	26.99	24.84	24.28	23.42	23.95
Uttar Pradesh	6,968,646	9,001,704	11,570,117	14,575,668	29.17	28.53	25.98	35.05	32.90	31.19	31.64
NCR	19,883,162	27,362,532	37,100,266	46,069,303	37.62	35.59	24.18	100.00	100.00	100.00	100.00

Source: Compiled from the Census of India 1981, 1991, 2001, 2011.

**Figure 2.** Population growth in Delhi

Source: Compiled from the Census of India 1981, 1991, 2001, 2011.

The population of the NCR increased at a rapid pace after 1981 due to the monumental growth of Delhi as an economic hub. In 1981, it had a population of 19 million which increased to 46 million in 2011. In 1981, Uttar Pradesh had the highest proportion of the NCR's population; however, the NCT of Delhi had the highest post-1991.

Nevertheless, between 2001–2011, the decadal growth rate in Uttar Pradesh was the highest at 25.98%, followed by Delhi at 21.21% (Table 1). While the share of Delhi's population within India's total population is rising at a moderate pace, the decadal growth in Delhi is declining rapidly (Figure 2).

III. Population Growth Due to Migration

Migration is a major factor in Delhi's population growth besides the natural increases. Being an economic hub, Delhi acts as a magnet and exerts a pull factor on the hinterland. Of the total increase in the size of population, the role and share of migration rose from 0.55% in 2002; 0.62% in 2013; and 1.31% in 2017 (Table 2). The rate of the natural increase slowly declined after 2013 and has continuously declined since then (Office of Chief Registrar Births & Deaths, 2017).

Table 2. Population growth and migration trends in Delhi (2002–2017)

Year	Population Increase %	Natural Increase %	Migration %
2002	2.70	2.15	0.55
2011	3.22	2.41	0.81
2013	3.35	2.73	0.62
2017	3.62	2.31	1.31

Source: Office of Chief Registrar Births & Deaths (2017).

IV. Infrastructure Facilities

1. Power supply

The power supply in Delhi is relatively lower when compared to the other sub-regions, and produces around 250 MW for its own consumption. A major share is supplied by the Indraprastha Thermal Power Station, alongside the Badarpur Thermal Power Station which generates around 450 MW to cater to Delhi's requirements (NCRPB, 2015). The nearby industrial regions of Noida, Ghaziabad, Gurugram, Meerut, and other industrial clusters buy electricity from sponsored schemes such as the Singrauli Super Thermal Power Station, the Salal Hydroelectric Power Station, the Bhakra-Nangal Dam, the Rana Pratap Sagar Dam, the Narora Atomic Power Station, and the Tehri Dam. The respective states that form sub-regions of

NCR are in agreement with the NCRPB as this is meant to cater the power requirements of NCR under single authority for better operations.

2. Water requirements

The Yamuna River, which is a perennial source of water, is the lifeline for the industrial establishments in Delhi. Among the sub-regions of the NCR, the NCT of Delhi has the highest per capita water requirement at around 240 litres per capita per day, which caters to the needs of about 95% of the people. The state of Haryana has a scarcity of water resources and heavily relies on the Yamuna River, while Uttar Pradesh has a rich depository of water resources, as rivers like the Hindon in Ghaziabad and the Ganga are the main sources of water supply to the industrial regions of Ghaziabad and Meerut.

3. Transport and communication networks

One of the major contributors to economic growth in Delhi-NCR is the transport and communication networks. The NCR has a dense network of well-connected roads, railways, metros, and communication lines. Five railway lines either converge in or radiate from Delhi, consisting of both broad and metre gauges, and most areas fall under the Northern Railway Command. Five National Highways (NH), namely NH 1, NH 2, NH 8, NH 10, and NH 24, terminate in and radiate from Delhi. Nearly 67.3% of the gross vehicular traffic plying the roads of Delhi are private vehicles, thus the Delhi-Meerut Expressway has become a major lifeline for the industrial units along this stretch. In addition, the recently built Western Peripheral Expressway will contribute to the industrial potential in the region. All three major satellite towns of Gurugram, Noida, and Ghaziabad are connected to the Delhi metro network, and the metro to Meerut is in the pipelines.

V. Income Status, Manufacturing Sector, and FDI

The average per capita income (PCI) per annum in India was Rs 33,901 in 2009–10. For the same period, it was nearly double the Indian average at Rs 59,264. Within a short span of 5 years (from 2005 to 2010), the PCI rose from Rs 38,758 to Rs 59,264, with a Compound Annual Growth Rate (CAGR) of 8.86%. When assessing the NCR's averages, the highest PCI was found in Delhi (Rs 98,262), followed by the Haryana sub-region (Rs 74,457), Uttar Pradesh (Rs 35,036), and the Rajasthan sub-region (Rs 29,300). However, the maximum CAGR was reported from the Haryana sub-region at above 10% in 5 years,

Table 3. Comparative PCI in the NCR

Sub-Regions	2004–2005	2009–2010	CAGR %
NCT of Delhi	63,877	98,262	9.00
Uttar Pradesh	25,549	35,036	6.53
Haryana	44,895	74,457	10.65
Rajasthan	20,721	29,300	7.17
NCR	38,758	59,262	8.86
India	24,143	33,901	7.02

Source: NCRPB (2015).

which is more than Delhi (Table 3).

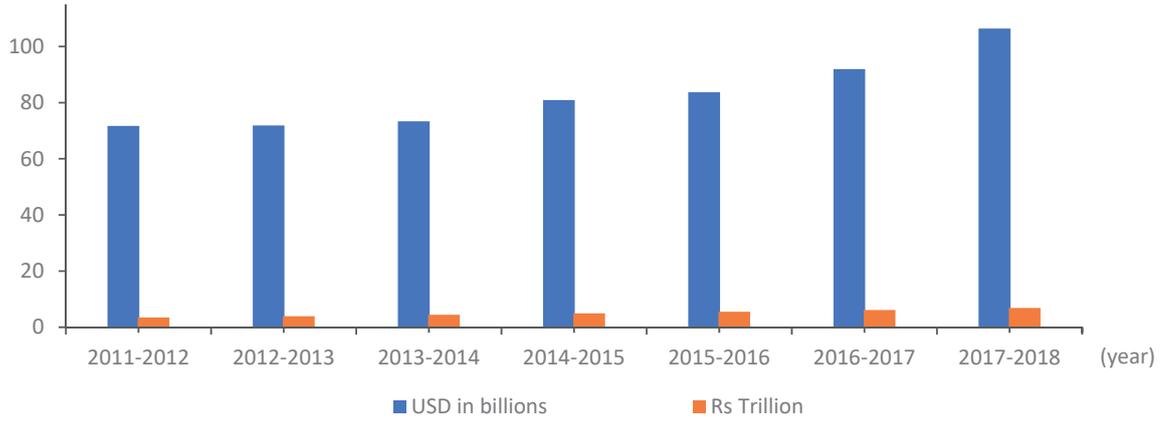
When analysing the trend of the Gross State Domestic Product (GSDP) at the current price, Delhi became a Rs 6 trillion economy in 2018, showing an upwards trend since 2011 when it was a Rs one trillion economy. There was a phenomenal growth in the GSDP (12% CAGR). The PCI of Delhi at the current price in 2011 was Rs 202,532, which jumped to Rs 360,646 in 2018 with a 10% CAGR. Since 2011, the PCI of Delhi at the current price has shown an upwards progression, despite the population of Delhi rising every day due to migration (Figure 3).

Delhi's economy is primarily due to its tertiary-driven sector (84.12% in 2019), while 14% of its GDP is still contributed by its secondary sector. The share of the secondary sector in the total GDP was 14.17% in 2013 and declined to 12% in 2015, but has since seen a steady rise (Government of National Capital Territory of Delhi, Planning Department, 2019). The share of the manufacturing sector in the total gross value added (GVA) has slightly declined since 2013 at 6.82% and 6.04% in 2019, and the share of the manufacturing sector in the secondary sector was 47.65% in 2012 and 43.14% in 2019. Therefore, manufacturing forms almost half of the secondary sector's total GDP (Figure 4).

As per figures, the NCR's economy is primarily dominated by service sector-related activities, which constitutes around 66% of the NCR's total GDP. The primary sector contributes around 8.04% and the remaining 26% is contributed by the secondary sector (NCRPB, 2015). In the secondary sector, manufacturing accounts for 62%, which is around 17% of the NCR's total GDP.

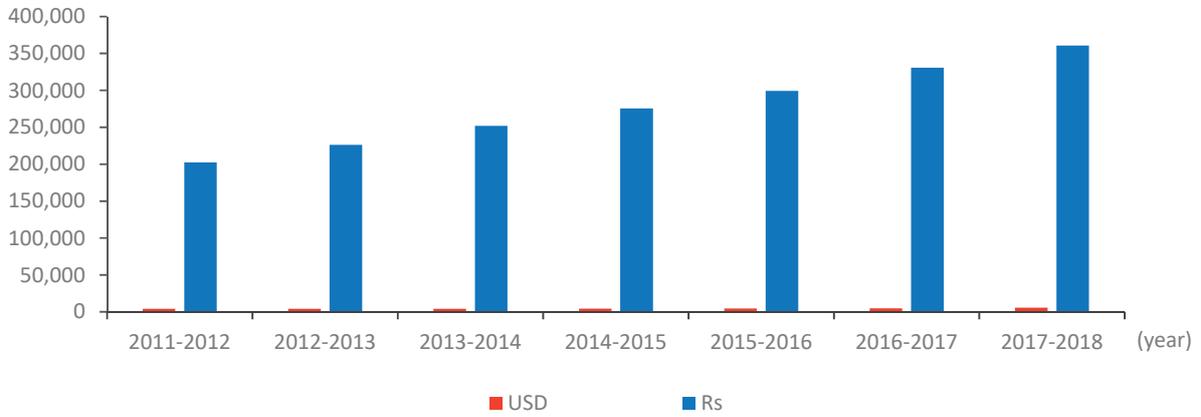
A total of 875,000 industrial establishments were operating in Delhi (2013). Around 1.42% of the total establishments worked in rural areas, while a staggering 98.58% were operating in and around the city centres with a growth rate of 1.94% per annum. Approximately 118,000 new establishments were added between the 2005 Fifth Economic Census to the 2013 Sixth Economic Census (2013). Between 2017–2018 and 2018–2019, an impressive growth rate of 8.87% and 12.80%, respectively,

GSDP of Delhi at Current Prices



At the current price, the GSDP of Delhi reached Rs 6.68 trillion (USD 106.44 billion) between 2017–2018. The state's GSDP (in Rs) increased at a 12.2% CAGR between 2011–2012 and 2017–2018.

Per Capita GSDP of Delhi at Current Prices



The state's per capita GSDP between 2017–2018 was Rs 360,644 (USD 5,596). The per capita GSDP (in Rs) increased at a 10.09% CAGR between 2011–2012 and 2017–2018.

Figure 3. Trends and per capita GSDP in Delhi

Source: Ministry of Statistics and Program Implementation (2018).

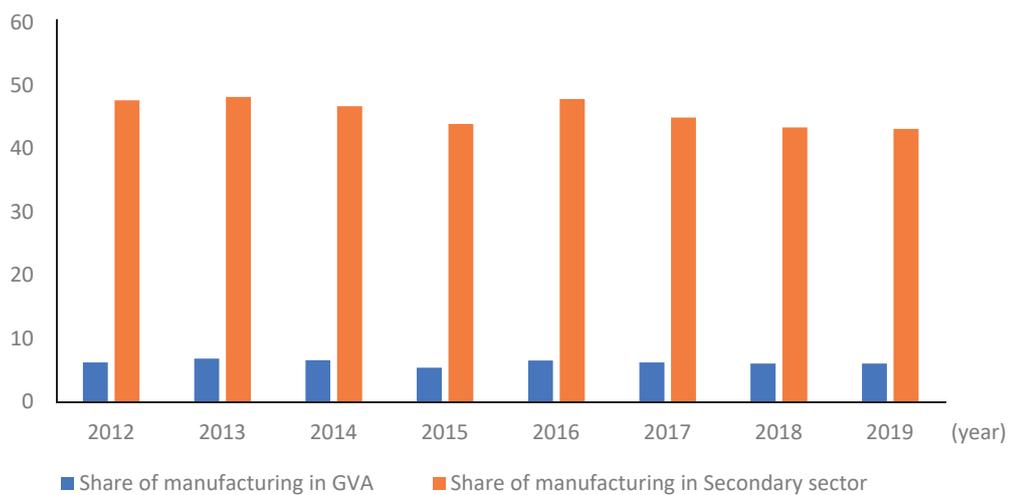


Figure 4. Percentage of the manufacturing sector in Delhi's total GVA (2019)

Source: Directorate of Economics and Statistics (2019).

was recorded since the estimates from the preceding years (2013). Industrial areas, estates, and flatted factory complexes have been developed by agencies such as the

Delhi State Industrial and Infrastructure Development Corporation (DSIIDC), the DDA, and industrial cooperative societies, and the maintenance of these complexes is

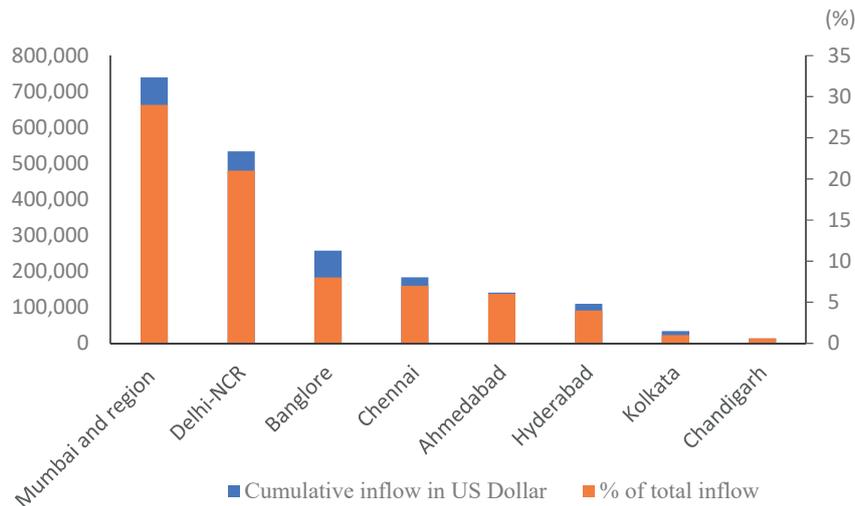


Figure 5. Regional share of FDI in India (2019)

Source: Department of Industrial Policy Promotion (2019).

the responsibility of the respective development agencies. There are a total of 29 planned industrial estates and 5 flat-ted factory complexes in Delhi (Government of National Capital Territory of Delhi, Planning Department, 2019).

The NCR receives around 21% of India's total FDI, followed by Mumbai, which accounts for 29%. Until 2019, the NCR has received around USD 500,000 in FDI. This shows that it is a very promising region for foreign companies to do business in India, which is mainly due to the NCRPB's favourable policies and the resultant impact of the agglomeration of units and economy of scale (Figure 5).

VI. Types, Status, and Patterns

Understanding the types, status, and patterns of industrial estates requires careful observation of industries in their sub-regional contexts, as a particular sub-region can dominate the production of a specific type of product or nature of industry. For example, a spatial analysis of industries (NCRPB, 2015) suggests that the Haryana sub-region dominates in electrical, machine, and industrial goods; Delhi dominates in textile and machine products; the Uttar Pradesh sub-region dominates in the production of chemical and metal products; and the Rajasthan sub-region has an abundance of micro, small, and medium enterprises (MSMEs) which have production capabilities for metal and basic non-metal products.

1. Types of industrial estates

Industrial units are located in particular areas known as estates or corridors. This is mainly due to the agglomeration effect and the consequent economy of scale. Industries are grouped together to provide the units required

electricity, transport connectivity, and tax benefits, and also to keep the units away from residential areas due to pollution. There are four categories of industrial estates which depend on the criteria of industrial activity, location, sponsorship, and size (NCRPB, 1999).

i Industrial activity General Purpose: Industrial estates are grouped according to different classifications, and are equipped with the required infrastructure, advanced management, and proper tool management to facilitate their higher levels of production.

Ancillary Industrial Estates: These estates are comprised of units that produce the supply parts and components consumed by large or major industries, and act as supporting industries.

ii Location Urban Industrial Estates: These estates are located in regions that have a population of 50,000 and above (NCRPB, 1999). These industrial estates have more advantages and a greater scope for success due to the availability of facilities. Large cities also provide the advantage in their external economies for viable small industries.

Semi-Urban Industrial Estates: These estates are mostly located near the peripheral areas of a city where advantages such as lower labour and land costs are available. They have been favoured in recent times due to environmental concerns such as pollution and the maintenance of human settlements in these zones.

Rural Industrial Estates: These estates are located in regions or areas with a population of 5,000 or less, or in non-town areas as per the census definition. The planning and management of these estates is difficult because they lack basic infrastructure and do not provide an edge over urban estates due to the lack of advantages in their external economies.

Table 4. Industrial estates based on geographical locations in the NCR (1993)

Cities	Urban	Semi-Urban	Rural	Total
Delhi	9	0	0	9
Ghaziabad	6	1	1	8
Meerut	1	1	0	2
Bulandshahr	1	2	0	3
Gurugram	3	0	1	4
Faridabad	5	1	1	7
Rohtak	2	0	0	2
Rewari	1	1	0	2
Sonepat	3	2	0	5
Panipat	1	0	0	1
Alwar	3	0	0	3
Total	35	8	3	46

Source: NCRPB (1999).

Table 4 presents the number of industries in the different estates in various locations. There are a total of 46 industrial estates, of which 35 belong to the urban industrial estate category, 8 belong to the semi-urban category, and 3 belong to the rural category.

iii Sponsorship Public Purpose: All operations such as land acquisition, infrastructural facilities, rent, taxation, and other measures are controlled by the state through industrial development agencies.

Co-operative Industrial Estates: The structure of a co-operative industrial estate consists of a mixture of the principles of the public or society and the private sector. This is based on a balance of both the government's vision and facilities and private players' capital and managerial skills.

Private Industrial Estates: The structure and management of a private industrial estate is influenced by private capital or agencies. They are driven primarily by profit motives and are characterised by advanced managerial functions. The responsibility of developing the required infrastructure is sometimes borne by private development agencies.

iv Size of industrial estates The size of the plot occupied by an industry is another criterion used for classification. Following the recommendation by the Committee on Industry (NCRPB, 1999), there are various classifications of the industrial estates. Large estates are those that are spread over 30 acres of land; medium estates have plots between 10 and 30 acres; and small and rural estates have land between 2 and 10 acres. Last, work sheds are classified as estates which have less than one acre of land.

2. Status and patterns

Regarding the spatial distribution of the nature of industries and their locations, MSMEs dominate the Rajasthan sub-region, the Haryana sub-region is propelled by automobiles and major goods manufacturing, and Delhi is a hub for textiles and electronic goods. The Uttar Pradesh sub-region is facilitated by relatively superior industrial services and infrastructure; the Greater Noida region alone has around 19% of its space allotted for these purposes (NCRPB, 2016). There are five major industrial clusters in Delhi with numerous small, medium, and large size units. The size and number of employees varies from one location to another. The northernmost cluster contains the Narela Industrial Complex on the western side of the Mangolpuri Industrial Area, the Okhla industrial Estate on the southern side, and the Naraina and Kirti Nagar Industrial Estates in the heart of Delhi. There are two special economic zones (SEZs) proposed. First, at Baprola, for Information Technology/Information Technology Enabled Services (IT-ITeS) and Gems-jewellery, and second, an IT Park at Shastri Park. The bodies of these SEZs were developed under the Delhi State Industrial and Infrastructure Development Corporation limited (DSIIDC) (Department of Commerce & Industry, Delhi, 2019). The current status of registered units in the NCR is very different from that in 1979 and 1993. There are a total

Table 5. Status of industrial units in the NCR (2015)

District	Units
Meerut	8,197
Bagpat	2,613
Ghaziabad	45,282
Gautam Buddha Nagar	9,880
Bulandshahr	4,629
Total in the Uttar Pradesh region	70,601
Total in the Delhi region	20,648
Alwar: Total in the Rajasthan region	551
Faridabad	17,291
Palwal	59
Gurgaon	22,491
Jhajjar	1,849
Panipat	4,068
Rewari	1,370
Rohtak	4,761
Sonepat	8,743
Mewat	42
Total in the Haryana region	60,674
Total in the NCR	152,474

Source: NCRPB (2016).

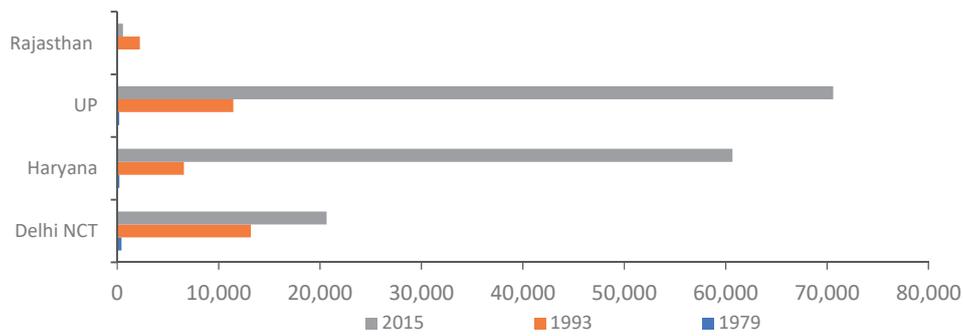


Figure 6. Growth of registered industries in the NCR

Source: Compiled by the Author from various reports of the NCRPB (1999, 2016).

of 152,474 registered units in the NCR, of which the sub-region of Uttar Pradesh has the maximum (70,601), followed by Haryana (6,064), Delhi (20,648), and Rajasthan (551 units). In Uttar Pradesh, Ghaziabad has the highest concentration of industrial units (45,282), followed by Meerut (8,197). In Haryana, most units are registered in Gurgaon (22,491), followed by Faridabad (17,291) (Table 5). When comparing the status of units from 1979 to 2015, it was found that the number had jumped from 203 in 1979; 11,441 in 1993; and 70,601 in 2015. For the Haryana sub-region, there were 209 in 1979; 6,570 in 1993; and 60,674 in 2015. Thus, the Haryana region has witnessed a high number of industrial units being established. In Delhi, the figure was 417 in 1979; 13,178 in 1993; and 20,648 in 2015. Thus, Delhi has seen a steady progression. However, the sub-region of Rajasthan has seen negative growth in the number of units registered, at 2,223 in 1993 and 551 in 2015. Thus, Uttar Pradesh has seen a 517% growth between 1993 to 2015, while Haryana has seen a 823% growth for the same period in terms of the number of industrial units being registered (Figure 6).

3. Status of MSMEs in the NCR

Between 2016–2017, the MSMEs sector contributed around 28.90% of the GDP and registered a growth rate of 9.44%. According to the National Sample Survey's 73rd Round Survey (2015–2016) on MSMEs, approximately 31% of the units were related to manufacturing and similar activities; around 36% of the units were engaged in trade; and the remaining 33% were engaged in other services (Ministry of MSMEs, 2018). As per the MSME Census in 2006 (Ministry of MSMEs, 2007), there were 35,881 micro enterprises operating in the NCR. District-wise, Ghaziabad had the maximum number of units (6,641), followed by Faridabad (3,879), Delhi (3,203), Bulandshahr (2,777), Noida (2,760), Panipat (2,660), Gurgaon (2,329), Meerut (2,432), Alwar (2,295), Sonapat (2,228), Mewat (1,023), and Baghpat (985). They have had a large contri-

bution to the NCR's total GDP.

4. Growth of industries and employment

In Delhi, between the period of the Fifth Economic Census, 2005 and the Sixth Economic Census (2013), the total number of establishments rose from 758,000 to 875,000 respectively. However, the level of employed persons fell from 355,600 in 2005 to 302,000 in 2013 (Government of National Capital Territory of Delhi, Planning Department, 2019). The number of registered units totalled 9,345 in 1983. This figure fell to 64 in 2003 but rose to 338 in 2011. The maximum number of employments was given in 1993, fell drastically to 2,271 in 2003, and rose to 7,024 in 2011 (Table 6).

When regarding the district-wise figures, it can be ascertained that Central Delhi has the maximum number of establishments (150,671), followed by West Delhi (106,726). The least number of establishments are recorded in New Delhi (38,153) (Government of NCT of Delhi, Planning Department, 2019). The majority of employed persons are in Central Delhi (599,059), followed by South-East and North Delhi (352,562 and 31,897, respectively). Thus, it can be seen that despite having a smaller number of establishments, both the South-East and North districts employ more people than the other districts (Government of NCT of Delhi, Planning Department, 2019).

The year-wise trend analysis shows that in Delhi in 2007, there were 7,793 factories employing around

Table 6. Growth of industries and added employment in Delhi

Year	No. of registered units	Employment
1983	9,345	70,955
1993	666	261,508
2003	64	2,271
2011	338	7,024

Source: Directorate of Economics and Statistics (2016).

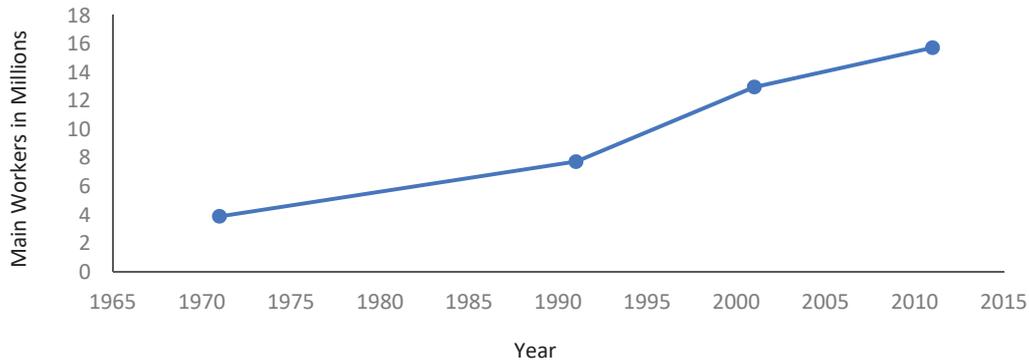


Figure 7. Growth of main workers in the NCR

Source: Compiled from the Census of India 1971–2011.

359,126 workers. This figure rose to 9,059 factories in 2017 with 420,156 workers. Although the number is rising, it is steady (Government of National Capital Territory of Delhi, Planning Department, 2019). In 2017, the maximum number of factories was for those producing textile products (2,020) and metal products and machine tools (1,902), and both categories employed the maximum number of workers (Government of National Capital Territory of Delhi, Planning Department, 2019). There are approximately 15 million workers in the NCR, with the majority in Delhi (5.5 million); 4.7 million in Uttar Pradesh; 3.6 million in Haryana; and 1.7 million in Rajasthan (Census of India, 2011). Around 3 million workers were added to the main workforce of the NCR between 2001–2011. In comparison, there were 3 million in 1970, yet there was a sharp rise post-1990 following the liberalisation regime of the Government of India (Figure 7).

When analysing the worker compositions in the secondary sector, it was found that the secondary sector employed approximately 42.63% of the total workers in the NCR in 2001; 22.81% in 1991; and 19% in 1971. The construction sector absorbed the maximum number of workers, which rose from 4.58% in 1991 to 16.2% in 2001. Rural industries were the second largest employer (8.29%) in 2001, and household industries employed 7.22% in 2001, which was just 1.66% in 1991 (Census of India).

Between 2010–2011, the NCR received Rs 982,577.29 lakhs in investment, of which the Uttar Pradesh sub-region received the maximum (Rs 552,599.34 lakhs), followed by Haryana (Rs 404,277.95 lakhs), Delhi (Rs 24,300 lakhs), and Rajasthan (Rs 1,400 lakhs). There were a total of 152,474 units in the NCR which employed around 1 million industrial workers between 2010–2011. Though Haryana had 60,674 units, it employed 594,467 workers which is unlike the Uttar Pradesh region: its 70,601 units employed only 455,955 persons. Among the satellite cities, Ghaziabad had the largest number of registered

units (45,282). Gurgaon had comparably less units than Ghaziabad (22,491) but employed the maximum number of workers (329,340) (NCRPB, 2015).

5. Working SEZs

There are 16 operational SEZs in the NCR (Noida SEZ, DLF Cyber City Gurgaon, DLF limited Gurgaon, Gurgaon Infospace, HCL Technologies, Moser Baer, WIPRO in Greater Noida, Seaview Developers, HCL Noida, Achavish Softech Noida, NIIT Technologies Noida, Arshiya Northern FTWZ Noida, Ansal City Noida, ASF Insignia Gurgaon, URPL Gurgaon, and AnantRaj Industries Sonapat). Remarkably, the majority of the SEZs are located in Noida and Gurgaon due to the industry-friendly policies of the respective governments (Ministry of Commerce and Industry, 2014; NCRPB, 2016).

6. Education-industry interface

In keeping with the need for the industrial sector from the supply side, the government has established technical institutes and skill-based development institutions to keep up with the demand from factories for skilled labourers and technical experts. In Delhi, there are approximately 101 institutions in 2014 comprising of ITCs, BTCs, CSI/IBBSs, WCSCs, and polytechnic institutes (NCRPB, 2016). The majority are ITCs and polytechnics, and many are female-only institutes (Directorate of Training and Technical Education, 2019).

VII. Development Strategies, Policy Dimensions, and Vision for Delhi-NCR

Delhi has been experiencing a phenomenal decadal growth above 50% mainly due to its heavy influx of migration, particularly from the hinterlands of Uttar Pradesh and Bihar. This has contributed to both congestion and the shortage of amenities, and has necessitated the expansion of infrastructure in the surrounding parts of the city.

During the planning of Delhi, the need to absorb the ever-growing demand was felt and planning in the regional context seemed inevitable. Through his flowchart model, Kuchiki (2004) emphasised the role of policy interventions to create industrial and export processing zones. Policy intervention also induces local capacities for building and upgradation related to infrastructure development, institutional growth, and human resource development for superior front-end and back-end support.

In 1956, a master plan suggested giving ‘serious consideration’ to the decentralisation of planning areas in the outer or satellite locations. This was done with the aim to extend the outer limits of the planned city within the city’s region. As such, in 1962, the Master Plan for Delhi was developed which emphasised the role of a regional development plan for Delhi-NCR (NCRPB, 2020). Consequently, in 1985, the NCRPB was constituted following The NCR Planning Board Act, 1985 passed by Parliament to retain the region’s projected population of 149,710,000 by 2021. The NCRPB prepared the NCR Regional Plan 2021 with the aim of making the region an economic powerhouse which would be suitable for global investment. The main objective was to use the tools of economic development to create balanced development in the region. The developmental vacuum of Delhi was intended to be filled by developing satellite towns that would work as a hub for industries and businesses, and was the real motive behind the establishment of the NCRPB. This step has yielded positive results, as following the formation of the NCRPB, there has been a monumental improvement in the manufacturing capability in NCT-Delhi of various components such as textiles, automobiles, metal, and technology (Siggel and Agarwal, 2009).

The NCR Regional Plan 2021 has adopted infrastructure requirements induced by regional level investments such as electricity power, highways, railways, markets, and so on, which requires funds in addition to the FDI. This requirement for funds is supported by all three levels of the government—the central, state, and district levels—depending on the volume and nature of the projects and the will of the government. As per Section 17 (1) of the NCRPB Act (1985), the participating state must prepare a sub-regional plan for the concerned state that conforms with the local specificities of the various geographical, economic, and policy-related conditions and provisions. This Act also provides that besides the NCR Regional Plan 2021, the Board may prepare functional plans deemed necessary for project implementation and as guidance tools. The NCR Regional Plan 2021 aims to promote the value-added high-tech sector in Delhi in line with the

development of Delhi as a global hub of excellence. This also entails that investment strategies should be conducted in such a way that impedes undesirable economic activities such as banning polluting industrial units near the centre. The Plan has suggested the alternatives of shifting the locations containing hazardous units and wholesale trades to the periphery of Delhi alongside developing industrial estates on modern standards and SEZs in the sub-regions. This would be aided by establishing uniformity in a favourable tax regime for industries as party states for different sub-regions have their own tax structures (NCRPB, 2020).

Since the NCT of Delhi is the centre of economic activity, the Delhi government introduced the Industrial Policy 2010–2021. The major emphasis of this policy is on the promotion of knowledge-based clean industries, with skill-based development at its core. Some examples of the priority areas are the promotion of cluster development through the public-private-partnership model; redevelopment of existing industrial areas; infrastructure development; classification of capital and industries; and discouraging pollutive industries by levying higher infrastructure fees.

VIII. Maintenance and Operation of Industrial Estates

There is a total of 29 planned and 22 non-conforming clusters, and 4 flatted factories complexes in Delhi. The DSIIDC is the nodal agency entrusted with the maintenance and operation of such estates, and works on a public-private-partnership basis. The Agency has also been given the task of promoting small-scale industries in Delhi.

Due to the high prevalence of industries in non-conforming areas, the Supreme Court of India directed the government to shut down all units that were established after 1 August 1990. These non-conforming industrial clusters constitute about 70% of the total concentration. Following this order, these areas were notified of the redevelopment in a phased manner. The Government of NCT-Delhi also brought in a relocation scheme in 2006 through which approximately 27,905 units were identified to be allocated the required space and land for industrial purposes in the outskirts of Delhi. The areas include Bawana, Jhilmil, Narela, Badli, and Patparganj (NCRPB, 2016). The industrial associations of the respective areas were given the responsibility of preparing and implementing the redevelopment scheme in their respective areas. The Delhi Financial Corporation (DFC) supervises the financial

requirements attached to the operation and maintenance.

IX. Analysis and Suggestions

Delhi-NCR's emergence as a major economic hub is fuelled by agglomeration effects and the economy of scale. Delhi acts as a strong magnet and exerts a pull effect over the metros and regional centres of the NCR. Higher budgetary allocation, FDI, knowledge spill over, and transport have each played an important role in the development of the NCR, and the scale factor has resulted in a multiple nuclei structure of growth centres in the NCR. Regarding Delhi's total population increase, the influx of migration is replacing the natural increase day by day, yet the decadal growth rate is slowly declining. The Haryana region has recorded the maximum decadal growth while the total population in Delhi and Rajasthan is declining, and Uttar Pradesh and Haryana have seen a population increase post-2001. The NCR has all the available infrastructure facilities nearby, making the region the least costly location in terms of resources and labour, and cheap labour is available from the Uttar Pradesh and Bihar provinces. The Haryana region has registered the highest PCI growth, while Rajasthan has the least. The GDP of Delhi is similar to the aggregate GDP of the participating states in the NCR; however, the proportion of the manufacturing sector in Delhi's total GDP is declining. Manufacturing accounts for a 44% share within the secondary sector, but accounts for more than 66% in the NCR. In the regional centres of the NCR, the semi-urban, ancillary industries in the MSME format are more popular than in the metro centres. A cluster-based approach needs to be promoted, as rural industries—particularly the food processing industry—have great potential in the region. Though the total number of industries is rising in Delhi, its share in GDP is falling. Uttar Pradesh has the maximum number of units, but Haryana employs the maximum number of workers. Among the metro areas, Ghaziabad has the highest number of units, followed by Gurgaon, Delhi, and Faridabad. The Haryana region has the highest growth in terms of the units followed by Uttar Pradesh, yet Rajasthan has seen negative growth. Gurgaon is the biggest employer among the cities. Delhi has 9,059 registered factories and employs 4.2 lakhs workers. From the total 875,000 lakhs units, there are approximately 3 million workers employed in Delhi, and the textile industry is the biggest employer. The secondary sector employs approximately 42.63% of the total workers in the NCR, and construction is the biggest employer. There is a well-connected interface of education and industries in the NCR.

Delhi is a hub of education in the government sector, while the amount of privately-funded institutions is rapidly increasing. Many studies have established that there has been significant growth in the region after the formation of the NCRPB as sub-regional plans by each state and functional plans for particular purposes are implemented in the NCR. Thus, the NCRPB has enabled the superior convergence of plans and policies for all sub-regions, and in terms of policy, Haryana is the most pro-active while Rajasthan is the least. Pollutive conventional industries are being discouraged in Delhi and the value-added high-tech sector is being promoted. Model industrial townships are being established in the periphery of Delhi by decongesting the core area, thus showing a shift in industries from core to peripheral areas.

Given the falling proportion of the industrial and agricultural sectors after the 2000s, there is a need to promote agriculture-based industries to sustain growth. There is a lucrative scope for upstream industries in the food processing sector in districts with rural dominance. Since population growth rates are uneven in the NCR, demographic instabilities should be properly monitored as this will have a direct impact on both manpower and structure of the market force. Competition among industries will increase, which will invariably minimise their business risks. However, this competition will also facilitate the reduction of inventories and emphasise skill-based activities by reducing the unskilled labour force. The role of MSMEs in the manufacturing sector is expected to increase manifold and its share will increase in the future. Therefore, emphasis should be placed on the proper development of this sector, particularly in the sub-region of the NCR. The role of the government is likely to be reduced and private players are likely to play a major role in decision-making. There will be an increase in the application of clean technology, and research and development roles for product innovation will determine the sustainability of industries. Thus, it is imperative to develop a separate policy tool and convention, particularly for the industrial sector within the manufacturing segment, since the majority of the working policies and rules are focused on the tertiary sector. Resource optimisation using a cluster-based approach and the application of a regional development method with a sub-plan tactic may bring in revolutionary changes to the somewhat stagnant industrial growth in Delhi-NCR.

X. Conclusion

Delhi-NCR is a powerhouse of the Indian economy and

provides ample opportunities for employment. This planning region was conceived to accommodate the developmental needs of Delhi and the huge migration induced by it. Despite having huge potential, a vacuum has appeared in the manufacturing segment of the secondary sector which contributes only 17% and 6% of the GVA of the NCR and Delhi, respectively, and the falling proportion of the industrial sector needs immediate attention. Besides, the nature of the industries and their locations are gradually shifting from pollutive and conventional types to technology and skill-based enterprises. The food processing industry, particularly in rural areas located along transportation links, has immense potential for employment generation and could be used as an export zone. The share of the MSME segments within the manufacturing sector must be given the utmost priority for its promising capability of both absorbing the huge amount of labour and enhancing the overall industrial strength of the Delhi-NCR. Concerning sustainable industrialisation, a policy shift is required in order to create a favourable ecosystem with robust backward and forward linkages that could make this planning region realise its conception and vision.

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