

Regional Industrial Disparities in Haryana, India: A Composite Indices Analysis

Ranjan Aneja

*Assistant Professor, Department of Economics, Central University of Rajasthan,
BanderSindri, Kishangarh, Rajasthan, India- 305801.*

ranjananeja@curaj.ac.in

Abstract

The present paper is an attempt to measure the industrial regional disparities in Haryana over the period of 1990-91 to 2010-11. The extent of inter-districts industrial disparities has been measured by using deprivation method as well as Principal component analysis (PCA) method. The analysis provided interesting insight into the issue. The study found that the regional disparities in the industrial development in the state of Haryana are increasing over time. It is evidenced by increasing value of coefficient of variation of the constructed indices by DIM as well as PCA Method. Further, developed and moderately developed category values of indices indicate that major industrial development in the state is concentrating on or near NH1 or in NCR regions. This proves the unbalanced industrial development in the state and is a serious issue of concern and requires immediate attention of policy makers.

Keywords: industrial development, Regional disparities, principal component analysis, Haryana

1. Introduction

Neglect of spatial factors in industrial growth theories had been one of the major limitations in economic literature from the days of 'Adam Smith' till recently. The assumption of perfect mobility of factors between regions and the neglect of distance, geographical economies of scale and scope, and locational preferences constituted the foundation of the traditional economies of efficient utilization of resources. In many developing countries, discontent due to unequal development of a region- a result of neglect of locational factor in national economic policies – has reached an alarming proportion and becomes the political divisive issue.

The empirical evidences demonstrate that in a growing economy, regional disparities diverge at initial stages of development and subsequently they converge later when the economies reach the stage of maturity (Williamson, 1965; Myrdal, 1957; Alonso, 1968 and Rostow, 1960). This may be true to some extent. But the Indian economy is crossing take-off stage to reach the stage of maturity (Rostow, 1960). More so, regions grow at different rates due to difference in natural endowments and also due to differences in their geo-political, socio-economic and religious importance in the country. The difference in growth rate is also attributed to the difference in public policy (Olson, 1997).

In India, different states are growing at different rates and there seems to be no evidence in favour of convergence. In other words, at least, so far, the tendency of disparity amongst the states in the country seems to be increasing with time (Kurian, 2005). Equally important issue of regional disparities within the states is becoming a serious cause of concern as indicated by the growing demand of new states be it in Andhra Pradesh, Uttar Pradesh, and Maharashtra etc. These are the bigger states in the country and therefore, regional differences have been noticeable. However, in

case of smaller states, the problems may persist without drawing attention towards it.

Amongst the Indian states, Haryana is one of the better performing states. Haryana came into being on November 1, 1966, as a result of bifurcation of Punjab. It is located strategically surrounding the national capital Delhi from three sides. Economically, Haryana GSDP has been growing at more than 9 percent over the last decade. It is pertinent to mention here that growth of GSDP of Haryana has been consistently above the all India growth rate. Development of agriculture has been the major factor behind superior performance of Haryana. It was one of the early adopter of green revolution in the country. Moreover, growth rate in agriculture is less than 2 percent in comparison to above 10 percent growth rate in non-agricultural sectors of the state. This reflects a structural shift in favour of non-agricultural activities in the state.

Exceptional performance by Haryana in secondary and tertiary sectors has catapulted the state amongst the industrially most developed states in the country. Haryana is marketed as offering superior locational advantage on the outskirts of national capital. Gurgaon has come to be identified as an ideal location for IT and shopping malls. In fact it has become an extension of Delhi not only in terms of business but culturally also.

In view of the discussion it can be said that Haryana is a relatively small and economically better performing state, these factors seem to be the reason that at political level, policy making level or academically, growing regional disparities in industrial development have not attracted sufficient attention. In fact no policy document or efforts on the part of policy makers exist that can be seen to address the issue of disparities in the state. The problem is expected to accentuate in future as after the introduction-

of policy of economic liberalization, governments have withdrawn its authority pertaining to the location of industrial and other economic activities. Therefore keeping above discussion in mind the present study is an attempt to measure the intra-state disparities in industrial development in Haryana over the period of 1990-91 to 2010-2011

2. Objectives and Methodology of the Study

The main objective of the study is to measure the incidence of industrial disparities existing at district level in Haryana. For the purpose, we have computed the industrial development level attained in certain indicators at district. A vector of 08 indicators encompassing all dimensions of industrial development is used for working out the inter-district industrial development indices. (List of the indicators is at Appendix-I) Further in the study it is hypothesized that the regional disparities in industrial development are growing over time and secondly, Industrial development in the state is concentrated around national capital.

2.1 Construction of Composite Indices

Development is a multidimensional phenomenon. Each of these dimensions is measured in different units. Given the difficulties in analyzing development with respect to each of these dimensions, researchers generally prefer to aggregate them—what one calls composite index, to depict the overall status of region. For reduction of this dimensionality problem many methods have been suggested in the literature. While some are weighted others are weight free. The literature is silent vis-à-vis superiority of any method over others. Keeping the above limitation in mind, the study employed two commonly used methods Development Index, a weight free index and Principal Component Analysis Index (PCA), a weighted method. This will also be helpful to check the reliability and soundness of the results.

2.2 Development Index or Deprivation Method

The Development index (DI) is constructed in three steps. The first is to define a measure of deprivation that a region suffers in each of its variables. The notion of deprivation used by the UNDP (United Nation Development Programme) is one of absolute deprivation. In order to get an index of deprivation, the measure of regions is divided by the difference between the maximum and minimum value. Mathematically, I_{ij} is the deprivation indicator for the J_{th} region with respect to the variable is defined as

$$I_{ij} = \frac{Max_i - X_{ij}}{Max_i - Min_i}$$

The second step is to define an average deprivation index by taking a simple average of all the indicators.

$$I_j = \sum_{i=1}^n I_{ij} / n$$

Finally, the Development index is defined as absence of deprivation.

Mathematically,

$$(DI)_j = (1 - \sum I_{ij} / n)$$

2.3 Principal Component Analysis

The method of Principal component is a special case of the more general method of Factor Analysis. The mathematical formula of Principal Component Analysis was developed by Hotelling (1933). The Principal Component Method has a special advantage over all other methods of aggregation in the sense that it redefines the larger set of variables in terms of a fewer set of orthogonal variables called principal components and succeeds in reducing the dimensionality problem. The aim of the method of Principal Component Analysis is the construction of a set of variables P_i , called Principal Component ($i = 1, 2, \dots, k$) out of a set of variables, ($1, 2, 3, \dots, k$). Each Principal component is a linear combination of the X 's;

$$P_1 = a_{11}x_1 + a_{12}x_2 + \dots + a_{1k}x_k$$

$$P_2 = a_{21}x_1 + a_{22}x_2 + \dots + a_{2k}x_k$$

$$\dots$$

$$P_k = a_{k1}x_1 + a_{k2}x_2 + \dots + a_{kk}x_k$$

The method of principal component can be applied by using the original values of the X_j 's or the standardized variables Z_j defined by

$$Z_j = (X_j - \bar{X}) / \sigma_{xj}$$

The coefficients a_{ij} 's are called loading of the principal component which are so chosen that the newly created variables, called principal components, satisfy the following two conditions – (i) Principal components are orthogonal (uncorrelated), (ii) the first principal component has a larger variance as possible. The second principal component is then chosen in such a way that it absorbs the maximum of the remaining variations in X 's after allowing for the variation accounted by the first principal component and so on. In this procedure the data matrix is transformed into a new set of uncorrelated principal components which account as much of the variation as possible in descending order. The first two or three of these principal component accounts for substantial variation says 80 to 90 % and the contribution of remaining variables is very small. In such circumstances it becomes needless to drive the remaining principal components (Raza and Mahmood, 1998)

2.4 Categorization of Regions/Districts

For the sake of easy comparison among development dynamics across different districts over time the study classified all the districts into three categories namely; developed, moderately developed and underdeveloped. This categorization for both method used in study is made by assuming that the worked out composite index follows a normal distribution with mean (μ) and standard deviation σ . The groups are categorized by using the following cut-off points.

Developed	$Z_d \geq \mu + 0.44 \sigma$
Moderately Developed	$\mu - 0.44 \sigma \leq Z_d < \mu + 0.44 \sigma$
Less Developed	$Z_d < \mu - 0.44 \sigma$

By using above framework districts are classified into developed, moderately developed and less developed both at sectoral and overall level for each of methods. Then, this grouping is examined with respect of each of the method and districts are considered as a part of this domain. The categorization is used following the method employed by Mahanty (1999).

2.5 Sources of Data

The nature of study dictates the requirement of the secondary sources of information. Accordingly, all the required data has been obtained from various authentic sources. Some indicators have been manipulated by taking two and more different variables related with parent variable. The main source of data is as follow:

- Statistical Hand Book of Haryana issued by Economic and Statistical Organization, Planning Department, Government of Haryana, From 1991 to 2011
- Economic Survey of Haryana issued by Economic and Statistical Organization, Planning Department, Government of Haryana, (various issues);
- Reports of Census Operation in Haryana, Census of India, 1991 and 2001.
- Economic Survey of India issued by government of India, (various issues);

2.6 Reference Years

The study has attempted to estimate comparable Industrial development index and its inter-district variations in Haryana during 1990-91 to 2010-11. The study carried out at five points of time i.e., 1990-91, 1994-95, 1999-2000, 2004-2005, and 2010-11 The year 1990-91 is selected to analyze the effect of industrial development programmes that had been undertaken during the New Economic Policy. The year 1994-95, 1999-2000, 2004-2005, and 2010-11 are chosen to analyze the impact of the implementation of various measures taken for reduction of spatial variations during that period.

3. Empirical Findings of the Study

The results pertaining to the industrial development are depicted in the table 3 and 4. A perusal of both the tables shows almost similar results. The Spearman's rank correlation is also measured to assess the degree of relationship statistically between the ranks of districts obtained by both the methods. The results (Table 2) reveal that the value of rank correlation coefficient (R_k) is high and highly significant in respective year. Therefore, it implies that the ranks obtained by districts by both of the methods are statistically sound and forceful.

The table 3 (DIM) demonstrate that in 1990-91 Faridabad stands first in industrial development followed by Gurgaon, Yamunanagar and Panipat respectively. All these four are in the category of developed districts. While six districts namely Hisar, Ambala, Karnal, Rohtak, Rewari and Sonapat are moderately developed and remaining six districts are in less developed category. The results of industrial development by PCA method (Table 4) produce exactly similar result. In 1994-95, a few upward or downward changes in ranks and status of districts can be observed. Table 3 (DIM) depicts that six districts are less developed, seven are moderately developed and three districts are developed in industrial development. Similar behavior in ranks and status of industrial development among districts can be observed from table 4 (PCA) except Hisar identified as less developed.

Overall results presented in table 3 show that in 2010-11 four districts are developed, 8 are moderately developed and 7 districts are less developed in industrially in Haryana. A look at ranks of districts reveals that districts namely Kaithal, Mahendergarh, Sirsa, Kurukshetra, Bhiwani, Rohtak and Sonapat show downward trend in their ranks over the period of study. Relative development of industries in Jind, Ambala, Karnal, Panipat and Yamunanagar remained more or less same as shown by their respective ranks over the period of study. An upward move of ranks of Hisar and Rewari show increasing industrial development in these districts. However, in the year 2010-11 Gurgaon replaced Faridabad and became the industrially most developed district of state. The result analysed by PCA method (Table 4) reveals the same phenomenon of industrial development in districts of Haryana as explained above in case of DIM.

While looking at scenario of industrial development in various districts of Haryana, it is found that the less developed districts have not shown much progress in number of registered factories, number of worker employed in registered factories, value addition by per worker and unit., vis-à-vis in the developed districts. For instance a number of registered factories and worker employed in registered factories in Gurgaon as it most developed district increased from 266 to 2588 and 4435 to 161940 respectively while in least developed district Mahendergarh, it increased from 8 to 60 and 387 to 4250 respectively during 1966 to 2010.

Through the study period i.e., 1990-91 to 2010-11 it has been observed that the industrial development in Haryana has shown a tendency of divergence. The table 3 indicates that only Gurgaon and Rewari have shown consistent rise in the index of industrial development over the study period. The other prominent industrial towns including Yamunanagar, Faridabad, Hisar and Panipat have shown decline in the absolute value of indices. Regarding other districts either there is consistent decline or directionless movement in indices value. As we hypothesized that after liberalization of industrial policy, there has been a tendency of the industries to gravitate towards more industrially developed area i.e., Gurgaon and Rewari (Rewari is emerging as an extension of Gurgaon due to better connectivity).

At present the investments in industries prefer a location which provides superior infrastructure facilities and connectivity to other parts of country (Sidhu 1995, Dholakia, 2003). Regarding superior infrastructure facilities in Haryana HSIIDC has been entrusted with the job to develop the industrial township i.e., industrial estate, growth centers, technological park, integrated infrastructure development centers etc. The initiatives taken by HSIIDC over the last ten years point out that, most of the new industrial infrastructure has been developed around Delhi or NH-1. For example, the IMT (Industrial Model Township) has been developed in Manesar (Gurgaon), growth center at Bawal (NH 18), industrial estate in Faridabad, Kundli, Murthal, Ambala, Yamunanagar, Jind, Bahadurgarh and Samalkha. There is no effort on the part of HSIIDC or any other agency of GOH and GOI to induce industries in to any other region. Reasons cited by the HSIIDC for providing IMTs in a particular region are that, in other regions the industries are not ready to move, and in fact the HSIIDC has been responding for the demand for IMTs in a specific location. In other words, it is not in a position to influence the market forces to take industries into backward areas. The claim of HSIIDC and policy makers of Haryana are substantiated by the fact that in the past industrial estates were developed in Hisar and Jind could not succeed to attract industries. The efforts of GOI to develop the food park in Narwana, Dabwali (Sirsa), Rai (Sonapat) and Saha (Ambala) have also failed to attract industries. However, a closer look behind the failure of such initiatives reveals that government has not succeeded to integrate its imitative into holistic regional development plans.

The regional balanced industrial development needs better transport and communication connectivity in addition to better infrastructure facilities. Improvement in the transport connectivity facilities in a region substantially improves the geographic attractiveness of other regions by reducing the transport cost between the regions (Xubei, 2004). The issue of connectivity in terms of better highways, Airports, Ports and railway was ignored by the planners in Haryana particular and India in general. Moreover, a perusal of the industrial policy of Haryana point out that there is no visible effort by the GOH to address the issue of

regional balance growth in the state by giving tax incentives, fiscal benefits etc.

The effect of new policy of economic liberalization, privatization and globalization has resulted in increased industrial development in the state. The increase in average value of indicators such as number of registered factories per lakh of population (I_1), number of registered factories per 100 sq KM (I_2), value added by per unit and worker (I_4, I_5), worker employed in working factories (I_6) and value added by manufacturing industries (I_7) prove that there has been increase in the industrial production in the state since 1990-91. But this has created regional disparities in industrial development. The differences in the values of the index among the districts bring out the unequal development in industries in Haryana and these inequalities are rising as the value of Coefficient of Variation is increasing during the study period from 82.72 per cent to 97.31 per cent by DIM (Table 3) and 97.48 per cent to 106.76 per cent by PCI method as shown in table 4. Thus the hypothesis i.e. Inter-district disparities in terms of industrial development are growing in Haryana is accepted.

Table 1. Averages and Coefficient of Variation of the Industrial Development Indicators

Averages					
Indicator	1990-91	1994-95	1999-00	2004-05	2010-11
I_1	28.71	35.12	39.56	36.16	36.02
I_2	13.37	18.04	22.73	24.52	25.33
I_3	6.31	6.25	5.26	5.26	5.26
I_4	64.56	76.52	127.53	149.46	162.16
I_5	1.05	1.16	1.9	2.34	2.38
I_6	1558.75	2060.25	2131.11	2244	2438.32
I_7	866.25	1416.75	1835.36	4776.41	4776.41
I_8	3493.92	3319.03	3090.19	2581.93	2583.03
Coefficient of Variation*					
Indicator	1990-91	1994-95	1999-00	2004-05	2010-11
I_1	92.99	97.97	95.62	90.04	90.03
I_2^*	105.43	109.69	124.95	121.62	120.31
I_3^*	73.3	146.57	155.55	150.39	155.28
I_4^*	91.79	92.56	116.5	163.51	166.87
I_5^*	87.07	64.11	88.21	85.04	80.92
I_6^*	153.3	108.56	110.04	99.37	107.51
I_7^*	108.71	129.09	109.32	162.85	162.85
I_8	48.9	47.4	51.78	51.58	51.23

Note: I_1 to I_3 are Industrial Development Indicator. * Significant.

Table 2. Rank Correlation of Industrial Development Indices (PCA and DIM)

Year	Spearman's Rank Correlation Coefficient	t-value*
1990-91	0.988	23.99
1994-95	0.991	27.75
1999-00	0.996	46.11
2004-05	0.994	37.57
2010-11	0.998	65.06

* Highly significant at 1 per cent level of significance.

Table 3. Industrial Development Index of Districts of Haryana (Development Index method)

Districts	1990-91			1994-95			1999-2000			2004-2005			2010-11		
	IDI	Rank	Status	IDI	Rank	Status	IDI	Rank	Status	IDI	Rank	Status	IDI	Rank	Status
Kaithal	0.021	16	LD	0.065	14	LD	0.025	17	LD	0.048	16	LD	0.025	18	LD
Mahendergarh	0.037	15	LD	0.015	16	LD	0.016	19	LD	0.019	18	LD	0.012	19	LD
Sirsa	0.065	14	LD	0.048	15	LD	0.036	16	LD	0.031	17	LD	0.030	16	LD
Jind	0.110	13	LD	0.109	12	LD	0.056	15	LD	0.066	15	LD	0.078	13	LD
Kurukshetra	0.142	12	LD	0.104	13	LD	0.088	14	LD	0.070	14	LD	0.067	14	LD
Bhiwani	0.157	11	LD	0.133	11	LD	0.144	13	MD	0.080	13	LD	0.054	15	LD
Ambala	0.172	10	MD	0.232	7	MD	0.235	7	MD	0.220	7	MD	0.188	9	MD
Hisar	0.192	9	MD	0.178	10	MD	0.267	6	MD	0.230	6	MD	0.225	6	MD
Karnal	0.231	8	MD	0.224	9	MD	0.209	9	MD	0.201	10	MD	0.190	8	MD
Rohtak	0.231	7	MD	0.225	8	MD	0.195	12	MD	0.215	8	MD	0.155	11	MD
Rewari	0.275	6	MD	0.323	4	MD	0.353	4	D	0.404	3	D	0.404	3	D
Sonepat	0.282	5	MD	0.315	5	MD	0.208	10	MD	0.208	9	MD	0.213	7	MD
Panipat	0.396	4	D	0.233	6	MD	0.314	5	MD	0.337	5	D	0.298	5	MD
Yamunanagar	0.425	3	D	0.473	3	D	0.395	3	D	0.385	4	D	0.375	4	D
Gurgaon	0.430	2	D	0.531	2	D	0.572	2	D	0.649	2	D	0.743	1	D
Faridabad	0.870	1	D	0.869	1	D	0.817	1	D	0.693	1	D	0.666	2	D
Fatehabad	NA	NA	NA	NA	NA	NA	0.018	18	LD	0.018	19	LD	0.030	17	LD
Jhajjar	NA	NA	NA	NA	NA	NA	0.205	11	MD	0.112	12	LD	0.177	10	MD
Panchkula	NA	NA	NA	NA	NA	NA	0.227	8	MD	0.152	11	MD	0.127	12	MD
C.V*	82.72%			85.54%			88.09%			91.35%			97.31%		

NA: Not Available C.V: Co-efficient of variations, *Significant
Note: 1.IDI implies Industrial Development Index.
2. D refers to Developed, MD refers to Moderately Developed and LD refers to less developed.

Table 4. Industrial Development Index of Districts of Haryana (Principal Component Index Method scaled on the value of 10)

Districts	1990-91			1994-95			1999-2000			2004-2005			2010-11		
	IDI	Rank	Status	IDI	Rank	Status	IDI	Rank	Status	IDI	Rank	Status	IDI	Rank	Status
Kaithal	0.000	16	LD	0.111	15	LD	0.090	17	LD	0.312	16	LD	0.128	18	LD
Mahendergarh	0.301	15	LD	0.000	16	LD	0.000	19	LD	0.022	18	LD	0.000	19	LD
Sirsa	0.476	14	LD	0.205	14	LD	0.226	16	LD	0.174	17	LD	0.215	16	LD
Jind	0.811	13	LD	0.970	11	LD	0.410	15	LD	0.641	15	LD	0.814	13	LD
Bhiwani	1.219	12	LD	0.647	12	LD	1.214	13	LD	0.762	13	LD	0.520	15	LD
Kurukshetra	1.268	11	LD	0.475	13	LD	0.751	14	LD	0.675	14	LD	0.688	14	LD
Hisar	1.824	10	MD	1.106	10	LD	2.528	6	MD	2.670	7	MD	2.632	6	MD
Ambala	1.965	9	MD	2.235	7	MD	2.380	7	MD	2.717	6	MD	2.296	8	MD
Karnal	1.969	8	MD	1.318	9	MD	2.182	10	MD	2.489	10	MD	2.280	9	MD
Rohtak	2.101	7	MD	1.780	8	MD	1.877	12	MD	2.597	9	MD	1.890	11	MD
Rewari	2.663	6	MD	3.004	4	MD	3.390	5	MD	5.201	3	D	4.792	3	D
Sonepat	2.764	5	MD	2.655	5	MD	2.244	9	MD	2.647	8	MD	2.610	7	MD
Panipat	3.586	4	D	2.625	6	MD	3.596	4	D	4.479	5	D	3.768	5	MD
Gurgaon	3.672	3	D	4.280	3	D	6.056	2	D	9.173	2	D	10.000	1	D
Yamunanagar	4.566	2	D	5.450	2	D	4.588	3	D	4.757	4	D	4.699	4	D
Faridabad	10.000	1	D	10.000	1	D	10.000	1	D	10.000	1	D	8.843	2	D
Fatehabad	NA	NA	NA	NA	NA	NA	0.050	18	LD	0.000	19	LD	0.200	17	LD
Jhajjar	NA	NA	NA	NA	NA	NA	2.092	11	MD	1.957	11	MD	2.131	10	MD
Panchkula	NA	NA	NA	NA	NA	NA	2.378	8	MD	1.350	12	LD	1.473	12	MD
C.V*	97.48%			111.42%			101.20%			104.20%			106.76%		

NA: Not Available C.V: Co-efficient of variations, *Significant
Note: 1.IDI implies Industrial Development Index.. 2. D refers to Developed, MD refers to Moderately Developed and LD refers to less developed.

4. Conclusion

The present study was an attempt to measure the incidence of intra-state regional disparities in industrial development of Haryana over the period of 1990-2011. It can be concluded that regional disparities in the industrial development in the state of Haryana are increasing over time. It is evidenced by increasing value of coefficient of variation of the constructed indices by DIM as well as PCI Method. Further, developed and moderately developed category values of indices indicate that major industrial development in the state is concentrating on or near NH1 or in NCR regions. This proves the unbalanced industrial development in the state and is a serious issue of concern.

5. Appendix-I

Industrial Development Indicators

I_1 = District Wise Number of Registered Factories in Haryana per Lakh of Population.

I_2 = District Wise Number of Registered Factories in Haryana per 100 sq. K.M.

I_3 = District Wise Percentage of workers employed in working factories.

I_4 = District Wise Net value added by per Unit (Rs in Lakh).

I_5 = District Wise Net value added by per Worker (Rs in Lakh).

I_6 = District Wise Number of workers employed in working factories per Lakh of Population.

I_7 = District Wise Per capita value added by manufacturing industries (regd) at Current price.

I_8 = District Wise employment in private organized sector per Lakh of Population in Haryana.

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