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Regional Inequality in Human Development in Karnataka: A Spatial Analysis

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Abstract: The paper analyses the trend and pattern of inequality in human development across districts of Karnataka. To gauge the extent of spatial inequalities at sub- regional level, the study makes use of the district wise HDI data drawn from Karnataka, District Human Development Reports (1991, 2001 and 2014). The spatial inequality in human development and its components are evaluated by using Moran's Inequality index, LISA cluster map and LISA significant maps. The study finds that the overall spatial inequality in human development has declined. However, the spatial concentration in HDI has seen an increasing trend in Karnataka. It is observed that the districts of northern Karnataka, particularly the Hyderabad-Karnataka region have low levels of human development. Improved access and services of health, education and other deprivations at micro levels reduced spatial inequality and improved human development in the state.

Keywords: Human Development Index; spatial inequality; spatial econometrics

Introduction

There exists huge intra and inter-regional developmental variations in the country and it is persistently rising. The developmental variation is visible not only in monetary dimensions but also in non-monetary dimensions such as education, health, nutrition, sanitation and opportunities, which are vital to human development. Hence, it is argued that growth is exacerbating than reducing regional inequalities (Dasgupta, 2016). Empirical evidences (UNDP, 1990, Singh, 2015), on various dimensions of inequality, confirm that India is not only among the countries with high inequality but it also witnessed a sharp rise in inequality in recent times. The accelerated economic growth, both at national and regional level improved various economic indicators in general and human development indicators in particular. However, the achievements in human development indicators have not been adequate, and the distributions of achievements are regionally varied (Singh, 2015).

The concept of human development was emerged in the late 1980s, and it was put forwarded by Amartya Sen and Mahbub-ul-Haq[3]. It brought a paradigm shift in the development discourse by emphasizing on the importance of quality of human life. This approach places people in the center of development and considers people as the real wealth of a nation. The human development approach argues for creation of an environment in which people can develop their capabilities to their potential in accordance with their needs and interests. Human Development is both a process and an end. It is concerned with the process through which choices are enlarged but it also focuses on the outcomes of enhanced choices. Enlarging human choices is critically linked to two issues; capabilities and functioning on the one hand and opportunities on the other. Thus, it represents both human capabilities and

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[3]The interest in human development can be found in the works of Aristotle, Immanuel Kant, John Rawls, Adam smith and Karl Marx.

economic, political and social opportunities. Human Development seeks not only to increase both capabilities and opportunities but also to ensure an appropriate balance between them in order to ensure sustainable and equitable human development (Stanton, 2007). The Human Development Index, embodies Amartya Sen's "capabilities" approach[4] to consider well-being, which emphasizes the importance of ends (like a decent standard of living) over means (like income per capita) (Sen,1985). Key capabilities are instrumentalized in Human Development Index by the inclusion of three vital ends of development such as access to health, education and decent standard of living. There exist human development inequalities both at national and sub national levels. The inequalities exist at regional levels with some regions experiencing high human development some faced with low human development. Inequality is a fundamental problem, severe inequalities in opportunity and life possibility influence on human capabilities. The inequalities in human development are mainly focused on the level of human development index (HDI) evaluating the achievements in terms of improvement in quality of life and overall development (Ghosh. M 2011).

Human development in Karnataka

In 2016-17, the state of Karnataka ranks fifth in terms of its contribution to the national GDP. The growth rate of GSDP and per capita Income in the state during 2001 to 2011 is 8.2 percent and 7.6 percent respectively. In 2016-17, the state's share in all India GDP was 7.5%. During 2012-13 to 2016-17, the Gross State Domestic Product (GSDP) surged at an average annual growth of 7.64 percent, which is above the national average. The per capita income (PCI) measures the standard of living of the people and is a major component of HDI. The state continues to be in the medium income state, with per capita income considerably below the all-India average. The literacy rate of the State is 75.4 percent in 2011, which is above the national average of 74.04 percent. It is seventh most urbanized state with 38.6% of population living in urban areas. In terms of health, the average life expectancy age in the state is 67 and the infant mortality rate in 24 for 1,000 live births in 2016. Though the state is comparatively better placed in terms of major socio-economic indicators, it is experiencing wider intra-regional inequality in HDI and its indicators.

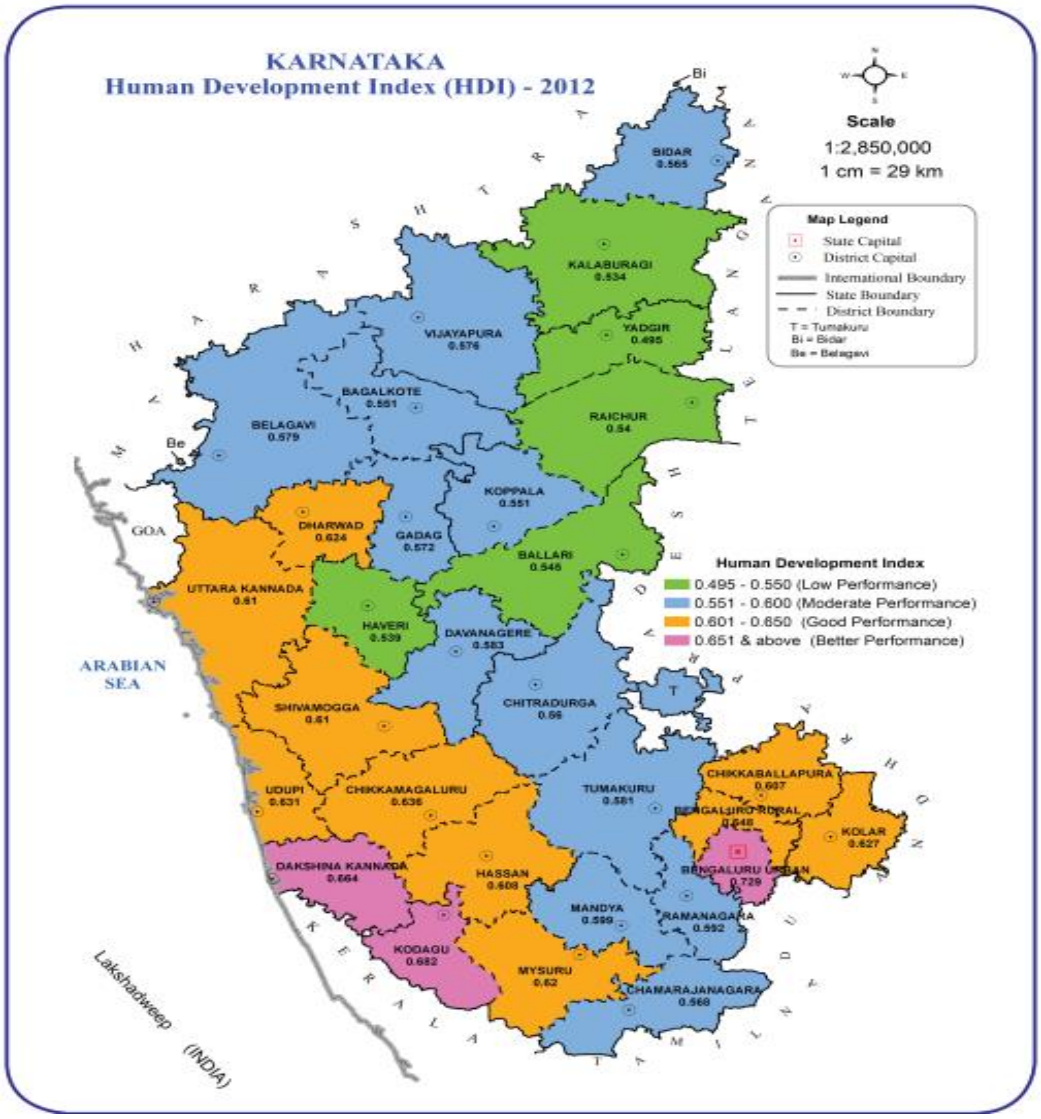
The first and second HDR in the state was brought out in 1991, 2001 and subsequently the district and taluks level HDR titled as DHDR was brought in 2014. The figure-1 shows the district wise human development index values of Karnataka. In 2011, the high human development index districts are Bangalore urban (0.928), Dakshina Kannada (0.691), Udupi (0.675), Kodagu (0.658), Chikkamagaluru (0.627) and Shimoga (0.596), however, the districts of Hyderabad Karnataka (HK) region[5] are faced with low human development with Ballari (0.354) Bidar (0.430) Kalaburagi (0.407) Yadgir (0.196) Koppal (0.280) and Raichur (0.165). At first glance it is evident that the districts from the southern part of the state have higher HDI values compared to northern part of the state, signifying high intra-regional inequality in human development in the state. The status of human development in the state shows wide regional inequalities across the districts and regions. Hence, the study evaluates the intra-

[4]Amartya Sen's capability approach has emerged as a leading theoretical construction in economics of welfare and human development. He argues that human life can be seen as a set of beings and doings and that a person has a range of functioning's from which a person may choose capabilities.

[3] The HK region is a part of North Karnataka consisting of six districts out of thirteen in North Karnataka. The six districts are Ballari, Bidar, Kalaburagi, Koppal, Yadgir and Raichur. To study this intra-regional developmental variation, the government of Karnataka appointed a high-power committee under the chair of Prof. D. M. Nanjundappa in 2002-03. The committee found that North Karnataka region is relatively backward in general and Hyderabad Karnataka region, in particular, is more backward. The Regulations of Admission in the Hyderabad-Karnataka Region Order 2013, provides reservation of 70 percent of the available seats in Hyderabad. Karnataka Region and 8 percent seats in statewide institutions for residents of HK region. The Karnataka Public Employment (Reservation in Appointment for Hyderabad-Karnataka Region) Order 2013, provides for creation of a local cadre and reservation in the Hyderabad-Karnataka region as; Group A Junior Scale - 75 per cent, Group B - 75 per cent, Group C - 80 per cent and Group D - 85 per cent, besides 8 percent reservation in the posts of state-level offices or institutions.

regional inequality in human development in Karnataka, emphasizing on spatial factors determining inequality in human development.

Figure 1: Human development Index in Karnataka



Source: Karnataka Human Development Report 2014

Background

Several studies both at the national and sub-national level have dealt with the problem of regional inequality in human development. Theoretically, it is argued that through the natural economic forces, the regional inequalities tend to persist and hence policy interventions are needed to address such inequalities (Myrdal 1957). Mehta. A (2003) observed that the relationship between economic growth and human development is relatively independent in the short run where as in the long run definite linkages between the two exist. The study concludes that the links from human development to economic growth are stronger and the reverse link from economic growth to human development is significant. Adabar. K (2009) by using per capita investment, population growth rate, human capital and initial level of per capital income examines the level of variances in the steady state and economic growth for fourteen major states in India for the period 1976 to 2000. The study reconsiders the hypothesis of convergence and finds a strong conditional convergence for the period. In a much broader analysis of inter and intra-regional inequalities Suryanarayana.M.H (2009)

using Kuznets framework examined inequalities in income generation and consumption distribution in two major states such as Karnataka and Maharashtra. The two states performed better than the national average in terms of mean-based estimates of average income; however, the study finds higher inter-regional disparities, interpersonal inequalities and intra-regional deprivations. The study advocates for broad inclusion-based measures for resource mobilization making a case for investment strategy that promotes inclusive growth across all regions in the state. Sakthivel and Sabyasachi (2007) analyses the impact of pro-market reforms on regional inequality in India, both at the aggregate and the sectoral level. The results show that regional inequality in India remained largely unchanged during the 1980s and but rose dramatically after the adoption of the reforms. This is mainly because the per capita production from the industrial and services sectors showed convergence before the reforms and divergence afterwards. Kundu and Varghese (2010) has taken multiple parameters like income, consumption, poverty, employment, urbanization and migration to examine the factors responsible for India's spatial structure of growth and development. The study finds that during the past two-decade's i.e during the post globalization era the economic inequalities at the state level has been at a rise leading to higher regional inequalities. In a similar study focusing on regional inequalities at state level Majumdar (2005) observed that states like Kerala, Maharashtra and Himachal Pradesh have put up good performance in social and human development indicators; however, Kerala has not been able to convert its social development into economic progress. However, Gujarat, in spite of low Human Development, performed better in Per Capita Net State Domestic Product (PCNSDP). Dholakia. (2003) examined the trends in regional disparities in economic and human development over the two decades, and the direction of two-way causality between human and economic development. The structure of the relationship varies over time when human development indicators were the cause and per capita income was the effect, whereas, in reverse case, the relationship was found to be stable overtime. Ghosh (2012) examines regional inequalities in human development and their association with per capita income and per capita social sector expenditure. The results reveal that regional convergence in human development despite a divergence in real per capita income, indicating that the poor states, which have failed to catch up with the rich ones in terms of per capita income, however, managed to make up in terms of human development. The effects of the per capita social sector expenditure on human development are found to be stronger than those of per capita income. The study suggests that the strategy for improving various dimensions of human development by increasing the per capita government expenditure on social services would be more effective than the automatic improvement in human development resulting from the growth in per capita income. Majumdar (2007) try to look at the trends, patterns and regional dimension of human development in India through construction of alternate Human Development indices. The study suggested for greater role of the state in provisioning social infrastructure, particularly to the marginalized groups. Sangita Kamdar (2009) analyzed the regional imbalance in human development in Maharashtra, by measuring disparities across districts in the various regions of the state by using outcome-based indicators instead of indicators like education and health. The measure is termed as 'Human Development Backlog Measure' and is presented as a planned alternative to the present method of allocation of financial resources to remove regional imbalances. Banerjee, Arpita (2015), analyzed the trend and pattern of inequality in human development across states of India by formulating a human development index. The absolute beta and convergence test of human development index indicates a sign of convergence of human development across the states. Empirical analyses suggest that– inclusive government programmes would facilitate the process of human development by addressing the basic distortions in the level of human development in the economy. Kumar and Rani (2019), based on 2011 census data examined the regional disparities in social development in India using social development index (SDI) and also compares selected states

on the basis of human development index (1981, 1991 and 2001). The findings of the study confirm the northern–southern social developmental divide and the prevalence of huge disparities at district and states/UTs level in India. Yingru Li, (2012) explores china's regional inequality in human development by using spatial methods such as Moran's I and spatial regression models. The results reveal that the overall disparity in HDI declined in the country but at the same time, the spatial concentration in HDI increased and the multiple transitions determined the changing patterns of human development. Abdel-Samad M. Ali (2010) uses exploratory techniques such as global and local Moran indexes and Moran scatterplot maps to indicate the existence of spatial inequality in human development in Egypt and finds significant regional inequalities in human development.

Most of the studies examined the level of inequalities in human development however very few studies used spatial methods to assess the extent of inequality in human development. This paper uses spatial techniques such as mapping, Moran's index and cluster map to gauge the extent of regional inequality in human development in Karnataka. The importance of this study lies in application of the spatial techniques at the regional level, where in the empirical works are limited.

Methodology

Economic data is essentially spatial in nature and has received an increasing level of attention in recent years with the emergence of an impressing array of spatial econometric techniques. The current study investigates the spatial patterns in human development, it draws on the results of the spatial analysis on HDI and its sub-components comprising of health, education and income indicators. In order to capture the extent of spatial inequalities at sub-regional level, the district wise HDI data is drawn from Karnataka District Human Development Reports (1991, 2001 and 2014). The spatial inequality in human development and its components are evaluated by using Moran's Inequality index, LISA cluster map and LISA significant maps, performed in GeoDa an open-source software for spatial data analysis. Firstly, the study estimates the nature of spatial dependence in human development and its components by using Moran's I Index. Generally, the Moran's I index is employed to gauge the nature of spatial inequalities and it is estimated as follows.

$$I = \frac{n\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}(x_i-\bar{x})(x_j-\bar{x})}{\sum_{i-1}^{n}\sum_{j-1}^{n} w_i j \sum_{i-1}^{n}(x_i-\bar{x}^2)} \quad (1)$$

$$Ii = \frac{\sum_{i-1}^{n}\sum_{j-1}^{n} w_{ij}(x_i-\bar{x})(x_j-\bar{x})}{s^2 \sum_{i-1}^{n}\sum_{j-1}^{n} w_i j} \quad (2)$$

where, n is the total number of regions; w_{ij} is a spatial weight, x_i and x_j are the attributes of the region i and region j respectively, $\bar{x} = \sum_{i=j}^{n} x_i$ is the average of the attributes; $s^2 = \frac{1}{n}\sum_{i=j}^{n}(x_i - \bar{x})^2$is the variance of the attributes. With a null hypothesis of no spatial autocorrelation, the probable value of I is given by E (I) =-1/(N-1). If the computed Index (I) is larger than the expected value, then the overall distribution of the attribute is characterized as a positive spatial autocorrelation and if it is less than the expected value, it is characterized as negative spatial autocorrelation. Positive spatial autocorrelation occurs while similar values cluster together and negative spatial autocorrelation occurs when dissimilar values cluster

together (R. Niranjan.2020). In general, the Moran's index is a global correlation coefficient, where a value of 0 would indicate no spatial correlation and a value of 1 indicates spatial dependency or correlation. The benefit of applying Moran scatterplot is to compare the spatial distribution of an attribute around its local mean (Abdel-Samad M. Ali 2010).

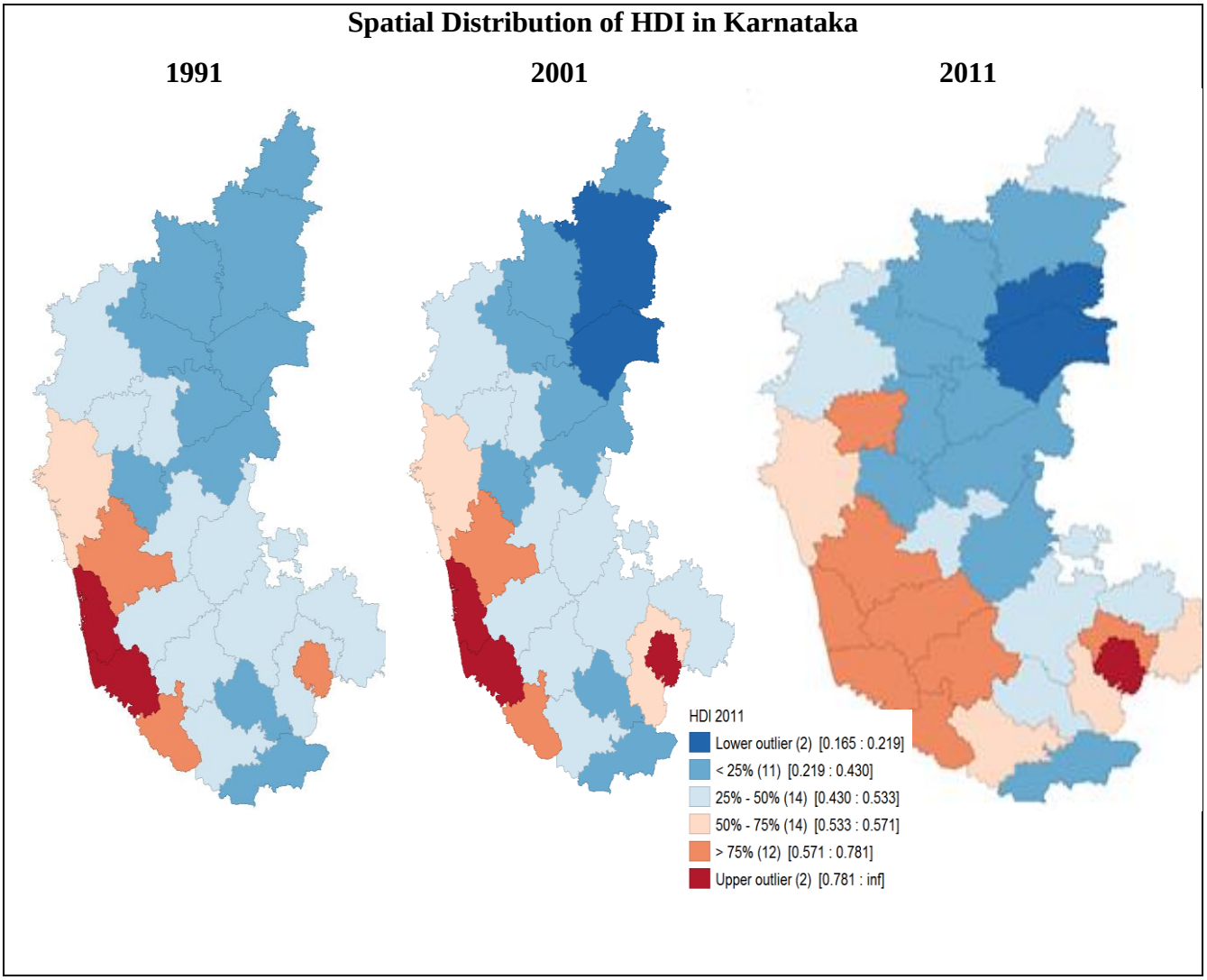
Secondly, Local Indicator of Spatial Association (LISA) cluster map is used to identify each observation of the coefficient of local indicator of spatial autocorrelation. The LISA for each observation gives an indication of the level of significant spatial clustering of similar values and the Sum of LISAs for all explanation is comparative to an overall indicator of spatial autocorrelation (Anselin, 1995). The LISA cluster map shows whether the variables in a definite location has high-high cluster rate, high-low cluster, low-high cluster and low-low levels of cluster relationship with the same variable in the clear location (Niranjan, 2020). It is clustered in four quadrants named quadrant 1 for high-high regions that has a highest coefficient of LISA surrounded by another highest region (Positive or Positive). The quadrant 2 shows High-Low regions that has high coefficient of LISA surrounded by low coefficient of LISA (Positive or negative). The quadrant 3 for Low-Low region that has low coefficient of LISA surrounded by low coefficient of LISA (negative or negative) and the last quadrant 4 indicates Low-High region that has low coefficient of LISA surrounded by high coefficient of LISA (negative or positive). In other words, LISA cluster map indicates significant local spatial correlations, LISA statistics allows to determine local areas of influence i.e, areas that exert significant influence on overall map trends. LISA stats are similar to Moran's I in that they represent either positive or negative association with each other. LISA uses the Monte Carlo procedure to compare the actual data values across space to that of randomly generated and distributed data values.

Results and discussion

The spatial analysis[6] of the pattern of human development in Karnataka for the period 1991, 2001 and 2011 is shown in fig 2. It is observed from the figures that the districts of Northern Karnataka region, particularly the districts that are under Hyderabad-Karnataka region have low levels of human development during the study period. The district bordering Maharashtra and west coastal districts have moderate to high human development. However, except few districts such as Chamarajanagar and Mandya districts, rest of the districts of south Karnataka have medium to high human development patterns. Similarly, in south, the coastal districts such as Udupi, Dakshina Kannada consistently have high human development. In general, at the state level it can be assessed that, lower human development is significantly concentrated in North Karnataka and medium to high human development in South Karnataka. The figure 2, presents the spatial distribution of HDI in Karnataka, in 2001 the HDI value varied from 0.543-0.609 for twelve districts and seven districts have a higher value ranging from 0.653 - 0.719 values. In 2011, the pattern of human development varied significantly with low HDI values ranging from 0.165 to 0.219 for two districts, and remaining districts with high (twelve districts) to medium (fourteen districts) HDI values hovering from 0.571-0.761 values. The position of the Yadgir, Raichur and Kalaburagi continue to be the lowest over the period. In addition to the spatial mapping of HDI the study estimated the spatial inequality index: the Moran's inequality index to gauge the extent of inequality in human development in the state. The figure 3 shows the Moran's scatter plot for HDI and its sub-indicators such as Income, health and education.

[6] Refer figure-1 for district labels on spatial distribution, LISA cluster and significance maps on HDI.

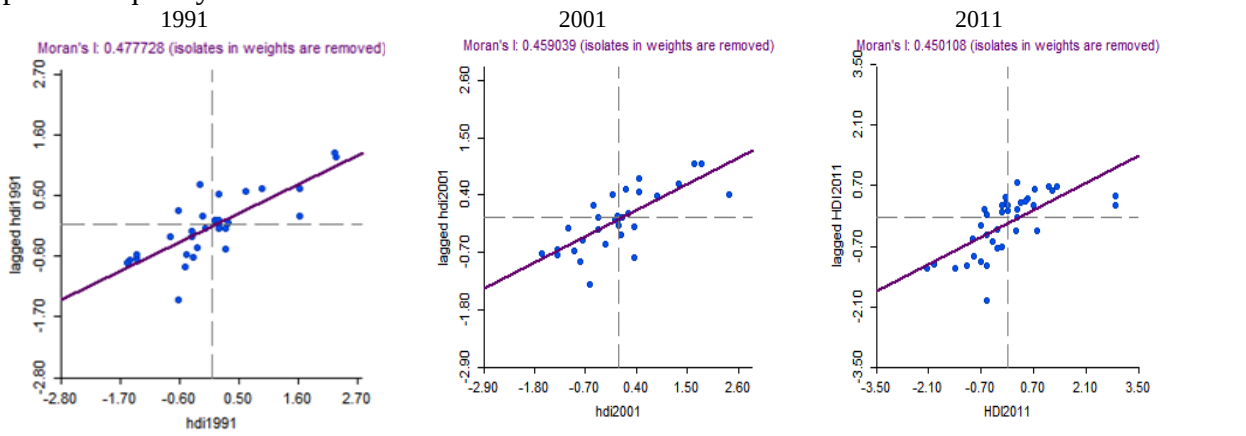
Figure 2: Spatial Distribution of HDI in Karnataka



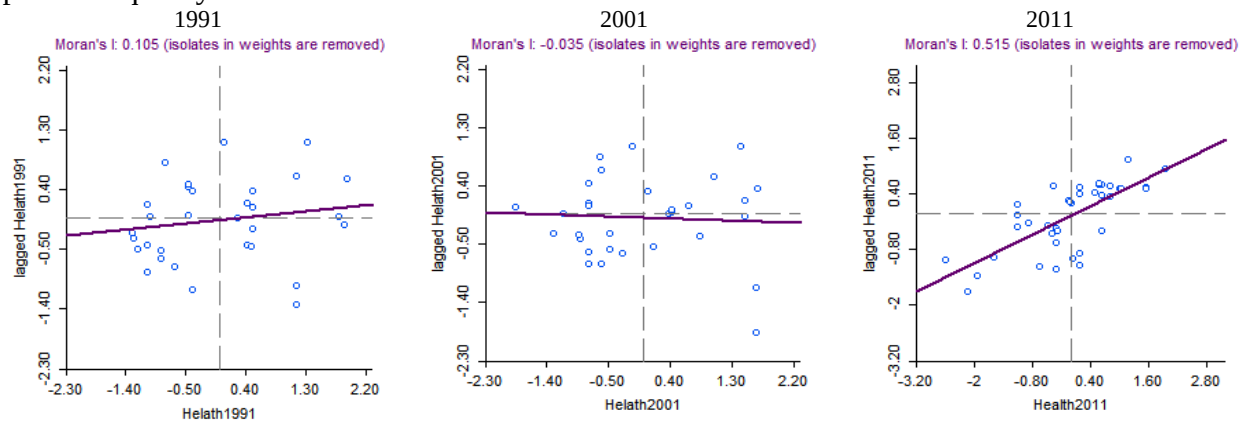
Source: Authors work by using Geoda.

Figure 3: Moran's Inequality value for HDI and its Components

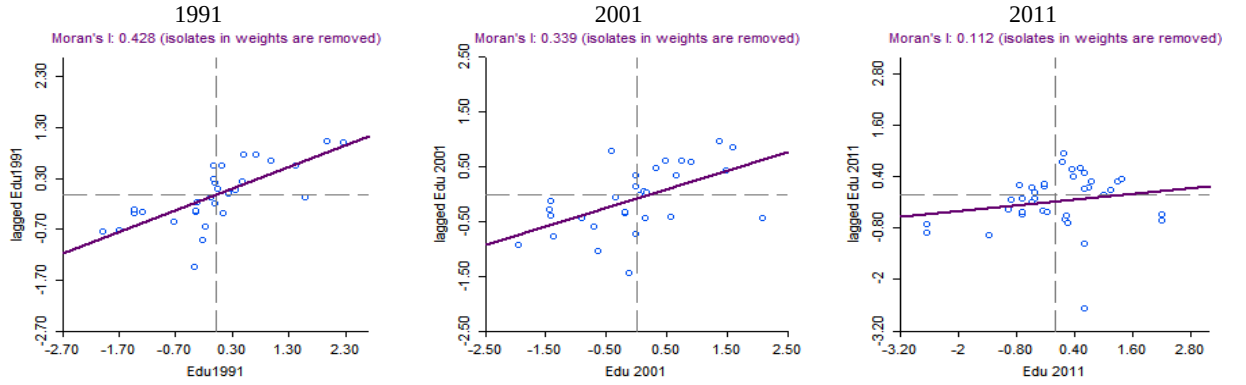
Spatial Inequality in HDI



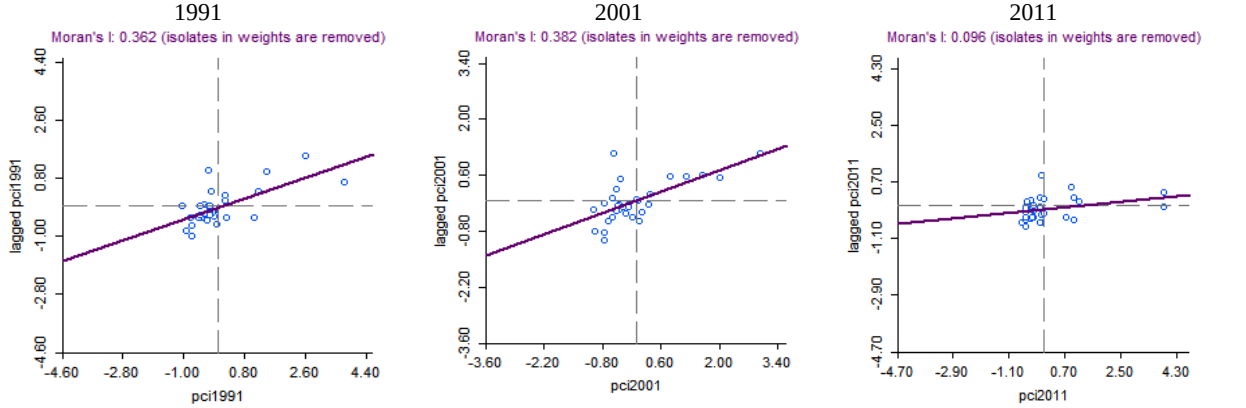
Spatial Inequality in Health



Spatial Inequality in Education



Spatial Inequality in Income

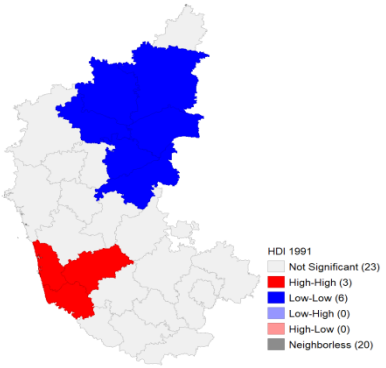


Source: Authors work by using Geoda.

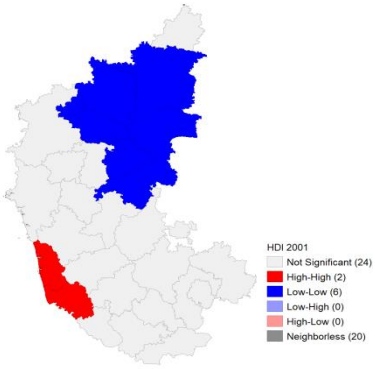
Figure 4: LISA Cluster Map of HDI and its Components

LISA Cluster Map- HDI

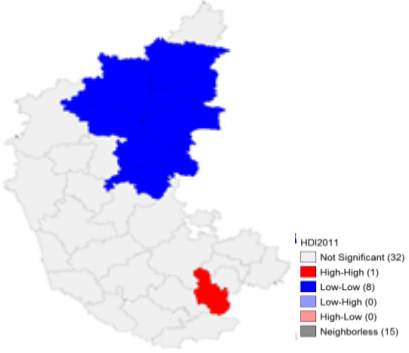
1991



2001

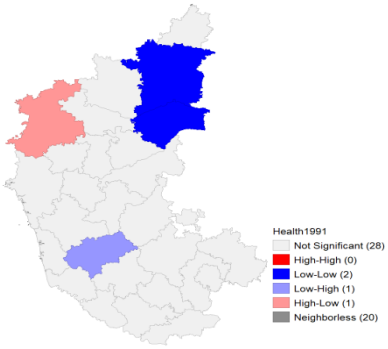


2011

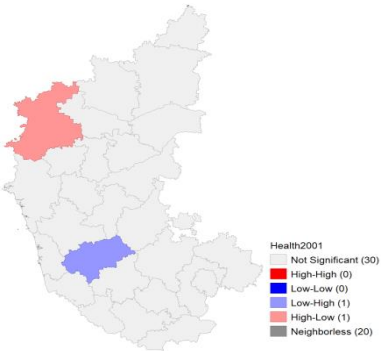


LISA Cluster Map- Health

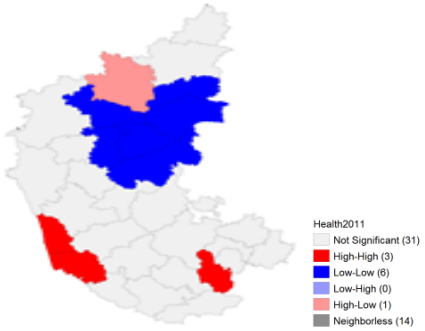
1991



2001

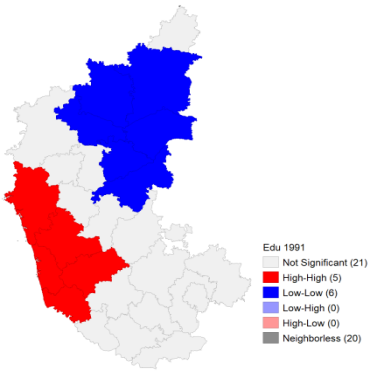


2011

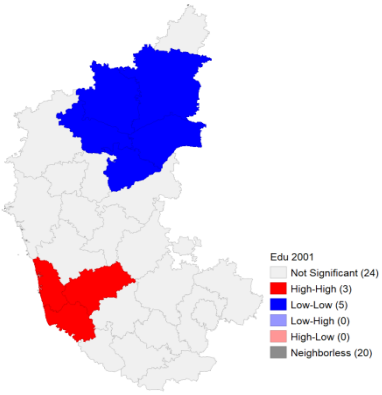


LISA Cluster Map - Education

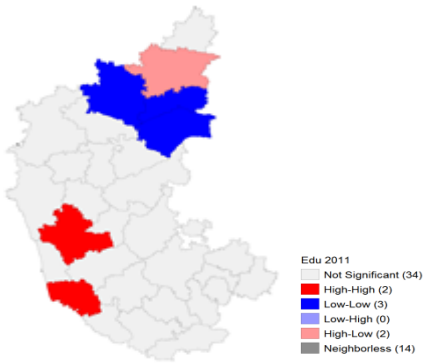
1991



2001

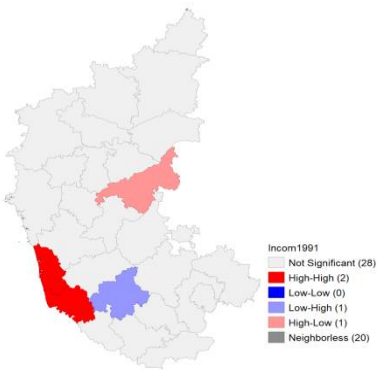


2011

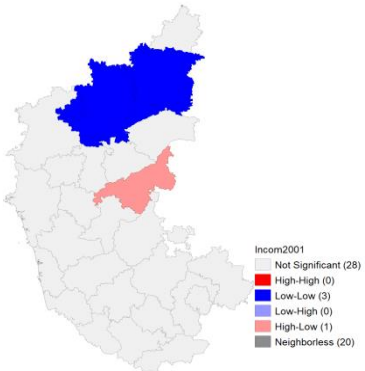


LISA Cluster Map - Income

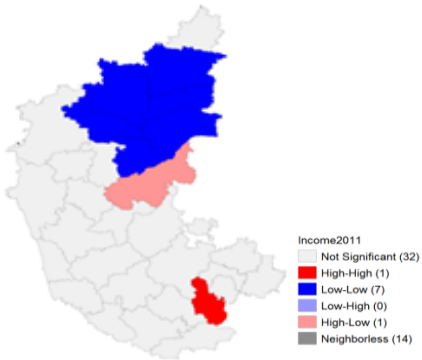
1991



2001



2011



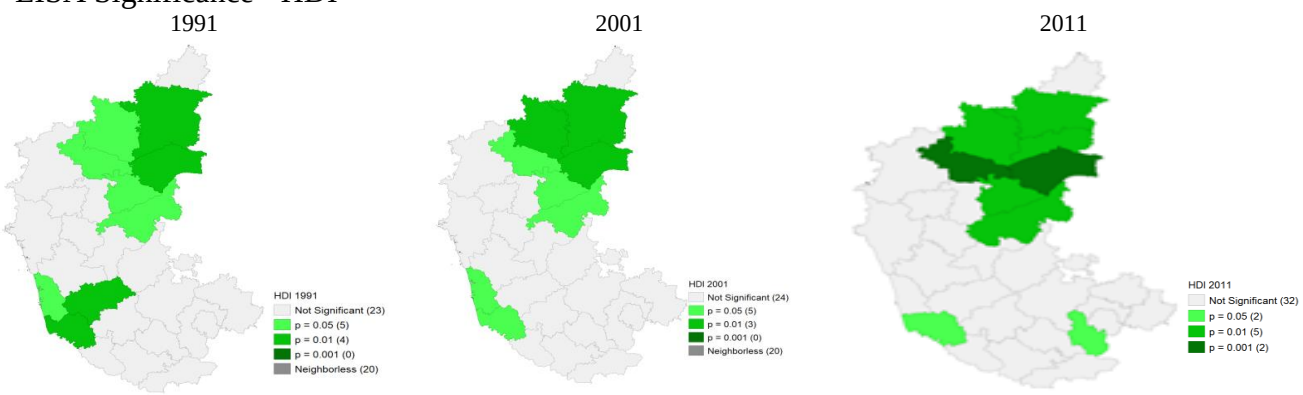
Source: Authors estimation by using Geoda

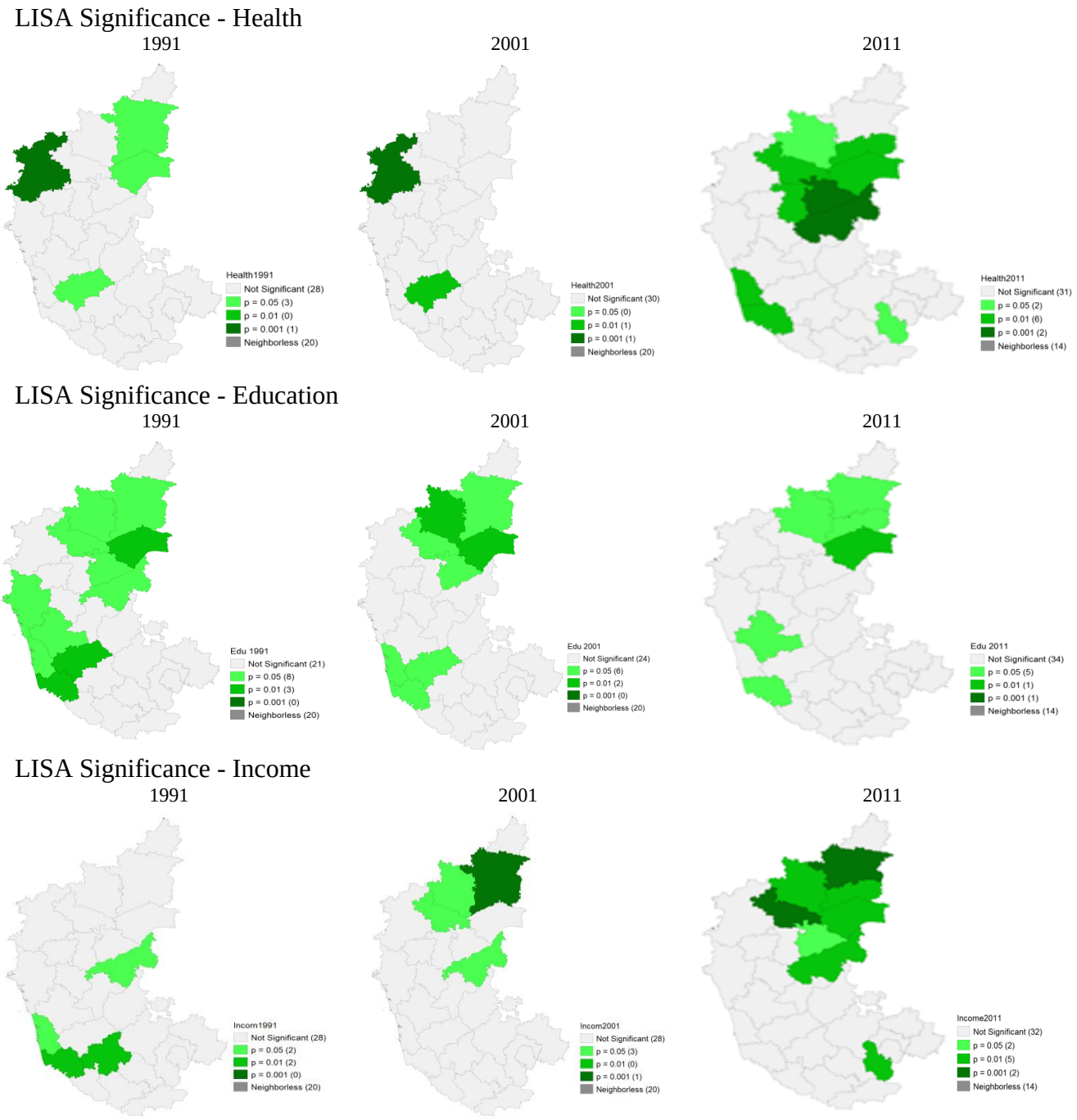
In the figure 3, the purple line represents regression line and it is fixed through the points, the Moran's Inequality value on HDI shows decreased spatial dependence in the human development from 0.477 in 1991 to 0.459 in 2001 and subsequently Moran's Inequality index decreased to 0.450 in 2011. The overall trend for spatial inequality in the human development has declined significantly in Karnataka. However, the spatial inequality in sub-indicators of human development shows interesting aspects. Firstly, the Moran's index on income indicator shows an overall converging pattern where in the spatial inequality in income increased marginally over the period from 0.362 in 1991 to 0.382 in 2001 and thereafter significantly declined to 0.096 in 2011.

In fig 4, in the LISA cluster map, the red color shows regions where high HDI value cluster with high HDI values and blue shows where low HDI values cluster with low values. Over the period in 1991 the spatial distribution pattern of income is characterized by the persistence of both high-high cluster (2) districts and low-low cluster (0) districts, low-high cluster (1) and high-low (1) clusters, and then in 2011 high-high cluster (1) districts and low-low cluster (7) districts, low-high cluster (0) and high-low cluster (1), shown in fig 4; however, the pattern is dominated by low-low district clusters. The general sub regional trend on income shows that districts such as Bangalore, Dakshina Kannada, Kodagu, Udupi, Ballari, constitutes high income clusters whereas the districts such as Bidar, Koppal, Yadgir and Gulbarga fall in low-low-income clusters. This pattern is explained in fig 5, in the LISA significant maps, which indicates the significance level of clusters. The green color shows the significant clusters with 0.05 and 0.001 percent level and the white color indicates the insignificant clusters in human development in the state.

Similarly, the Moran's value for the health index shows that the spatial inequality in health declined from 0.105 in 1991 to 0.035 in 2001. However, the post 2001 the Moran's value on health increased significantly to 0.105 in 2011. The spatial inequality in health indicator has increased drastically with an increase in Moran value by 0.48, as shown in fig 3. The spatial clusters in health indicator are shown in fig 4, where in it is clear that the low-low district clusters have increased significantly from 1991 to 2011 and over the period it is prevalent in Hyderabad Karnataka Region. Lastly, the Moran's value for the education indicator shows that the spatial inequality in education declined from 0.428 in 1991 to 0.339 in 2001 and it has declined significantly to 0.112 in 2011. The spatial clusters in education indicator are shown in fig:4, where in it is clear that low-low clusters have declined significantly from 1991 to 2011 and it is still marginally with low – low (3) district cluster prevalent in Hyderabad Karnataka Region.

Figure 5: LISA Significance Map of HDI and its Components





Source: Authors estimation by using Geoda.

Finally, the figure 5, presents that there is statistically significant result for the whole research area, however only some tracts, particularly the district of the northern part of the state shows significant clustering in Human Development and its sub-indicators. It is observed that the districts of northern Karnataka, particularly the Hyderabad-Karnataka region have low levels of human development. The spatial inequality in HDI in general and its attributes such as health, education in particular are due to inequality in access to these basic amenities. There exist serious gaps in the levels of and access to the basic facilities across regions, socio-religious groups and households falling in different income and asset brackets hindering human development (Kundu, A., Mohanan, P. C., & Varghese, K. 2013). Hence improved access and services of health, education and other deprivations at micro levels reduce spatial inequality and hence improve human development.

Conclusion

The present study investigates the trends and patterns of spatial inequality in human development, it draws on the spatial analysis on HDI and sub-components comprising of health, education and income indicators. The pattern of human development in Karnataka is assessed for the period of three decades. The spatial inequality in human development and its components are evaluated by using Moran's Inequality index, LISA cluster map and LISA significant maps. The study finds that the overall spatial inequality in human development has declined, however the spatial concentration in HDI has seen an increasing trend in Karnataka. It is observed that the districts of northern Karnataka, particularly the Hyderabad-Karnataka region have low levels of human development. Improved access and services of health, education and other deprivations at micro levels reduce spatial inequality and hence improve human development, in the state.

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