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Measuring the industrial concentration and dispersal of major Indian industrial states

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Abstract

Objectives: This study illustrates how major industrial states in India suffer with industrial disparity and centralization.
Methods/Findings: We use two mathematical models: (1) Localization Coefficients *to identify which major industries are suffering by industrial concentration* and (2) Location Quotient which is a simple method for measuring regional industrial specialization. It shows us the propensity of industries for dispersal between the major Indian industrial states. The recommendations for policy makers through this research are that they can easily determine the lack of industrialization in a particular region and industry.
Application: This research helps to understand that those regions are either less specialized regions or concentrated with few industries.
JEL Classification: *L52, L6, L5*
Keywords**:** Regional Specialization, Location Quotients, Coefficient of Localization, Intra Industry Disparity, Industrial Classification.

1. Introduction

At present era, the scenario of distribution of industrial activities in India is an important research field to be excavated. It is the characteristic of developing countries that their industrial development renders the centralization of capital with concentration of output and employment in some specific regions where remain off them industrially backward*(in developing countries some specific regions, which are near to urban areas are more concentrated with the availability of jobs and industries).*Such atypical development, the product of an urban-biased strategy of development*(Products only made for urban use)*, crops up an inter-regional and intra-regional disparities over and above the problem of divergence in backward regions where chronic unemployment and underemployment are overwhelmed with other crises. For the salvation of depressed regions, the task of industrial development through packages of policies needs knowledge about the 'propensity of industries for dispersal' *(The natural tendency of spreading industries over a wide area).*

There are two measures which determine the 'propensity for dispersal'. (1) Localization Coefficients and (2) Location Quotients. A close examination of these two aspects would reveal the existing nature and pattern of industrialization in the country and would help in finding the way to the planner to move through.

2. The nature of dispersal in the registered manufacturing sector in India

We study the localization coefficients and location quotients for industries in Indian five major industrial states to find out the natural tendency of spreading industries in India over these selected five regions, where all units are registered under sec. 2m(i) and 2m(ii) of the Indian Factory Act, 1948.NationalIndustrial Classification is made by output criteria i.e. specifying a product under the industry group. The 3- digit industry group belonging to the National Industrial Classification (NIC). Division 2 and 3 are related to manufacture. The 4th and 5th "digit" are under the 3rd digit to specify a product class and sub class under the industry which produces it*(This study table will help us to better understand how Indian manufacturing sectors are classified by digit analysis)*. Table 1 shows detailed classification of industries [1].

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Table 1. National Industrial Classification (NIC) Clarification with digits like 2, 3, 4 and 5 (with a set of an i.e)

Division	Group	Class	Sub-Class	Description
11				Manufacture of beverages
	110			Manufacture of beverages
		1101		Distilling, rectifying and blending of spirits; ethyl alcohol production from fermented materials
			11011	Manufacture of distilled, potable, alcoholic beverages such as whisky, brandy, gin, "mixed drinks" etc.

Source: National Industrial Classification (All Economic Activities) – 2008, Central Statistical Organization, Ministry of Statistics and Programme Implementation. Page-42

From the year 2010 to 2018 there were growth of new units in the industries except the following industries like electrical equipment, machinery and equipment, motor vehicles, trailers and semi-trailers, other transport equipment, Printing and reproduction of recorded media, paper products, beverages, food products and mining and quarrying etc. And there is nothing worthy of re-mark at the growth rate for these above listed industries in the registered manufacturing sector in India. This information makes step for a study about regional intra industry disparity in the country.

Many economists from 1984 to 1987 have defined regional industrial disparity through the use of localization coefficients and location quotients for the Indian industry. But after 1987 no research works were performed on the basis of Indian industrial disparity through the methods like localization coefficient and location quotient. The location quotient and localization coefficient model was devolved by several economists a year after year till 2013 but those models are used for other country's industrial disparity. And these two models are also successfully identified the industrial disparity and specialization of industry in regional basis. So, in this research paper the lack of literature resources for the Indian industries are also an issue. But still I collected most of them, from 1984 to 1987 and those researchers have been said, it follows, that localization coefficients and location quotients are elaborates of the disparity rate of Indian industry that is also helping to make good policies for the decentralization of industry. Some series of works have been done on this line.

In [2] used to study on the "Structure of India Industries" and mentioned that any inductive study of the propensity of each industry for dispersal would not only be of great theoretical significance, but of immense practical utility in framing a realistic policy of location planning based on broader economic, social and strategic consideration. In [3] study on the "Regional Dispersal and Location of industries in India" found the industries in India in some regions to be centralized. In [4] his research study on his book the "Industrial Economy of India", it is written that, there is unequal development of Indian industries in the various regions. So, there will always be a necessity for allocation and reallocation of industries among them in order to attain equilibrium conditions in industrial employment. In [5] worked with localization coefficients and location quotients on Indian industries to identify the dispersal of Indian industry.

So, these limited literature reviews on Indian industrial disparity, have encouraged me to write this research paper. At first, I provide some common indicators to make my discussion about method clean. Suppose that the country is divided into N regions, the total number of industry is M and E represents as labour (General economic activity). Therefore,

E_{ri} – Labour of industry *i* in region *r*.
$NE_i = \sum_{r=1}^{M} E_{ri}$ – The total labour of industry *i* in the entire country,
$TRE = \sum_{i=1}^{N} E_{ri}$ – The total labour of all industry in region *r,*
$TNE = \sum_{i=1}^{N} \sum_{r=1}^{M} E_{ri}$ – The total labour of all industry in entire country,
$s_{ri} = \frac{E_{ri}}{NE_i}$ – The employment share of industry *i* in region *r* in total employment of industry i,
$s_r = \frac{TRE}{TNE}$ – The employment share of region *r* in aggregate employment,
$S_{ri} = \frac{E_{ri}}{TRE}$ – - The employment share of industry *i* in region r in all the industry region and
$S_i = \frac{NE_i}{TNE}$ – The employment share of industry *i* in aggregate employment.

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The location Quotient is a simple method for measuring industrial concentration and for specialization for analysing the regional employment problem, industrial concentration and regional specialization. But it has an important defect that, it does not consider the effect of regional size, which is an essential part of coefficient analysis. To overcome this problem a formula with the effect of regional size.

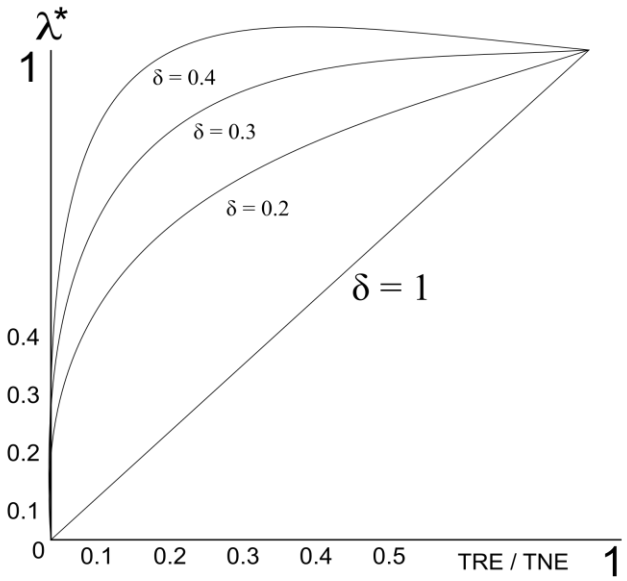
$$FLQ_{ri} = \frac{E_{ri}/TRE}{NE_i/TNE} \times \lambda^* LQ_{ri} = \frac{E_{ri}/TRE}{NE_i/TNE}$$

$$\text{Where, } \lambda^* = [\log_2(1 + TRE/TNE)]^{\delta}$$

$$\delta = \frac{\log[(TRE - TNE)/\log_2(1 + TRE/TNE)]}{\log[\log_2(1 + TRE/TNE)]}$$

Here δ is the sensitivity of localization and λ^* is the regional scalar [6]. By the sensitivity coefficientδ, if the value is greater than zero the regional scalerλ^* becomes more concave. And if δ= 0 the regional scalarλ^* becomes a 45 degree upward straight line and FLQ and SLQ becomes coincide also. We can show this through the diagram (Figure 1).

Figure 1. The relation between the regional scalarand the sensitivity coefficient



So, the FLQ model now not only involved in relative size of supplying and purchasing but also involved in regional size. Now if we use the FLQ instead of LQ to measure the industrial concentration, the result differs from the LQ. For an industry, in a region, the value of FLQ is lesser than the LQ because of a smaller regional size, which means that the specialization of the industry in that particular region measured by FLQ is less than that measured by LQ. It is argued by Lu, Flegg and Deng (2011), that the most important factor should not be regional size. Because when an economist wants to construct the coefficients for measuring industrial concentration they need the regional industrial scale as a factor in the model. And then the new FLQ* model is constructed as:

$$FLQ^* = \frac{E_{ri}/TRE}{NE_i/TNE} \times [\log_2(1 + s_{ri})]^{\delta}$$

Thus, FLQ* can reflect industrial concentration. But the values of FLQ* indicate the concentration of a particular one industry in a single region and in a single time period. So, it is difficult to analyse for the general specialization of a country through this method. Moreover, the FLQ* is unable to reflect and measure regional specialization. By discussion of Lu, Flegg and Deng (2011), if FLQ* is greater than unity, it indicates a high concentration and higher FLQ* value implying higher concentration.

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The value of FLQ* in most of the region may be greater than unity, but their variance may be very small or close to the unity or may be vice versa. So, it means the variance of FLQ* is also related to the regional specialization of industry. If the variance is higher for certain industries, then it means that the industry is mainly localized in a few regions and for a lower variation it is vice versa.

So, we can use the coefficients of variation for FLQ*. Now, if the value of the coefficients of variation of FLQ* is 0, which is identified as the lower bound, it means complete uniformity and if the value of the coefficients of variation is $\sqrt{n-1}$ (where, n is the number of regions), which is identified as upper bound, it means that there is an absolute level of inequality.

The same for the regional specialization analysis, if the value of FLQ* is 0, which is identified as a lower bound, it means the complete uniformity and if the value of the coefficients of variation is $\sqrt{m-1}$ (where, m is the number of industries), which is identified as the upper bound, it means that the regions are an absolute level of inequality.For the strong and weak variability analysis, the coefficients of industrial localization and the regional specialization can be constructed as through FLQ* [7].

$$\iota_i = \sqrt{\frac{1}{M}\sum_{r=1}^{M}\left(FLQ^*_{ri} - \frac{1}{M}\sum_{r=1}^{M} FLQ^*_{ri}\right)^2} \Big/ \frac{1}{M}\sum_{r=1}^{M} FLQ^*_{ri}$$

$$\iota_r = \sqrt{\frac{1}{N}\sum_{i=1}^{N}\left(FLQ^*_{ri} - \frac{1}{N}\sum_{i=1}^{N} FLQ^*_{ri}\right)^2} \Big/ \frac{1}{N}\sum_{i=1}^{N} FLQ^*_{ri}$$

Collected data, by the frames of the Annual Survey of Industry, Govt. of India (ASI, 2016-2017) from major manufacturing factories, the distribution of workers under the different industry sub-groups among five major industrial states of India (Selected Five major industrial states on the basis of highest level of total output of all manufacturing industries.) are summed up to major industry group. Data Availability: http://www.csoisw.gov.in/cms/En/1024-asi-manual.aspx

3. The empirical results

From the above models through the calculations of Localization Coefficients and Location Quotients, the highly dispersal industries and regional specialization analysis are as listed below, respectively (Detail result see appendix: A and appendix: B).

Table 2. Localization Coefficient and coefficients of variation of Location Quotients based on different major industry groups among five major industrial states in India

Industry code	Description	COV FLQ*	ι_i
89	Mining and quarrying n.e.c.	2.2**	2.0**
143	Manufacture of knitted and crocheted apparel	1.7**	1.5**
151	Tanning and dressing of leather	1.9**	1.7**
191	Manufacture of coke oven products	1.7**	1.5**
252	Manufacture of weapons and ammunition	2.0**	1.8**
267	Manufacture of optical instruments and equipment	1.7**	1.6**
302	Manufacture of railway locomotives and rolling stock	1.9**	1.7**
303	Manufacture of air and spacecraft and related machinery	1.7**	1.5**
***304	Manufacture of weapons and ammunition	2.2**	1.9**
322	Manufacture of musical instruments	2.2**	2.0**
323	Manufacture of sports goods	2.2**	2.0**
Lower: 0, Upper: $\sqrt{5-1}=2$			

*(** used for higher coefficient of variation of location quotients), (**used for higher coefficient of localization)*
Source: Calculated by the author
*Note: *** 304 industry code, we will not take it into account in our research analysis, because it is controlled by the Govt. of India*

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So, with the identification of the industry gap the inter industry disparity in terms of localization co-efficient and location quotients has been an interesting view of this analysis. For this, the natures of spreads of these industries have been observed in 5 major industrial states viz: Karnataka, Gujrat, Maharashtra, Hariyana, and West Bengal. In Table 2, we see that the eleven three digit manufacturing sub-group industries suffer from centralization. Those who have the closer value, it is 2. This means that industries are not equally distributed in the selected five major Indian industrial states. Those industries are either concentrated in one region or in two regions. But these listed centralized and unequally distributed industries have still the opportunity to establish their units in other states.

Side by side we also try to arrange a rank in Table 3 among the five major industrial states through the regional specialization coefficient. As per the result showing us that, the regional specialization co-efficient of West Bengal, it is almost 2 not much closer to 9 but higher than the other states. This means that West Bengal has fewer industries than the other 4 major Indian industrial states. And here West Bengal holds the last position among the five major industrial states.

Table 3. Rank of five major Indian industrial states by regional specialization analysis

States	COVFLQ*	ι_r
Maharashtra	*****0.84	*****0.83
Haryana	****1.21	****1.20
Gujrat	***1.30	***1.29
Karnataka	**1.49	**1.48
West Bengal	*1.81	*1.80
Lower: 0, Upper: $\sqrt{78-1} = 9\ approx$		

*Lower * indicates region is specialize in few industries*
Source: Calculated by author

4. Policy implication

Swelling industrialization of an area needs power and rapid infrastructural development which are decisive indicators to meet the interest of entrepreneurs. With this, available raw materials and markets follow ideological preference for manufacturing units to have a start. If an industrialization programme does not follow this connection, within a short period the new venture will enter into deep crisis for capacity utilization. Following under the utilization of capacity every unit incurs loss, runs into debt and dries up through debt servicing burden. Then, sickness and closer of units over through the industrialization programme follows: The programme for industrialization in backward areas of Indian states has come at this juncture.

5. Conclusion

Through the study of localization coefficients and location quotients we observed that industrialization in India follows the nature of dispersal in compliance with Govt. policies and measures. Most of the industries suffer due to centralization in India. And through regional specialization analysis we also get the evidence that, industries are not equally distributed in all major five industrial states in India. As studies, we have made through coefficients of variation of different states, that degree of regional specialization is unequal, which may partly be attributed to government's effort in mitigating disparities among the states in India.

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Appendix: A

List of the major industry group of the five major industrial states with high localization coefficient and location quotients								
Code	COV FLQ*	ι_i	Code	COV FLQ*	ι_i	Code	COV FLQ*	ι_i
16	0.8	0.7	202	0.7	0.7	281	0.4	0.4
89	2.2**	2.0**	203	1.2	1.1	282	0.5	0.4
101	0.9	0.8	210	0.7	0.6	291	1.0	0.9
102	0.6	0.5	221	0.6	0.5	292	1.1	0.9
103	0.8	0.8	222	0.5	0.4	293	1.1	1.0
104	0.7	0.6	231	0.6	0.5	301	0.6	0.6
105	0.4	0.4	239	0.6	0.6	302	1.7**	1.5**
106	0.8	0.7	241	0.7	0.7	303	2.2**	1.9**
107	0.6	0.5	242	0.3	0.3	304	2.2**	2.0**
108	0.5	0.4	243	0.5	0.4	309	1.4	1.2
110	0.5	0.5	251	0.5	0.5	310	0.8	0.7
120	1.0	0.9	252	2.0**	1.8**	321	1.5	1.4
131	0.9	0.8	259	0.5	0.4	322	2.2	2.0
139	0.9	0.8	261	1.1	0.9	323	2.0	1.8
141	1.3	1.1	262	1.0	0.9	324	2.0	1.8
142	0.0	0.0	263	0.6	0.6	325	0.9	0.8
143	1.7**	1.5**	264	1.2	1.1	329	0.2	0.2
151	1.9**	1.7**	265	0.5	0.4	331	0.7	0.6
152	1.4	1.3	266	1.4	1.3	332	1.4	1.3
161	0.4	0.4	267	1.7**	1.6**	381	1.5	1.3
162	0.6	0.6	268	0.0	0.0	382	0.6	0.5
170	0.3	0.3	271	0.5	0.4	383	1.9**	1.7**
181	0.4	0.4	272	0.9	0.8	581	1.4	1.3
182	0.0	0.0	273	0.3	0.2	Other	0.4	0.3
191	1.7**	1.5**	274	0.7	0.6			
192	0.5	0.5	275	1.0	0.9	Lower: 0, Upper: $\sqrt{5-1}=2$		
201	1.2	1.1	279	0.4	0.4			

Source: Descriptions of the code from ASI,
*Note: *** 304 industry code, not take into account, because it is controlled by the Govt. of India*

Appendix: B

Rank of the five major Indian industrial states by regional specialization analysis		
States	COVFLQ*	ι_r
Maharashtra	*****0.84	*****0.83
Haryana	****1.21	****1.20
Gujrat	***1.30	***1.29
Karnataka	**1.49	**1.48
West Bengal	*1.81	*1.80
Lower: 0, Upper: $\sqrt{78-1}=9\ approx$		

*Lower * indicates that the region specializes in a few industries*
Source: Calculated by author

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6. References

1. Central statistical organization. National industrial classification. Government of India. 2008.
2. M.M. Mehta structure of India industries. Popular Book Depot, Bombay, India. 1961; 201.
3. J. Satyanarayan, K. Ramakrishna Sharma. Regional dispersal and location of industries in India. State and Society. 1984.
4. S.C. Huchhal. Industrial economy of India. Chaitanya Publishing House. Allahabad, India. 1989; 248.
5. K.Y. Alag. Regional Aspects of Indian Industrialization. Bombay University Press. 1972
6. A.T. Flegg, T. Tohmo. Estimating regional inputs coefficients and multipliers: The use of the FLQ is not a gamble. University of the West of England. 2013; 1-38.
7. Z. Lu, A.T. Flegg, X. Deng. Regional specialization: a measure method and the trend in China. Munich Personal RePEc Archive (MPRA). 2011; 1-25.

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