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Statistical Analysis of Industrial Sector - A Case Study of Dakshina Kannada District, Karnataka

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ABSTRACT: Dakshina Kannada district is one of the industrial based economy generating and coastal district in Karnataka state. As industrial sector plays one of the major role in economy of any region, the paper aims to analyse the industrial scenario of the Dakshina Kannada district by using different statistical models. In Dakshina Kannada district after transportation sector industry is the most invested sector. Many statistical models were developed and applied in industrial sector to analyse the various problems and structure of industries. Here, three statistical models are used i.e. Gini coefficient, location quotient, shift-share models are used to analyse the industrial scenario of Dakshina Kannada district and industrial structure dynamics are described through different variables like demography, employment population, taluka wise industrial investments, industry wise employment at both district and state levels.

KEYWORDS: Gini coefficient, shift-share analysis, location quotient, statistical models.

I. INTRODUCTION

Modernisation brings lot of changes in education, technology, infrastructure and in turn impacts urban planning. Industrialisation is one of the most important sector and have vital role in the modernisation, economic development. Industries act as the key force for rapid economic development and therefore is being considered as synonymous with economic development. Recognising the role played by industries in economic development, the government of India as well as state government has given special emphasis on the development of industries.

Dakshina Kannada was archival and prominent district in Karnataka for industrial sector. Dakshina Kannada district is abundant with natural resources, only 7% in total area of the district is covered with the built up. Significant area i.e. 27% and 8% of land was covered with dense forest and water body respectively. Both inland and coastal area of Dakshina Kannada district is rich in fisheries industries.

Red clay tiles also called Mangaluru tiles are originated from this district, cashew nut processing is internationally famous from good olden days. Due to rapid urbanisation, the demand for tiles had declined along with decline in availability of quality clay and labour. Thus traditional tile manufacturing industries eventually lost their glory. Beedi rolling is the one of the major home based small-scale industry in Dakshina Kannada district. Mangaluru is called as gate way to the Karnataka and it is well connected with all the three modes of transportation i.e. rail, road and sea. Airport in the district was established at Mangaluru city in fifties and seaport in seventies. Due to the well connectivity by all these three modes of transportation mangaluru city enormously developed its potential in medium and large scale by utilising the connectivity and resources available for industrial sector.

The major industries in the district include Mangalore chemical and fertilizers Ltd, Mangalore refinery and petrochemical Ltd, Kudremukh iron ore company, cocoa marketing and processing units and many more heavy scale industries are evolved around Mangaluru city. Mangaluru taluk in the Dakshina Kannada district evolved into hub for IT sector, petrochemical industries and fertilizer industries.

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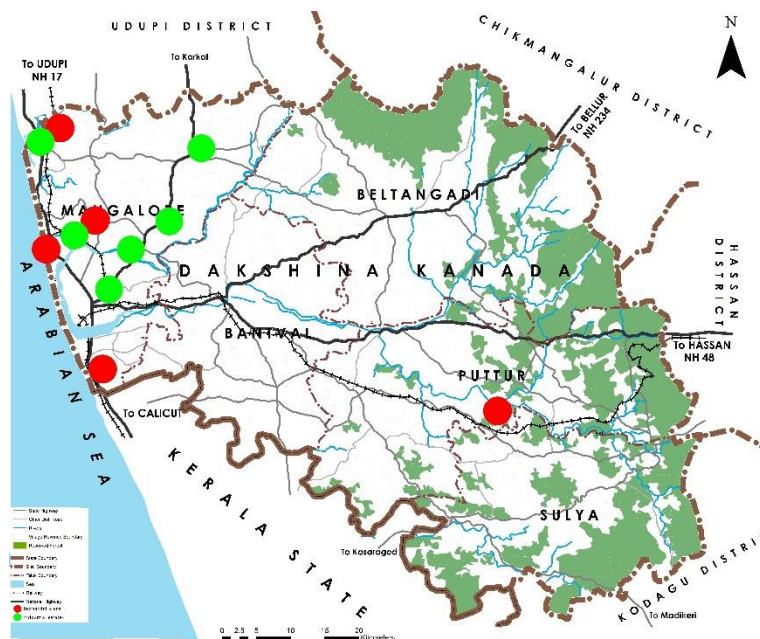
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Another major economy generating sector in this district is tourism after heavy scale industries. In Dakshina Kannada district, the natural and heritage-based tourism is concentrated in Puttur and Sulyataluks whereas urban tourism is majorly concentrated in Mangalurutaluk and coastal tourism in Mangaluru and Bantwal taluks

II. CASE AREA PROFILE

Dakshina Kannada (erstwhile) south Kanara is one of the three coastal districts of Karnataka state with a geographical area of 4859 sq. Km. the district lies vicinity of 12.57° and 13.50° North Latitude and 74 and 75 50 East Longitude. It is situated between the lower region of Western Ghats in the east and Arabian Sea in the west, it is flanked by Udupi District towards north, Chikmagalur district towards north east, Hassan District to the east, Kodagu District to the southeast, and Kasaragod District in Kerala to the south. The district has five talukas specifically, Bantwal, Belthangady, Mangaluru, Puttur and Sulya. Mangaluru city is the principal and dominating city in the region. Mangaluru is among the major port towns in Karnataka state. The region is honoured with inexhaustible precipitation, prolific soil and rich vegetation. Unblemished shorelines, beautiful mountain ranges, sanctuary towns, and rich culture makes it a looked for after traveller goal. (Shetty, 2014)

Total geographical area of the district is 4859 sq. Km which constitutes about 2.53% of the total area of the state. Geographically, Belthangady is the largest taluka with 1375 sq. Km (28.3%), followed by Puttur with 1000 sq. Km (20.6%) and mangaluru with 923 sq. Km (19%). Bantwal with 735 sq. Km (15%) is the smallest taluka in terms of geographical area. Sulya has geographical area of 826 sq. Km, which constitute 17% of the district's geographical area. Dakshina Kannada district constitutes a part of tulu nada along with the neighbouring Udupi district. Kannada, Tulu and Konkani are the main indigenous languages in the district. Administratively, the district has 331 villages, 203 GPs, one municipal corporation (Mangaluru City Corporation), four town municipal councils (Bantwal, Puttur, Ullal, and Moodabidri) and three town panchayats (belthangady, Mulky, Sulya).



(a)

Fig.1.(a) Base map of the Dakshina Kannada showing geographical characteristics and industrial areas and estates in each taluk

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III. LITERATURE & METHODOLOGY

This research paper studies the industrial scenario through statistical models Gini coefficient, Shift-share analysis and Location quotient. This section discusses the role of all these three statistical models in the industries and what would be the interpretation from these models in industries. Gini coefficient was proposed by the Italian statistician Corrado Gini in 1912. (Anon., 2015) The Gini coefficient provides an index to measure inequality it varies from zero to one says that zero indicated perfect inequality and one indicates perfect equality and it is calculated from the Lorenz curve. Lorenz curve defined the actual distribution of income curve. In this paper Gini coefficient is calculated to find out the inequality between the investment in each taluk to the population distribution and employment in each taluk to the population distribution. By, calculating these two indices it shows the equality distribution among the taluks in the district.

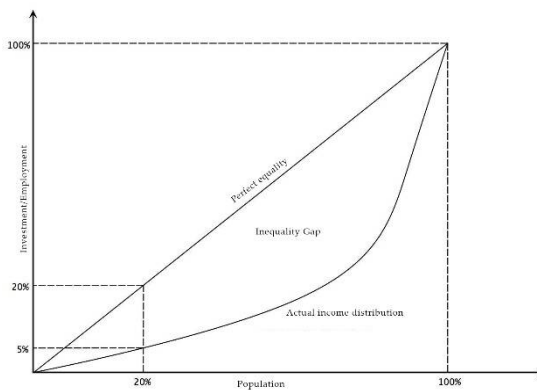


Fig.2.Lorenz curve plotted between population on X-axis and investment, employment on Y-axis

Second model is Shift-share analysis, it was developed by the Daniel Creamer in forties and later it was transformed by the Edgar S. Dunn in 1960 (Shi & Yang, n.d.).Shift-share was the regional analysis used for the regional change and competitiveness of the region to the nation. Here, in the study region is defined as district. Naturally, shift share is calculated for the employment factor that how regional job growth contributes the national trend. In shift share analysis there are three components namely National share, Industrial mix, Regional shift. Below equation is used to calculate the shift share of the region.

SHIF SHARE EQUATIONS

$$\Delta e_i = e_{i,t} - e_{i,t-1} = NS_i + IM_i + RS_i$$

$$NS_i = e_{i,t-1} \times \frac{E_t - E_{t-1}}{E_{t-1}}$$

Here,

Δe_i = Change in employment in a certain industry(i)

$e_{i,t}$ = Employment change in that industry in recent year

$e_{i,t-1}$ = Employment in that industry in first year

NS_i = Change due to national trends

IM_i = Change due to industrial Mix

RS_i = Change due to regional shift

E_t = Total national employment in all industries in recent year

E_{t-1} = Total national employment in all industries in first year

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Third statistical model used in this paper for industrial analysis is location. It is also one of the regional economic analysis in industries. It is characterized as the proportion to the proportion of employment in specific industry to total employment and proportion of employment in specific industry in region to total employment in the region. Simply it is ratio to ratio. Not only for employment shift share was calculate for other economic item like earnings, GDP etc.

LOCATION QUOTIENT EQUATION

$$LQ = \frac{e_i/e}{E_i/E}$$

Here,

e_i = Employment in industry

e = Total local employment

E_i = Employment in industry in region

E = Total employment in region

IV. STATISTICAL RESULTS

Here we calculated two Gini coefficients for finding out the equality between the population and investment, population and employment in Dakshina Kannada district. These two coefficients say how investments and employment in industrial sector among all five talukas in Dakshina Kannada district are distributed. As population of Mangalore taluka was high investment in that region is also high to satisfy the demands of the people. Population distribution among five talukas in district are as follows, 1086340 in Mangalore taluk, followed by Puttur had 287852, Sulya had 144297, Bantwal had 403123 and Belthangady had 261920. Investment in all talukas are as 138968, 10685, 1975, 1796, 1976 crores in Mangalore, Puttur, Sulya, Bantwal and Belthangady respectively.

Table.1.Taluka wise population distribution and investment distribution

S. No	Taluk	Population	Investment	% Pop	% Investment	Cum % pop	Cum % Invest
1	Mangalore	1086340	138968	49.75	89.43	56.45	89.43
2	Puttur	287852	10685	13.18	6.88	69.63	96.31
3	Sulya	144297	1975	6.61	1.27	76.24	97.58
4	Bantwal	403123	1796	18.46	1.16	94.70	98.73
5	Belthangady	261920	1976	12.00	1.27	106.70	100.00

Industrial employment in Dakshina Kannada are 18133, 2211, 1777, 1816, 1358 in Mangalore, Puttur, Sulya, Bantwal and Belthangady respectively. Next step is calculating Lorenz curve so that Gini coefficients was ratio of area between perfect line and distribution curve to area under perfect line.

Table.2.Taluka wise population distribution and employment distribution

S. No	Taluk	Population	Employment	% Pop	% Employment	Cum % pop	Cum % Emp
1	Mangalore	1086340	18133	49.75	71.69	56.45	71.69
2	Puttur	287852	2211	13.18	8.74	69.63	80.43
3	Sulya	144297	1777	6.61	7.03	76.24	87.46
4	Bantwal	403123	1816	18.46	7.18	94.70	94.64
5	Belthangady	261920	1358	12.00	5.37	106.70	100

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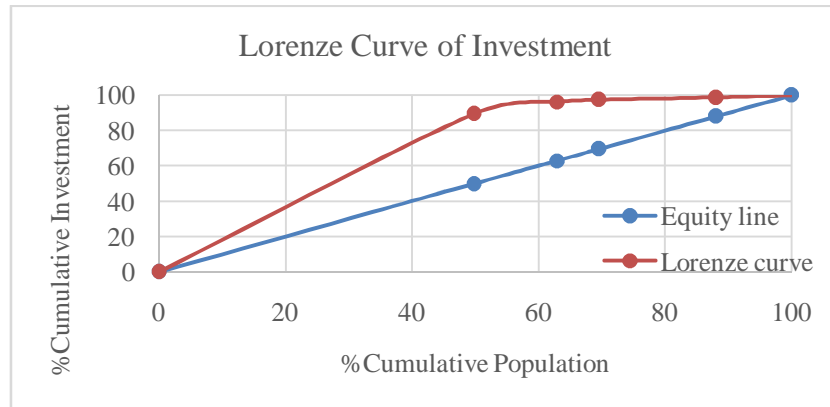


Fig.3.Lorenz curve showing equity line or perfect line and distribution curve of investment

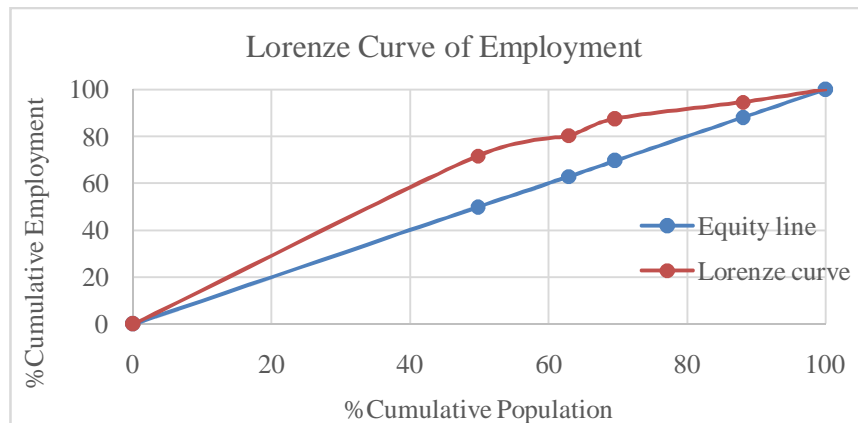


Fig.4.Lorenz curve showing equity line or perfect line and distribution curve of Employment

GINI COEFFICIENT CALCULATIONS

Gini coefficient for investment versus population:

Area under equity line or perfect line = 5000

Area under Lorenz curve of investment = 7093.60

Area between Lorenz curve and equity line = 2093.60

$$\text{Gini coefficient} = \frac{\text{Area under equity line or perfect line}}{\text{Area between Lorenz curve and equity line}} = \frac{5000}{2093.60} = 0.42$$

Gini coefficient for employment versus population:

Area under equity line or perfect line = 5000

Area under Lorenz curve of employment = 6189.02

Area between Lorenz curve and equity line = 1189.02

$$\text{Gini coefficient} = \frac{\text{Area under equity line or perfect line}}{\text{Area between Lorenz curve and equity line}} = \frac{5000}{1189.02} = 0.24$$

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As discussed in previous section, second statistical model for industrial analysis is shift share analysis. In this analysis employment details and number of industries are collected industry wise to compare the local employment shift and share in regional trends. Here, Dakshina Kannada is considered as local and Karnataka is considered as regional. Above data was collected for 2010 and 2015 years for both Dakshina Kannada district and Karnataka. According to data industries are classified into five categories called readymade, textile, chemical, engineering and others. Following tables shows the detailed calculations of national share, industrial mix and regional shift.

Table.3. Industry wise employment details for Dakshina Kannada and Karnataka in 2010 and 2015

Industries	2010		2015		Change		Growth rate	
	DK	Karnataka	DK	Karnataka	DK	Karnataka	DK	Karnataka
Readymade	0	339196	40	379492	40	40296		1.12
Textile	0	37543	0	22302	0	-15241		0.59
Chemical	2311	54911	7713	51923	5402	-2988	3.34	0.95
Engineering	5071	282469	2695	208700	2376	-73769	0.53	0.74
Others	39407	605536	30213	854263	9194	248727	0.77	1.41
Total	46789	1319655	40661	1516680	6128	197025	0.87	1.15

Dakshina Kannada was chemical and Petro-chemical based industrial city can be said by there is increase in number of industries in respect to the chemical and Petro-chemical industries up to 62% and employment growth rate from 2010 to 2015 is 0.95. Mangaluru Taluk was influenced by the sea port for the development in chemical and Petro-chemical industries.

Table.4. Number of industries in Dakshina Kannada and Karnataka in 2010 and 2015

Industries	2010		2015	
	DK	Karnataka	DK	Karnataka
Readymade	0	961	1	859
Textile	0	287	0	191
Chemical	24	560	39	510
Engineering	51	3717	63	2129
Others	479	7487	573	10270

National growth (NG), Industrial mix (IM), Regional shift (RS), of Dakshina Kannada District was calculated as stated in above segment with sufficient data from table No. 3 and table No. 4. NG, IM, RS of the region is used to interpret the current situation of Industrial profile of Dakshina Kannada district with respect to the national industrial profile. Here, national industrial profile defines the industrial profile of Karnataka.

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Table.5. Calculations of national growth, Industrial mix and Regional shift of Dakshina Kannada

Industry	DK(2010)	National Growth rate	National Growth Share	DK Growth rate	Industrial mix share	Regional Shift
Readymade	0.00	1.15	0.00	0.00	0.00	0.00
Textile	0.00	1.15	0.00	0.00	0.00	0.00
Chemical	2311.00	1.15	2656.03	3.34	-470.79	5527.75
Engineering	5071.00	1.15	5828.10	0.53	-2081.43	-1051.67
Others	39407.00	1.15	45290.48	0.77	10303.15	-25380.63
DK National Growth			53774.62			
DK Industrial mix					7750.93	
DK Regional shift						-20904.541

SHIFT SHARE CALCULATIONS

National share = 53774.62

Industrial mix = 7750.93

Regional shift = -20904.54

Shift share = National share + Industrial mix + regional shift

= 53774.62 + 7750.93 - 20904.54

= 40621.00

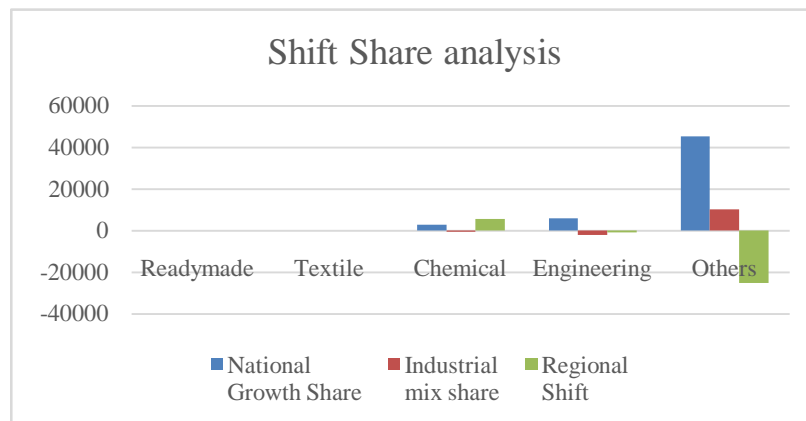


Fig.5. Graph showing national growth share, industrial mix share and regional shift among individual industries

As discussed in the previous segment, third statistical model for industrial analysis is location quotient. This analysis deals with only employment details of industries which are collected industry wise to calculate the ratio defined as in formula. Here, Dakshina Kannada is considered as local and Karnataka is considered as regional. Required data was collected for 2010 and 2015 years for both Dakshina Kannada district and Karnataka. According to data industries are classified into five categories called readymade, textile, chemical, engineering and others. Following tables shows the detailed calculations of location quotient. Table 3 was the data used for calculation of LQ.

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Table.6.Calculation result of location quotient of Dakshina Kannada to Karnataka

Type of industry	2010			2015		
	DK	Karnataka	location quotient	DK	Karnataka	location quotient
Readymade	0	339196	0.000	40	379492	0.0039
Textile	0	37543	0.000	0	22302	0.0000
Chemical	2311	54911	1.187	7713	51923	5.5409
Engineering	5071	282469	0.506	2695	208700	0.4817
Others	39407	605536	1.835	30213	854263	1.3192
Total	46789	1319655	1.000	40661	1516680	1.0000

LOCATION QUOTIENT CALCULATIONS

LQ of chemical industry in 2010:

No. of employees in Dakshina Kannada district (chemical industry) = 2311

Total No. of employees in Dakshina Kannada district = 46789

No. of employees in Karnataka (chemical industry) = 54911

Total No. of employees in Karnataka = 1319655

$$LQ = \frac{2311/46789}{54911/1319655} = 1.187$$

V. CONCLUSION

With Gini coefficient, shift share analysis and location quotient, industrial scenario of Dakshina Kannada was examined. Gini coefficient shows the inequality between population and investment, population and employment. As Gini coefficient between population and investment is 0.42 says moderate distribution of investments among all five talukas within the district. Gini coefficient between population and employment is 0.24, it is very close to the perfect inequality. Investment was distributed among all five talukas moderately equal but there is great inequality in distribution of employment opportunities. This is mainly due to the concentration of heavy scale and large number of units around mangaluru city causing less job opportunities in other taluks. In shift-share analysis positive regional share to chemical industry says that it is out performing in the national trends. Negative regional share for engineering industry says that it is underperforming in the national trends. Understanding importing and exporting capacities of individual industries from location quotient. Chemical industry had LQ 1.187, 5054 in 2010 and 2015 respectively says that this region has capable to meet the local demand and produces enough for exporting. Capability of chemical industry in Dakshina Kannada district was increased five times from 2010 to 2015 because of well transportation connectivity of sea port and huge investments in chemical industry in Mangalore taluk. While engineering industry fall under importing category as LQ was less than 0.75.

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