DEVELOPMENT PERFORMANCE OF INDIAN STATES IN A MULTI-DIMENSIONAL FRAMEWORK: A Study of Inter-Linkages among Dimensions and Clusters of States

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DECLARATION

I declare that the dissertation entitled "**DEVELOPMENT PERFORMANCE OF INDIAN STATES IN A MULTI-DIMENSIONAL FRAMEWORK: A Study of Inter-Linkages among Dimensions and Clusters of States**" submitted by me for award of the degree of **Master of Philosophy** is my own work. The dissertation has not been previously submitted for any other degree of this University or any other university.

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CERTIFICATE

We recommend that this dissertation be placed before the examiners for evaluation.

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Chapter 1

Introduction

1.1 Background

The main objective of Economic Development is to improve human well-being. As well-being is a multidimensional concept, to evaluate the development experience of a country we need to take into account various aspects of development. While previously material prosperity was thought to be the sole component of economic development, now it has been widely recognised by the experts that income is not a measure which alone captures the well-being of nations. Economic development cannot be confined to material prosperity alone and many different aspects of life, such as education and social connectedness, are also important determinants of human wellbeing. Taking income as the sole dimension of human well-being ignores other dimensions of development which people value. There has been a growing discontentment among academics, ordinary citizens, politicians and policymakers regarding the emphasis on GDP as the sole measure of development. Though the recent years have seen interest among academicians about material prosperity as inadequate indicators of progress, there has been always scepticism from the inception of GDP about its suitability as a measure of human wellbeing. The pioneers of GDP has also cautioned against its use as the main indicator of social progress. For instance, Kuznets acknowledged that economic indicators were but one aspects of citizens' wellbeing, and that "the welfare of a nation can […] scarcely be inferred from measurement of national income" (Kuznet, 1934 p.7).

Many studies have emphasized the limitations of GDP, even in its adjusted form, in truly reflecting human wellbeing. Most recently, the Commission on the Measurement of Economic Performance and Social Progress (CMEPSP), generally referred to as the Stiglitz-Sen-Fitoussi Commission (2009), stressed on the drawbacks of GDP as a proxy for human wellbeing for a diverse set of reasons. For instance, many determinants of human wellbeing such as health, social networks and quality of institutions are non-economic in nature. Similarly an important aspect of human life is social relations. Interaction with social and natural environment affects human wellbeing. These interactions are not reflected in GDP figures. The methods of GDP calculation are also problematic. The sale of antidepressant medications because of divorce raises GDP while

it actually reduces the wellbeing of people. So it is important to take into account other factors that contribute to people's wellbeing along with GDP.

Recent years have seen attempts to incorporate the non-economic aspects of human well-being. HDI developed by UNDP is one of such attempt. Even so as HDI only takes into account income, education and health measures, it is, in a sense, limited and not so comprehensive. Countries like Norway which have high HDI score, but perform poor if sustainability is taken into account. There have been many efforts to extend HDI by taking account sustainability (Happy planet Index), Civil liberties and political rights (Dasgupta and Weale, 1992) and income inequality and uncertainty of future income (Osberg and Sharpe, 1998). According to Fleurbaey and Blanchet (2013) increasing availability of international data and the increasing dissatisfaction of citizens with official statistics the reason for big advancements in the formulation of alternative measures of economic and social progress.

In many countries such as UK, Bhutan, France etc. there has political willingness for giving prominence to dimensions other than material prosperity. Even Government of Indian state of Madhya Pradesh (MP) has a department of happiness[1].

Looking at global experience, different countries have adopted different strategies to promote economic development. For instance, Japan, China and East-Asian countries promoted economic growth as an instrument of development, while Nordic countries placed greater importance on reducing inequality. As Dreze and Sen (2013) has emphasized, in some regions (like the state of Kerala in India) state action in human capital in the form of education, health and other dimensions of social welfare not only reduced poverty but also vitalized a new source of growth.

According to Stiglitz, Sen and Fitoussi commission report (2009), economic development not only depends on material prosperity but also on various non-material aspects such as health, education, sustainability, social connectedness, social and economic securities, and political voice. They have emphasized the importance of each of these dimensions when it comes to economic development. For instance, political voice is an important factor for promoting political stability, without which there will be large incidences of crime, chaos and disruptions and elite capture of power. Similarly not only achieving

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[1] https://economictimes.indiatimes.com/news/politics-and-nation/the-pursuit-of-happiness-in-shivrajs-madhya-pradesh/articleshow/62888305.cms

economic development is important, it is also equally important to have sustainable development so that future development is not jeopardized for current well-being. Likewise, economic insecurity is an important factor influencing bearing on health, education and environmental sustainability.

While it is important to recognize that all these dimensions are essential for economic development and should be pursued equally, but there are many trade-offs involved. All dimensions may not necessarily move together − improvement in one dimension may reduce (or increase) achievements in other dimensions. For instance, in a country with a low level of development, a rise in GDP may degrade its environment or an improvement in health can reduce its per capita income by increasing the size of its population. Therefore, policies to promote economic development will depend on the nature of relationships that exist among different dimensions of development. For example, if economic growth is accompanied with severe environmental degradation, policy towards stronger environmental regulation, even if it limits economic growth, may be justified.

While India's growth experience in recent decades has been impressive, its achievements on poverty reduction, health & literacy have been a matter of debate (Bhagwati and Panagariya, 2013 and Dreze and Sen, 2013). India's progress as a union of states depends ultimately on the performance of Indian states in terms of a broad set of development parameters. This is the key focus of our study. We adopt a multidimensional view of development. We also try to analyse the inter-linkages and trade-offs among different dimensions of development, as evident from the experience of the Indian states. Finally, we intend to cluster Indian states according to their development performance across all dimensions.

1.2 Definition and Rationale and Scope of the Study

Given that economic development is a multidimensional concept; our objective in this study is to understand the development performance of Indian states. In a federal structure, states may have divergent policy goals and strategies and accordingly they may end up with divergent performance across various dimensions of development. Ray et al (2018) measure the development performance of Indian states in a multidimensional framework. They have captured the relative performance of all states with respect to eight dimensions of development specified above. We intend to use this measurement to analyse the inter-linkages and trade-offs among various development dimensions. We

shall also undertake a cluster analysis to explore possible clusters of Indian states according to their development performance. We shall draw upon the framework developed in the new economic geography/ geographical economics literature in our analysis of clustering of Indian states w.r.t. their performance along multiple dimensions of development.

We will compare the predetermined grouping such as BIMARU states, Coastal states, resource endowed states with the result grouping by cluster analysis and observe the difference and similarities.

1.3 Research Questions and Hypotheses

The key research question that we address is whether states perform uniformly across all dimensions. More specifically, we pose the following questions in this study:

1) Given the multidimensionality of the concept of development, is it possible that a region performs well in some dimensions but poorly in others?

2) If so, what are the inter-linkages and trade-offs among different dimensions?

3) Finally, it is possible to cluster states according to similarity of their performance across different dimensions?

Our basic hypothesis is that, given the federal structure and socio-political and cultural heterogeneity among Indian states, their development experience will be divergent across dimensions. However, even within this diversity, we expect to arrive at common patterns of performance that we hope to explore through the inter-linkages among dimensions and clusters of states.

1.5 Method

We shall use the data on state level achievements in eight dimensions of development along with a composite index of development aggregating these dimensions, as measured by Ray et al (2018). Using these indices we shall use the following methods for our two sets of analyses:

(1) Inter-linkages and trade-offs among dimensions: Simple correlations and regression analysis

4

(2) Clustering: Cluster analysis

1.6 Chapters Schemes

The thesis contains five chapters. The introductory chapter contains the Background of the research. It includes definition, rationale and scope of the study, research questions and hypothesis and plan of the thesis.

In the next chapter we will review the various streams of literature related to our work. We will discuss the limitations of GDP. Then we discuss the relevance of multi-dimensional view of development from the point of view economics of Happiness. Happiness studies literature suggests that other than income good health, stable employment, human rights and marital status matter a great deal for human well-being. Then we discuss Stiglitz, Sen and Fitoussi commission report (2009) which is an attempt that proposed a framework for measuring progress of the society. This report among other things highlighted limitations of GDP, suggested ways of improving it, and emphasised issue of sustainability- present wellbeing is distinct from future wellbeing. We present a discussion on an attempt by Ray, Agarwal and Parameswaran (2018) to implement Stiglitz, Sen and Fitoussi (2009) in Indian context. Then we review the both theoretical as well as empirical literature on inter-linkages and trade-offs among the dimensions of development. Finally we present a review of literature on geographical economics and clustering which suggests that many of the dimensions including income and health may have spatial aspects.

In chapter 3 we use correlation and multiple regression analysis to explore the inter-linkages among the dimensions. Here we use development rank (DR) constructed by Ray, Agarwal and Parameswaran (2018) for both regression as well as correlation analysis. They have computed the ranks by using Kemeny's median ranking procedure which is non-compensatory, namely better performance one dimension cannot offset poor performance in other dimensions. In our correlation analysis we check inter-linkages and trade-offs using spearman's rank correlation method. As there are strong theoretical reasons for bidirectional causality, we use simultaneous equations procedure. Here we use the development rank (DR) constructed by Ray et al. (2018) as our endogenous variables. We here use Three stage least squares (3SLS) method for the purpose of regression analysis. We then discuss the results.

Chapter 4 entitled as "Clustering of States according to development performance" deals with the exploratory analysis of finding similarities of states. Here we use the composite index (DI) developed by Ray et al. (2018) based on compensatory aggregation using variance weighted geometric mean. By using K-means clustering method we try to find out meaningful clusters of states. Here states in the same cluster are more similar than those in different clusters. We also try to find out the geographical patterns from the clusters. By using cluster centres we discuss the performance of clusters of states across the indicators. Chapter 5 summarises the findings and concludes.

Chapter 2

A Review of Literature

Introduction

Over the last half-century, many economists have attempted to find suitable metrics for the measurement of economic development and social progress. To guide policy-makers about the observed level of economic activity, in the early 20th century, Simon Kuznets developed GDP. GDP has the advantage of being a single number which consequently gives a snapshot of the economy. From the very beginning, there have been serious doubts regarding GDP's suitability as a measure of development. Economic development does not depend on material prosperity alone; it also depends on various non-material aspects. Apart from material prosperity, human well-being depends on a range of other dimensions of development. To get a broader view of the performance of the economy, it is essential to see along with material prosperity, other aspects of development such as health, education, sustainability, social connectedness, social and economic securities, and political voice etc. It is also essential to see the interconnections that exist between these dimensions of development. Though all these dimensions are necessary and to be pursued equally for overall happiness of the citizens, there is a range of empirical and theoretical literature that suggests the trade-off between these dimensions.

Similarly, it is also important to cluster the states to find the commonality among the states. The clustering of states will enable us to discover whether there is a geographical dimension in development performance of states. There are many studies which argue that not only economic activities, but many other dimensions of development also have spatial implications. Before doing the analysis, we intend to do a review of literature in this chapter, focusing on the areas of limitations of GDP, the importance of multidimensionality of development, inter-linkages and trade-offs among the dimensions and economic geography.

The remainders of the chapter are structured as follows. The following section discusses the literature on limitations of GDP as a measure of welfare. Section 2.2 reviews evidence from happiness studies literature on importance of multidimensionality of development. Section 2.3 discusses Stiglitz, Sen and Fitoussi commission report (2009) and its

implementation in India by Ray et al. (2018). Section 2.4 presents literature on inter-linkages and trade-offs across dimensions. Section 2.5 discusses the literature on geographical economics and clustering. Section 2.6 concludes the chapter.

2.1 Limitations of GDP as a measure of social welfare

Gross domestic product (GDP) refers to the sum of market values overall of goods and services produced by residents of a particular country during a specified period (a year or quarter). Since its inception, general public, community of economists and in popular media, viewed it as a measure of the welfare of the society. Though construction of GDP as a measure of national income was a phenomenon of the twentieth century, Sir William Petty In 1665, for the first time introduced an estimate of a national income for England. In the in the last century, the idea got its present shape in the pioneering works of Nobel laureate Simon Kuznets. His works were instrumental in developing the concept of national income as a performance indicator of the whole economy. Before the invention of GDP in last century, policymakers were using stock indices, the volume of tax collection to track the performance of the economy. It expanded the scope of policymakers to diagnose the health of the economy.

Though now there has been controversy on GDP as a measure of national welfare, both by professional economists and ordinary citizens, GDP has been tremendously successful as a popular measure of national income. One of the most important reasons for its persistent popularity is its one-dimensional simplicity. The monetary valuation of goods and services makes it easier for adding quantities of different nature. As stated by Van den Bergh (2009) the impact of GDP information has been quite pervasive. It is used by economic agents such as firms, investors, consumers, Governments and central banks and in framing their decisions. So Governments invest a considerable amount of money and time in collecting the data for it. Official records document GDP widely. Politicians at opposition criticise the ruling party for not delivering on growth front. Again as tax collection is related to GDP, increased GDP implies increased tax collection. So politicians are enthusiastic about GDP growth. The instantaneous response of financial markets GDP growth figures reflects the private business policymaker's importance to GDP. The expectations of GDP growth determine the confidence of consumers which in turn determines Consumers' purchase decision. Central banks formulate their policies with reference to GDP and inflation. Again multinational organizations give considerable

importance to GDP figure. With multiple channels of interaction, this information on GDP becomes more reinforced and can have a potentially significant effect on the economy itself.

Though many economists and policymakers have given substantial emphasis on GDP as an indicator of the performance of an economy in their analysis and policy formulation, now-a–days many economists have severe doubts regarding its significance about effectiveness in capturing complex relationships and trade-off between present and future, work and leisure, inequality and growth, pollution and prosperity etc. Even those who pioneered the concept of national income did not suggest using GDP as a measure of well-being. In fact, among the others, Simon Kuznets and President Kennedy, who are pioneers of GDP accounting and prominent policymakers respectively, have warned against the use of GDP as a measure of national welfare.

The following are the major problems with GDP as a measure of national welfare.

2.1.1 Problem with Market Prices

When markets are competitive, and no externalities are there, GDP can be a measure of national welfare. In reality, prices might not exist for many products such as Govt. provided health care insurance, parental engagement in childcare etc. So the cases where price does not exist or distorted may make GDP more imperfect measure of economic progress.

As GDP does not take into account negative externalities, it violates Principles of proper accounting. Another shortcoming is that it covers the costs of the provision of certain public goods, such as national defence, even though it is evident that the costs may not reflect the benefits associated with these goods.

As a result of market failures, private goods imply divergence of private costs from social costs. With damages to the environment, private goods may not reflect the actual social costs. So GDP underestimates the costs of pollution and other forms of ecological damages. In presence of imperfect competition there are possibilities of firms gaining at the expense of consumers by indulging in unfair practices such as manipulating consumers' ignorance. While GDP captures the gains to firms, it does not capture consumers' loss.

Another shortcoming is that with imperfect information, it is difficult to value the prices of products truly. Behavioural Finance states that it is possible and likely that market values of financial securities may diverge from their underlying values and the stock market can show irrational exuberance. So with complex financial products, prices may not reflect all the available information.

2.1.2 Intertemporal considerations

According to Van den Bergh (2008), economics does not support GDP as an indicator of social welfare. The models used by optimal growth theorists use a theoretical notion of inter-temporal social welfare that is not the same as GDP type of criterion. For example, 2% growth rates per year may result after 1000 years, multiplying the current national income by 400 million times. But it is quite difficult to imagine that welfare can be increased to such an extent. So, more specifically, a positive correlation between GDP growths with perceived progress should not be confused with the idea that GDP (growth) is a good indicator of social welfare (progress) in general.

In the course of time, many goods disappear from the market, and the quality of existing goods undergoes significant changes. So when comparing GDP across time periods, the problems of constructing index number issue becomes a problem. GDP reflects averages consumption baskets for comparison. But with rising skewness of income distribution, consumption patterns become more heterogeneous. So GDP which is an average does not illuminate much in the presence of skewed income distribution.

2.1.3 Lexicographic preferences

It is impossible to trade off basic needs like food, water, shelter, respect, company, and freedom against consumption of luxuries. So, there is limited scope of substitution between broad categories of consumption. This is the core of the notion of lexicographic preferences, which is closely related to the idea of the Maslow pyramid in psychology. Within this framework, GDP growth and the associated rise in material consumption is an imperfect substitute for lack of fulfilment of basic needs, clean air and access to nature. GDP does not resolve the issue of substitution.

2.1.4 Formal and informal economy

GDP does not reflect the contribution of the informal economy. So the growth of GDP per se does not say anything about contraction or expansion of the Informal economy. It may be possible that GDP may be growing because of formalisation and but it may contract the informal economy. In developing countries share of the informal economy is substantial, and GDP growth in these countries does not reflect the structure adequately.

2.1.5 Crime and other bad good and regretables

GDP does not reflect costs of many negative goods such as crime, drug abuse and mental isolation and traffic congestions etc. which affect the well-being of people.

2.1.6 Income Distribution

The GDP per capita indicator portrays average income and neglects (changes in) the income distribution. But the unequal distribution of wealth and income indicates skewed opportunities and well-being. Also, because of operation of the diminishing marginal utility of income, individuals or households with low-income benefit relatively much from a rise in income. GDP fails to capture these results.

2.2 Happiness

As GDP as a measure of national welfare has been subject to much criticism, there has been an alternative approach which studies happiness as an alternative to GDP. Happiness, operationally defined as the overall satisfaction with the quality of life, has been verified to be a well-founded and reliable concept. It has the advantage of retest reliability, capable of comparison across countries and not a fixed trait by varying with changes in individual circumstances. A review of the literature on the economics of happiness suggests that discrepancies among income and other aspects of development can help us in better understanding the nature of development. This approach proposes that subjective well-being of people should be studied as one of the important indicators of development. Many policy-making agencies and Government organisations are using Happiness data to formulate policies that are helpful in improving the subjective well-being of the people. Researchers from economics of happiness literature suggest that apart from material prosperity many factors determine the happiness of individuals.

According to Frey and Stutzer (2002) happiness is determined by following factors.

"a) Personality factors, such as self-esteem, personal control, optimism, extraversion, and neuroticism.

(b) Socio-demographic factors, such as age, gender, marital status, and education.

(c) Economic factors, such as individual and aggregate income, unemployment, and inflation.

(d) Contextual and situational factors, such as particular employment and working conditions, the stress involved at the workplace, interpersonal relations with work colleagues, relatives and friends, and most importantly – the marriage partner as well as living conditions and health.

(e) Institutional factors, such as the extent of political decentralization and citizens' direct political participation rights."[2]

In many empirical studies, various factors are found to be shaping happiness. For instance, Graham (2006), Gerdtham and Johannesson (1997) and World Happiness Report (2012), Deaton (2008) found health to be one of the most important factors affecting subjective well-being. Similarly, more educated people are found to be happier. Educated people can cope better with life; they have better income and health which many ways affect the subjective well-being positively. Oswald (1997), Frey and Stutzer (2000) also found the significant impact of non-economic factors such as Education. Namazie and Sanfey (2001) and Lelkes (2002) document that in Kyrgyzstan and Hungary, among other things; education levels have stronger effects on self-reported levels of happiness, as in the more developed western economies. Though it is difficult to disentangle the impact of environmental pollution on happiness, there have been researches into the causal effect of environmental degradation, urban green space, high temperature, and noise, on the happiness of subjective well-being of Individuals. Another channel through which the increase in quality of environment affects happiness is through health. Sugiyama et al. (2008) in a case study of Adelaide, Australia, show those residents who report living in less polluted areas report better physical and mental health. Ferreira et al. (2013) in their study of air quality and life satisfaction in Europe found that SO_2 concentration has a negative impact on the subjective well-being of Europe. In a case

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[2] Frey and Stutzer (2002), p.10-11

study for China, Zhang et al. (2017) found similar results in the sense that air pollution reduces happiness and increases the incidence of cases of depression among the people.

Similarly, many studies which have focused on the effect of social capital on alternative measures of happiness find that social connections have a significant effect on subjective well-being (Helliwell and Putnam, 2004). Durkheim's finding that suicide rates are lower in the countries that have more extensive social links and have the dominance of highly communitarian religion still holds the test after one century (Haidt, 2006). Helliwel (2004) empirically document the advantageous effect of social connections on prevention of suicides. Similarly, from cross-country studies, it is found that factors like unemployment and inflation which constitutes economic insecurity have also negatively affect alternative measures of happiness. Frey and Stutzer (2000) also see the quality of governance and human rights positively influence happiness.

It is thus evident from the economics of happiness literature that development does not depend on material prosperity alone. One should take a holistic view when assessing the development of a particular country, state or region. Such an approach was comprehensively discussed by the Stiglitz, Sen and Fitoussi commission and the report is reviewd in the next section.

2.3 Stiglitz, Sen and Fitoussi commission report (2009) and its implementation

While GDP and associated measures of national income were initially intended to measure market economic activity, later they were presumed to be measuring social well-being. Though previously many economists suggested about the limitations of GDP and the need for a multidimensional approach for measurement of economic and social progress, Stiglitz, Sen and Fitoussi commission report (2009) is one of the major intellectual efforts which comprehensively studied the flaws of GDP and suggested the broadening of the scope of traditional indicators. President of France Nicolas Sarkozy constituted the Commission on the Measurement of Economic Performance and Social Progress in 2008 to test whether GDP- the extensively used metric of economic activity truly reflects economic and social progress and to lay- out an agenda for developing more useful indicators. The report provided a stimulus to the debate on the measurement of well-being not only to the scholarly community but also it generated interest on the

relevance of going beyond GDP to policymakers, politicians and the general public. The report has a considerable impact on policymaking both at the national and supranational level. OECD countries and European Union has shown interests in developing suggestions on economic development and social progress based on the recommendations of the report. The report analyses the main ideas and suggestions that have put forth in recent decades regarding measurement of economic growth and development, wellbeing and sustainability. The members of the commission covered various issues regarding the development of different statistical indicators for the well-being of the society. In the report, the authors suggest that GDP neither measures income nor measures well-being. So the obsession with GDP presents a highly distorted view of the economy. They highlighted the pitfalls of using flawed statistics which lead to erroneous inference. For instance, in time global financial crisis instead of using growth as an indicator if the policymakers have taken into account the increased household debts, then they could have found a different picture of the economy. They recommend that focus should shift from per capita figures to household income and consumption measured jointly with wealth. They offered various suggestions about corrections required to be on GDP to make it a meaningful indicator. So the authors suggested the need for developing the more holistic indicators of progress. They highlight the disconnection between the projections of official indicators and how the people perceive their lives. Similarly, they draw special attention to the importance, and role leisure and other noneconomic activities which positively influence the well-being of people. They have given many suggestions to develop new metrics that take things like education, health, environmental sustainability and gender equity into account. They discuss the role of income distribution, happiness and various ways to account for sustainability. The report argues that sustainable development is a process which emphasises on not only economic development but also ecological and social dimension as well. It highlights that social connectedness is essential for the vitality of the society. The authors suggest in addition to material prosperity, education, health, personal activities including work, governance and political voice, social connections and relationships, both present and future environment and economic and personal insecurities are important for economic development and social progress.

2.3.1 Implementing Stiglitz et al (2009) for Indian states

Ray et al (2018) and Ray et al (forthcoming) attempted to implement the multidimensional conceptualisation a la Stiglitz et al (2009) and developed a holistic measure of development in context of Indian states. They use the key generic dimensions identified by Stiglitz et al (2009) - material prosperity, health, education, personal activities, political voice and governance, social connections, environmental conditions, personal and economic security- as a broad template to design their measure in a context specific manner. They conceptualised development along three major components:

A. Human Development, encompassing material prosperity, health and education

B. Voice and Confidence, encompassing political voice and Governance as well as Social connections and networks

C. Security, encompassing three important dimensions of human security-personal (physical), economic, environmental.

While drawing up a list of possible indicators, they made clear distinction between input, output and processes, as it is inappropriate to club all three together into a common measure. First they list out ideal indicators to capture each of these dimensions, followed by a discussion of list of feasible indicators that can be constructed. In doing so they used three principles-(1) considered in outcome variables, (2) drop variables that are highly correlated with another one, as it adds precious little extra information, (3) drop variables for which consistent and comparable data is not available for all major states of India. They choose to use Kemeny's median ranking procedure which is non-compensatory, namely better performance in one dimension cannot offset poor performance in some other dimension. Kemeny's median ranking allows them to arrive at a ranking of states that reflect their ranking on multiple dimensions of development-the development rank (DR). To perform a sensitivity analysis to ascertain how sensitive is the ranking of states with respect to principle of non-compensatory aggregation, they also constructed a composite index (DI) based on compensatory aggregation, using variance weighted geometric mean.

For our study we used both DR and DI for our analysis of inter-linkages and clustering (DI), presented in chapters 3 and 4 respectively.

2.3.2 Brief descriptions on dimensions of Development

We present a brief description of each of the eight dimensions here.

Material prosperity is a very important dimension of quality of life. Many studies such as Fleurbaey and Gaulier (2009) and Jones and Klenow (2016) found that the correlation between economic welfare and GDP are very high. Apart from income, wealth and consumption as proposed by Stiglitz et al (2009), Ray et al. (2018) considered many other parameters. They constructed the index for material prosperity using the following eight indicators: (1) Per capita income, (2) Household assets, (3) Share of non-food items in monthly per capita consumption expenditure, (4) Per cent of households having pucca or semi pucca houses, (5) Percentage of households having access to safe drinking water, (6) Percentage of households having latrines in their premises, (7) Road density and (8) Non-BPL population.

Knowledge and education constitute another important dimension of development which affects many other dimensions such as health, economic growth, political voice etc. They have captured it by two indicators such as (1) Percentage of graduate population, and (2) Learning outcome.

Health is not only important for economic development as an instrumental worth as a component of human capital but it is an end in itself. It is captured by (1) IMR, (2) Prevalence of illness, (3) Percentage of children fully immunized, (4) Vitamin supplementation.

Political voice refers to participation in political discourses and public policy making, and to express dissent. It also incorporates a corruption-free governance structure, devoid of biases, to ensure individual's rights and freedoms irrespective of class, caste, gender, race and other considerations. They have constructed this dimension of political voice and governance by the following variables (1) Voter turnout, (2) Women's political participation, (3) Ratio of court cases pending to court cases disposed.

Social connections is broadly the measure of people's connection, interaction with each other. At level of individuals, social connections involves the quality and quantity of connections individuals have with other persons in a social circle of family members, staff or employers. In a broader sense it also refers to going beyond one's community and bridging relationship with other communities. The variables Ray et al. (2018) considered

for measuring dimension of social connections are (1) Marital Stability and (2) Suicide rates.

Personal security is a dimension of development that entails security from all risks that may potentially violate their physical integrity. These risks include external factors like crime, violence, accidents, and natural disasters. The authors included the following three variables in constructing this dimension: (1) Crime rates, (2) Dowry deaths and (3) Deaths due to road accidents.

Economic insecurity is concerned uncertainties pertaining to job loss (unemployment) and wage cuts, income uncertainties in certain occupations (like agriculture), provisions for old age, illness etc. – all of which can drastically reduce quality of life. The authors of Ray et al. (2018) constructed this dimension by using the following four indicators: (1) Unemployment rates, (2) Dependence on agriculture, (3) Informal sector workforce, and (4) Debt free households.

Finally, environmental conditions constitute a key dimension of quality of life as humanity
will not be able to sustain itself unless mother earth is protected and nurtured. According to Ray et al. (2018) Better environmental conditions contribute to life quality in many ways – clean air, water and surroundings positively contribute to the health and well-being of the people. It will also have a long term impact on climate. Ray et al. (2018) measured environmental conditions through (1) Forest cover and (2) Water treatment.

2.4 Inter-linkages and trade-off across dimensions of development

Though the dimensions of development are distinct, there are many theoretical reasons which entail that these dimensions are not independent of one another. Similarly, many empirical studies also document various observed links between these distinct dimensions of development. These trade-offs and interlink-ages are important for understanding for formulating effective policies. For example, Environmental Kuznets Curve Hypothesis suggests that there is a non-linear relationship between income per capita and environmental degradation depending on the stage of development of a particular economy. If environmental degradation is accompanied with rising material prosperity, then policy choice may be to curtail growth, on the other hand, if the rising material prosperity is associated with improving environmental quality, then policymakers may

consider growth-enhancing policies. Similarly, if improvements in educational quality can help in sustaining long-run economic growth and improvements in health, then policymakers should prioritise the strategies which can help in improving educational quality. So understanding the interlink-ages is important for effective policymaking.

Often the observed empirical relationships may not imply causality, but it is useful to look how various dimensions of development may be moving together positively or negatively. In this section, we present literature on the postulated relationship between various dimensions of development.

2.4.1 Education and material prosperity

The relationship between education and material prosperity both in individual level and social level has been widely studied and debated. For long there has been extensive debate among academic community regarding the usefulness of education in driving national prosperity.

In labour economics, it is documented that there has been a significant impact of education on individual earning outcomes (Becker, 1962 and 1964). Mincer wage equation (Mincer, 1974) specifies the relationship between wage income and schooling and experiences. In the following specification $\log y = \alpha + \beta educ + \delta_1 exp + \delta_2 exp^2 + u$, here β represents the rate of return to education. The correlation between u and Educ is called ability bias. Strictly speaking, u may or may not relate to ability and determinants of earning may be related to u. Many studies found that the returns to an additional year of education are only between 6-10 per cent.

The evidence from mincer earning model is represented as private returns to education. Social returns to education can be less or more. Typically social returns are expected to be more than private returns because of effect of education on crime (Lochner and Moretti, 2004), fertility, health (Currie and Moretti, 2003), improved citizen's participation in the democratic process (Dee (2004) and overall growth and productivity of the economy.

There many intuitive reasons for expecting a link between economic growth and education. First of all the increased standard of living which is observed in developed countries is not found in illiterate societies. Secondly, as discussed above if higher learning for individuals contributes towards theirs earning, why the same won't be observed in countries which are the majority of people are poor.

According to theoretical literature on economic growth, there are several mechanisms by which education affects economic growth. Firstly, according to Mankiw, Romer, and Weil (1992) education enhances human capital inherent in the labour force, which increases the productivity of labour and thus leads to higher level of output. Second, as proposed by Aghion and Howitt (1998), Lucas (1988), Romer (1990), etc. education stimulates the innovative abilities of nations by increasing new knowledge on novel technology, products, and processes. Third, it can promote the diffusion and transmission of knowledge which is required to process the knowledge and technology developed by others, which again promotes economic growth (Benhabib and Spiegel, 1994; Nelson and Phelps, 1966). Fourthly according to Boumol (1986), education and associate human capital help in facilitating global technology transfer from R&D intensive countries to developing countries through which it helps in convergence.

Despite the theoretical prediction regarding the effect of education on economic growth, the empirical results have been mixed in this regard. Early studies following Barro (1991, 1998) and Mankiw et al. (1992), most of the literature on cross-country growth report a significant positive correlation between quantitative measures of schooling and economic growth. It turns out that primary education is the most significant factor in explaining economic growth (Sala-i-Martin et al. (2004)).

Still, the interpretations of such results are debated. An important debate has been taken place whether it is the level of years of schooling as predicted by endogenous growth frameworks or the change in years of schooling predicted by basic neoclassical growth models is the more important driver of economic growth. Barro and Sala-i-Martin (2004) and Benhabib and Spiegel (1994) report a positive effect of levels of education on growth but not of the effect of changes in education on economic growth. Further pieces of evidence suggest that both levels and change are associated with higher levels of economic growth (Gemmell (1996); Krueger and Lindahl (2001); Topel (1999)).

Similarly, in empirical studies, another important issue is the importance of specific mechanism is for growth. Though it is difficult to disentangle the respective effects, it is found that education is found to be important both as an investment in human capital and research and development. At lower levels of educational attainment, additional education is also important for imitation while higher education is important for innovation (Vandenbussche et al., 2006).

Many scholars raise caveats regarding results from such studies. For example, Bils and Klenow (2000) argue about the importance of reverse causality running from higher economic growth to additional education. Similarly, there are many scholars such as Pritchett (2001, 2013) who raise scepticism over the contribution of education towards economic growth. According to Pritchett (2001) while the developing countries have experienced the rapid progress in schooling growth-enhancing effects of education has been less than expected than expected from standard augmented Solow model. According to him, this may be due to the reasons, such as firstly, the increased levels of schooling have not created cognitive skills or productivity in some developing countries. Secondly, even if skills are formed, owing to a weak institutional framework which gives rise to incentives for extractive activities, they may have effected in used in the sectors of privately remunerative but socially unproductive or counterproductive businesses. This may explain micro-macro discrepancies observed in the literature. Thirdly the expansion in the supply of educated labour has exceeded the demand for educated which is nearly stagnant, so the returns to education may not be too large.

Another issue is the issue of quality schooling. One year of schooling in Sub Saharan Africa does not produce the same effect as observed in the Norway and Finland. For 1960–1990 periods, by using international testing agencies score on cross-country tests on cognitive skills, Mathematics, English as a measure of quality, Hanushek and Kimko (2000) found statistically and the economically significant positive result of the quality of schooling on economic growth. They argue that as institutions affect the incentives of skills, interacting quality of education with institutional quality is important. When interacted in the growth regression both the educational and institutional quality and interaction term came significant.

From the literature on the analysis of economic growth and education, we find that schooling is one of the important determinants of growth. But what matters is cognitive skills and quality of education.

2.4.2 Education and Health

Like material prosperity and education, there is also a persistent and positive relationship between education and health. This result is consistent across countries, time periods, specifications and varieties of indicators of health. The relationship between education and health is one of the most complicated relationships observed. In their pioneering

study on America, Kitagawa and Hauser (1973) found that mortality is associated with education. Cutler et al. (2008) found that those with a college education degree live longer than those who do not possess a college education degree. The correlation between health and education may be because of many reasons. Firstly, poor health in childhood may affect education. Secondly, subsequent education affects health behaviour, and thirdly, both education and health are driven by other factors such as discount factors. These associations can be interpreted in three ways; Education gradient in health, health gradient in education or a confounded gradient in both. Education gradient in health indicates education is causally affecting growth. Health gradient in education indicates a selection effect, in which people with good health choose more education.

The existing body of literature is mostly unanimous in explaining life expectancy varying with education. These relationships also hold in cross country context (Kunst and Mackenbach, 1994 (northern European countries), Marmot et al., 1984 (the United Kingdom); Mustard et al., 1997 (Canada)). From stylised facts, it is found that more educated people have less obesity, less probability of smoking and less excessive drinking habits. Better educated people are more conscious about automobile safety and also household safety. Overall the education is associated with a wide array of positive health behaviours (Cutler and Lleras-Muney, 2010).

There are several reasons why education affects health. In sociology, many reasons are advanced for the effect of education on health. According to the economic mechanism, being educated protects people from unhygienic and hazardous jobs. The psychological explanation suggests that more educated people have more self-control mechanism which enables them pursuing healthy lifestyles (Ross and Wu, 1995). Education also increases social support which insulates people from health insult. The educated people have more stress coping capabilities, which allow individuals to navigate through potential health setbacks (Mirowsky and Ross, 2003). As education is a command over resources, more educated people can purchase more products that improve health, including health insurances.

The theoretical foundation of the economic effect of education on health is derived from seminal work on health capital by Grossman (1972) who used Becker's Human capital model. In this model, individuals derive utility from health directly as they do not like to fall sick and through labour market as sick people earn less. Labour market effect can be

of various types. As returns to education are positive, educated individuals can purchase healthy products but also can buy cigarettes and drugs. So the increased wage can also be used in purchasing unhealthy products. In addition to an increase in income raises the opportunity cost of time, increases in wage can lead individuals not to undertake healthy activities as these activities demand time. With the increase in wage, individuals can purchase health insurance products, which theoretically may or may not help in achieving good health outcomes due to issues of moral hazard. But as the uncompensated costs of illness are higher, the second order effects are less likely to dominate direct effects.

Secondly, the educated people have a deeper understanding of healthy behaviour. They can process their health-related information more efficiently. There is another theoretical reason why education could be related to health: education could drive change in the 'taste' for healthier and longer life. Becker and Mulligan (1997) posit that education lowers discount rates of individuals, making them more "patient." and risk-averse. As healthy habits of individuals are formed in a social context and affected by peer group, educated individuals more likely to have peer groups that are more informative. So they can have better health behaviour.

The effect of health on education has been nearly unanimous that early childhood poor health affects education. Many studies found that healthier adolescents select into higher education; that is before education is complete, health decides whether a particular individual will choose higher levels of education or not (Conley and Bennett, 2000; Haas, 2006; Haas, 2007; Needham et al., 2004). Miguel and Kremer (2004) show that deworming had significant effects on schooling, Bleakley (2010) find that eradication of malaria resulted in higher education in the US and many Latin American countries and Meng and Qian (2006) find that being born during famine reduces educational outcomes. But in the Indian context, a quasi-experimental study by Cutler et al. (2009) does not find any effects of malaria eradication   on educational attainments and income.

In this regard, there are several mechanisms proposed in the literature. Some scholars suggest that poor health delay cognitive development (Hack et al., 1995), while others argue that negative health leads to reduced interaction with peers, teachers, and causes social isolation. Many economists, for instance, Becker and Mulligan (1997) and Cutler et al. (2008) argue that good health enhances life expectancy, which can orient individuals towards future.

It could be instead possible that education is correlated with other factors that affect health outcomes. That means other variables may cause education-health gradient confounded. There are two suggested explanations for this confounding gradient. One is the socio-economic status of parents like parental income may affect both education and Health. Similarly, individual specific psychological characteristics such as motivation, ability to delay gratification and self-control may affect both health and education. Lynch and von Hippel (2016) by studying 1997 cohort of the National Longitudinal Survey of Youth, (NLSY97) sample of all American youth find evidence in favour of confounding gradient.

2.4.3 Education and Political Voice

According to Glaeser et al. (2007), the correlation between education and democracy is very high. According to Putnam (1995), education is the best predictor of political participation. Modernisation theory proposed by Lipset (1959) argues that role of education is more important in achieving political democracy. According to this hypothesis which is known as the Lipset-Aristotle hypothesis, education broadens the outlook of people, makes them understand needs for tolerance and patient, helps them sorting out differences by voting and deters them from subscribing to extremist and violent methods. There are several reasons for expecting the relationship between education and political voice. By making people better informed, education enables them to exert judiciously the necessary checks and balances required for the proper function of a democracy. There are other indirect mechanisms such education as a force of material prosperity bringing about democracy. According to Berinsky and Lenz (2011), a close association between political behaviour and educational attainment may be due to two reasons. Education empowers the citizens the skill and resources needed for political activities. More educated citizens are more likely to understand political issues, candidates and campaign. So the more citizens are educated, the more they are likely to be politically active. Huntington (1991) posits that education was important in bringing of the "Third Wave of Democratization" in the 1970s and 1980s. There is a school of that that argues that education brought about individual autonomy and correlated with greater knowledge related to politics (Almond and Verba 1963, Verba and Nie 1972, Hanushek 2002). It is associated with women's empowerment. Glaeser (2007) argues that as education promotes civic engagement, it makes participation in favour of broad-based regimes (Democracies) than narrow based governments (Dictatorships).

There are other views which hold that education indoctrinates culturally and acts as a method of social control (Lott 1999, Pritchett 2003, Kremer and Sarychev 2008). Bowles and Gintis (1976) argue that U.S. education regenerates the existing class structure by training citizens to comply with commands within the modern hierarchical corporation. Many empirical studies such as Barro (1999), Glaeser, LaPorta, Lopez-de-Silanes, and Shleifer, (2004) and Papaioannou and Siourounis,(2005) found evidence in support for view that education is mean for democratisations (However, while studying Freedom House democracy score between during 1970-1995 versus the change in average years of schooling Acemoglue et al. (2005) finds less support for the hypothesis that education brings political participation. But Glaeser et al. (2007) in his comment on Acemoglue et al. (2005) argues that with correct specification change in education again become significant.

2.4.4 Education and Social Connections

Empirically there has been a consistent link between education and social connections. Social capital is a form of the capital where social networks occupy a central place. This comprises of social relationships, trusts, and networks that play a complementary role with economic capital. According to OECD, Social capital is defined as "networks together with shared norms, values, and understandings that facilitate co-operation within or among groups". In recent literature, Civic Social capital is divided into three parts (Woollcock, 2000). Firstly bonds, among the people links among the people who share the common identity, family etc. Secondly bridges, links that extend beyond a common feeling of identity, for example, colleagues, distance friends, and thirdly, linkages among the group of people further up or down the ladder. There are many economists following Coleman (1988, 1990) and Putnam (1993), argued that economic growth and development of a country is positively affected by Social capital. La Porta et al. (1997) argue that Social capital promotes trust and cooperation among agents, which in turn increases socially efficient collective action.

 The concept of Social Capital is not without criticism. Many critics argue that Social Capital does not constitute capital at all, as capital involves sacrificing something in the present for the benefit in future (Arrow, 1998 and Solow, 1998). They also highlight the issue of depreciation regarding Social capital (Adler and Kwon, 2002). Defenders of

concept Social capital argue that it is a peculiar type of capita like human capital which depreciates when it is not in use.

According to Kassa and Parts (2008), social capital can be studied both in Individual level and country level. According to Putnam (1995), Education is a strong predictor of Civic and Social Engagement. In one of his valuable analysis on American Social capita, Bowling alone Putnam (2000) observes that,

"Education is one of the most important predictors – usually, in fact, the most important predictor – of many forms of social participation – from voting to associational membership, to chairing a local committee to hosting a dinner party to giving blood. The same basic pattern applies to both men and women and all races and generations. Education, in short, is a potent predictor of civic engagement." (p. 186)

Education along with health and job training constitute human capital. According to Part (2003), many authors blur distinctions between Human capital and Social capital as both are embodied in people. He argues that this approach is problematic because of the definition of Social capital. The critical difference between Human capital and Social capital is that while human capital is embodied in one individual, in regardless to other individuals, Social capital can only be acquired by a group of people and calls for a form of cooperation among them. Many authors view that Social capital and Human capital can be considered to be both complimentary as well as opposites (Saraceno, 2002). According to the first argument, while Human capital is an ingredient for success for many groups, Social capital has limited usefulness for some target groups, such as minorities and physically disabled. The second argument states that human capital and social capital reinforces each other's effect on economic growth, social support, health and better Governance etc. Both social capital and human capital are consumption as well as investment goods, education as an end itself is worth having, and similarly, a rich network of social associations are also worth having.

Many empirical studies found the effect of social capital on the accumulation of human capital. Coleman (1988) hypothesised that in family level; the children's access to parental social and financial capital determines their educational success. Coleman (1988) using a log-likelihood estimation tried to find the effect of family and community social capital on the likely-hood of dropping out from education. The effect was found to be negative.

There are some studies which exploited natural experiments to find the causal relationship between one aspect of civic and social connections, social engagement and Education such as Dee (2004) and Milligan, Moretti, and Oreopoulus (2003) found education actually improves social engagement. According to Campbel (2006), the connection between education and participation in politics is that education sorts people according to their relative social status. In the same social environment, more education relative to others, means relatively higher status, which leads to more involvement in politics.

The link between education and other forms of social connections such as marital stability and suicide needs to be explored because there are compelling pieces of evidence about educated people are more prone to suicide. Durkheim (1887) found the higher the level of education, the more likely it was that an individual would choose to commit suicide. However, he established that than an individual's education level, there is a more to correlation between an individual's religion and suicide rate. People who follow Jewish religion, who are more tightly related were generally highly educated but had a lower rate of suicide than Protestant Christians who are more individualistic.

2.4.5 Education and Economic insecurity

According to Western et al. (2012), Economic insecurity refers to the risk of financial loss encountered by workers and households as they face unpredictable events of social life. There are several reasons why education is associated with a major aspect of economic insecurity, i.e. unemployment. Educated people have more human capital. So they are more capable of accessing more secure and better-paid jobs. Higher education leads to accumulation of human capital, which is associated with higher productivity. As firms are concerned with productivity, they are reluctant to fire high skilled workers. Signalling theory proposed by Michael Spence (1973) argues that students who are highly educated are talented by innateness. As academic degrees act as filtering signal of innate capabilities, workers are more likely to hire workers with higher levels of education. According to Job competition model suggested by Thurow (1975), the labour market can be thought of having two rows. One row contains various levels of jobs, and another row contains individuals classified according to the qualifications. While the job-seekers want the most attractive job, the employers employ the highest educated. So the individuals are with the low level of education are ended up with the highest chance of unemployment.

Empirically, many studies find that higher educated people are more likely to be facing the brunt of unemployment. For instance, Mau et al. (2012) find that educated people perceive themselves as more secure economically in their life. Nunez and Livanos (2009) on studying the impact of an academic degree on short-term unemployment observe that an academic qualification is more effective in reducing the likelihood of short-term unemployment. Brauns et al. (1999) find that the level of education provides benefits regarding less search unemployment and lower job instability. Riddell and Song (2011) using data on compulsory schooling laws and child labour laws and conscription risk in the Vietnam War found that education significantly enhances the reemployment rates of the unemployed individuals. Similarly, Wolbers (2000) on his study of Dutch labour market finds that the least educated workers have a higher risk of being unemployed.

Similarly, another aspect of economic insecurity is informal labour. According to Gërxhani and van de Werfhorst (2013), there are two reasons for the effect of education on informal sector participation. Educational improvement causes an increase in income and increase in opportunity cost of working in the informal sector. Secondly, it creates the attitudinal change which reduces the participation in the informal sector. The authors find a negative correlation between education and the shadow economy. Marcelli, Pastor, and Joassart (1999) found that the correlation between more education and occupations having higher percentages of jobs in the formal sector is high. Thus sectors in which is dominated by the informal sector will be dominated by low educated people.

Similarly, Gallaway and Bernasek (2002) suggest that people with higher levels of education are more likely find employment in the formal sector, while those who have the highest probability of working in the informal sector are less-educated workers. Bairagya (2012) in analysing employment in India's informal sector found that individuals without any technical or general education have a higher probability of being employed into the informal sector. With increases in education, this probability decreases in all the states irrespective of their development level.

2.4.6 Education and Environmental conditions

Sustainable development requires that meeting the needs of the present generation in such a way that the needs of future generations are protected. Several studies have found that education does improve pro-environmental behaviour. There are several reasons stated in favour of this assertion. Environmental issues are associated with complex concepts and

mechanisms. Higher education enables an individual to comprehend subtle issues like understanding unfamiliar terminologies. It enhances the acquisition of complex skills to grasp topics like climate change and increases the accessibility of information. There are also second order effects of education on the environment. As education makes people patient and orient toward long-term issues, it helps them understand the critical importance of maintaining a quality environment and mitigate adversities of environmental pollution. Education enhances productivity and earnings of an individual it allows people to pay green taxes, use eco-friendly instruments and contribute to environmental charities.

2.4.7 Health and Material Prosperity

Health and material prosperity are highly correlated. But as establishing causality is difficult, the relationship between health outcomes and material prosperity is one of the problematic relationships. Health, in one hand, increases the material prosperity of a country by influencing educational achievements, productivity, and income, as well as an increase in material prosperity, may increase the demand for health and nutrition. Again third factors such as geographical disadvantage or Government ineffectiveness may hamper both productivity and disease control. Preston curve (Preston, 1975) is one such of an empirical relationship which plots life expectancy against per capita income for a cross-section of countries. It shows an increasing and concave relationship. At a low level of income, increase in material prosperity can bring a more considerable amount of life expectancy for the developing countries that have not undergone epidemiological transition. Among the rich nations the, increase income brings a small but positive increase in life expectancy. So Bleakley (2010) mentions that the correlation between health and income may be circular and cumulative: Income affecting health and health affecting income.

As Narayan et al. (2010) mentioned, good health contributes to economic growth in many ways. Firstly, a healthy workforce is associated with higher productivity, because the workers are now more active and mentally more dynamic. Absenteeism at work is reduced to both workers, and their family members enjoy good health. Secondly improvements in health raise incentive for acquiring education. Improved health is associated with higher cognitive skills and lower absenteeism among the students. According to Weil (2007), for the same level of schooling, healthier students acquire

better education. According to Ben-Porath model, human capital investment should be made early in life, and much of physiological, cognitive and emotional development happens in childhood. So poor health in early childhood may depress the formation of human capital. Many studies and census found that at the individual level, wages/earning/income are positively correlated with schooling, nutrition, and health. Human capital improves productivity in many ways. Health as a human capital itself and an input in producing human capital will have a significant effect on productivity.

There are also many other economic reasons for why health should matter for growth. Firstly individuals with high life expectancy are likely to save more. This saving affects capital accumulation and causes higher growth (Zhang et al., 2003). Secondly, people with high life expectancy are likely to invest more in education, which is also growth enhancing. Thirdly, according to Howitt (2005) people with high quality of health are more creative and adaptive to technological change and better able to cope up with rapidly changing nature of economic growth.

There are several micro studies which investigate returns to higher health in childhood. Taking height as a proxy for health, Ribero & Nunez (2000), who find that adult wages rise 7%−8% with per centimetre of height in Colombia. Similarly, many studies also find the effect of various shocks to the critical periods for health such as time in the womb. Almond (2006) examines the 1918 influenza epidemic and finds that those born in 1919 (and therefore in the womb when the epidemic hit the United States in 1918) had on an average 2% lower income (among men) and 0.15 fewer years of schooling (both men and women). In examining the effect of health on education, Miguel & Kremer (2004) and Bobonis et al. (2006) find that intestinal worms increase school absenteeism.

In a cross-country study, Sala-i-Martin (1997) found that health is one of the robust predictors of growth. Aghion, Howitt and Mortin (2010) using the period 1960-2000, found that a higher both initial level and a higher rate of improvement in life expectancy have a significantly positive impact on per capita GDP growth.

Ashraf et al. (2009) observe that extrapolating inference from micro studies may be problematic because the microeconomic studies do not control for general equilibrium effect of the increase in population health. For instance, increase in health and life expectancy can increase population, which may reduce the resource per capita ultimately resulting in reduced income per capita. In a calibrated, general equilibrium framework,

they found a very modest impact of health improvement on income per capita. In a study on India, Acemoglue et al. (2007) conclude that impact of health revolution in the 1940s on per capita income was negative. Their result has been contradicted by Bloom et al. (2013) who argue that the countries which have experienced higher improvements in health have the lower level of health outcome in the initial time and the countries which saw rapid economic growth are the countries which have high health outcomes in 1940. So we find a negative correlation between the growth of per capita income and health improvements.

Similarly, Bleakley (2010) argues that though the Malthusian diminishing return was visible in 50 years before because of increase in population, nowadays this will be completely different because of urbanisation which creates increasing returns to scale and globalisation which reduces the effect of increased population in short run. Similarly, land quality also improves and all in improvement in health does not cause population growth. Some improvement in health reduces morbidity, which enables people to reach their full productive potential.

2.4.8 Health and Social Connectedness

Not only social connections are found to affect political voice and environment, but it has also effect on health. In past years, there has been increased interest in the effect of social connections on health. The studies investigating the effect of social connections and health are traced back to Durkheim, who posited that the less integrated the people, the more prone to suicide they are. Wilkinson, Kawachi, and Kennedy (1998) social connections are closely associated with mortality in the United States. They showed that inequality reduced trust including social trust, which in turn affected mortality, i.e. health negatively. Uchino et al. (1996) showed that social connectedness is found to be correlated with better immune responses, lower levels of stress hormones and lower blood pressure rates, which help in the deterrence of chronic diseases. There has been a range of literature for instance Berkman et al. (2000) and Cobb (1976) which suggests that social connections and health, mainly mental health is positively associated. Brown and Harris (1978) found that the women who have a close confidant to turn to during the traumatic period of their life are more likely to be less depressed. Social connections may also affect health indirectly, through promoting healthy behaviour, helping each other in accessing the local health services, providing emotional support and increasing

knowledge about health literacy. Communities with a high amount of bridging and linking capital can influence policies that are supportive of health.

Cacioppo & Hawkley (2003) suggest that social isolation, i.e. lack of social connections may be detrimental to multiple chronic diseases like high blood pressure, obesity, and Diabetes etc. Studies have found that those individuals, who are facing social isolation, are more likely to be depressed and report symptoms of poor health. The adverse effect of social isolation is highest among the poor and elderly.

Social isolation increases the level of stress which leads to individuals using more unhealthy practices such as smoking, drug addiction, excessive alcohol and tobacco use. Lack of social connections arrests the probability of individuals undertaking healthy practices such as eating well, getting adequate sleep etc.

However, not all aspect of social connections is good for health. High bonded groups, where little external information is added can also result in increased tobacco consumption and illicit drug use, unhealthy food pattern (Berkman et al., 2000). Peer group effect influences the adolescents for smoking. It also suggested that excessive strong bonding among the individuals may be oppressive. With the increases in the importance of informal networks, individuals particularly women may have less choice and become vulnerable. The obligation of the active participants on the network can be high so that it may increase their level of stress. So the effect of social connections on health may be positive as well as negative.

2.4.9 Health and economic insecurity

In empirical literature, the relationship between unemployment and health has been widely documented (Dooley et al., 1996). Many studies, for instance Adams et al. (2003) find negative correlations between the experience of unemployment and health. Yet, the direction of the causality is still ambiguous. There are several mechanisms are at work here. Firstly, there is a possibility of selection of sick workers from work into unemployment. García-Gómez et al. (2010) and Lindholm et al. (2001) suggest that the workers who are ill have a high likelihood of becoming unemployed. Kirchhoff et al. (2010) found that adult childhood cancer survivors report high levels of unemployment. Secondly, poor health causes longer unemployment duration (Stewart, 2001). Both selection of ill workers into unemployment and selection of healthy workers into

employment – increase the likelihood of an ill individual being unemployed. This, in turn, leads to a lower average health status of unemployed individuals. Thirdly, unemployment itself may lead to deterioration of health. There are several reasons why unemployment may lead to poor mental health. According to Jahoda's (1981, 1982) renowned latent deprivation model, distress among unemployed individuals is the consequence of the absence of five crucial potential functions of employment- social contact, time structure, collective purpose, activity, and status which are essential psychological needs. There are studies also who predict that being unemployed increases the probability of excessive alcohol consumption. Furthermore, Gallo et al. (2004) found that involuntary job loss later life causes a significantly increased risk of both heart attack and stroke over the next ten years.

2.4.10 Heath and Environmental conditions

Natural environment refers to the union of all living beings as well as non-living beings. It offers not only fresh air and water which is necessary for the survival of human beings, but it also gives boosts of positivity, reduces hypertension and eases depression. There are several ways in which nature affects health. Trees, shrubs, and vegetation affect the quality of air by reducing levels of many pollutants, including gases and particulate matter (PM). But they may also add to air pollution by releasing hydrocarbons. During warm weather, trees reduce summer energy demand by shading and hence cooling buildings. So high forest cover reduces the need for energy, thus reducing the air pollution in the areas of coal combustion. Secondly, natural environment provides an environmental setting for physical activity (Kaczynski and Henderson, 2007). Physical activity leads to improved physical fitness and health. Physical activity is also associated with increased mental health. There are also other ways in which natural environment promotes health and well-being. It provides certain environmental stimuli to enable restoration from attention fatigue, occurring from the performance of cognitive tasks that demand enhanced period of directed attention (Kaplan and Kaplan, 1989). Many studies have documented positive associations between social relationships and health and well-being. Some studies suggest a positive association between social cohesion and natural environments (de Vries et al., 2013; Francis et al. 2012). Stress reduction is another way through which natural environment helps in improving human health. So we find that in many ways, natural environment affects human health.

2.4.11 Material prosperity and Political Voice

The Political voice is an important dimension of development. An informed citizenry is important for holding state and Government into accountable for effectively discharge the responsibilities and rights. The Political voice is important for both its intrinsic as well as instrumental values. It helps people to achieve the form of governance they seek and redress the possible injustice happening in society. It enables them in realising the freedoms that are necessary for the well-being and happiness of the people. In its instrumental worth, political voice helps the state officials in achieving the high-quality governance, which is participatory and representative. It helps in promoting the voices of marginalised sections of various kinds such as gender, caste, and region.

One of the contested areas of economic development is the relationship that exists between political voice and material prosperity. There has been a considerable debate on whether material prosperity is the cause of democracy or material prosperity is the result of democracy, or there is no relationship between the two variables. As highlighted by Barro (1996) there is indeed a tension between economic democracy and political democracy. Milton Friedman argued that economic and political democracies reinforce each other. But many scholars argue about the adverse effects of democracy on economic development. According to Barro (1996), democratic regimes support social programmes that support redistribution. Strong redistributive programmes necessitate progressive taxation, which hurts the incentive for work, save and invest. Another drawback of democracy in retarding growth is that in democracy, lobby groups are more powerful. These groups pursue policies in such way that it redistributes income in their favour which can take away resources from other productive uses and instil distortions in the economy. So democracies are dominated by rent seekers of directly unproductive activities (Bhagwati, 1982; Krueger, 1974). Also, democracies are vulnerable to conflicts of many varieties such as class, ethnic and social struggles. Authoritarian regimes can promote hard economic policies required for economic growth; they can overcome hold-up problem. In addition, Lipset (1959) hypothesis suggests that some level of economic development is prerequisite for democracies to function.

On the other hand some scholars argue that while ruling elites take away resources, democratic institutions can work effectively to constrain them. Authoritarian rulers can confiscate resources if they expect their tenure is going to be short (Olson, 1993). Nelson

(1987) argues that authoritarian rulers tend to be extravagant, pursue whimsical economic policies and experience short-lived and volatile growth. Bhagwati (1995) explains that democracies rarely engage with each other in militarised crises, as militarism is bad for prosperity so that democratic regimes can accelerate prosperity.

There are many empirical studies which examine the relationship between democracies and economic growth. Barro (1996) found that there is a non-linear relationship between economic growth and democracy. At a low level of political freedom more democracy, induces growth while at a higher level of political freedom, the effect is adverse. Overall the effect is weekly negative. Doucouliagos and Ulubaşoğlu (2008) in their meta-analysis on effects of democracy on growth found that "out of 483 regression estimates from 87 published studies, 15% estimates are negative and significant, 21% are negative and insignificant, 37% estimates are positive and statistically insignificant and 27% estimates are positive and significant." Using meta-analysis method, they found that democracy does not have a direct effect on growth and it has significant and positive indirect effects through higher human capital accumulation, lower inflationary burden, and political stability and more economic freedoms. Acemoglue et al. (2016) from data on 175 countries from 1960 to 2010 find that democracies increase growth, it increases growth through the channels of by increasing investment, promoting economic reforms, enhancing the delivery of schooling and health care, and lowering social conflict.

On the effect of income on democracy, Lipset hypothesis suggests that democracy is strengthened with higher material prosperity. Barro (1999) in his article on determinants of democracy found that propensity to have more democratic regime rises with per capita GDP. Muller (1995) noticed that most substantial improvement in democracy happen when the country is in an intermediate stage of development. On the contrary, Acemoglue et al. (2008) on their study on the relationship between income and democracy found that there is no causal effect of income on democracy.

So the relationship between democracy and material prosperity is one of the contested relations.

2.4.12 Material Prosperity and Personal Security

There are many reasons why personal security may affect material prosperity and vice versa. Crime inflicts an enormous burden on the society. Many scholars have offered

potential costs of crime. According to WHO (2004), the costs of crime can be classified into two parts: direct costs and indirect costs. Direct costs include the value of goods and services used to prevent violence or offer care to the victims such as health, policing, justice, and prisoning, foster care as well as resources spent on private security. Indirect costs comprise of lower earnings, lower productivity, lower labour force participation, lower investments, psychological damages, non-monetary losses such as mortality and morbidity and the suffering, sorrows, difficulties, and death. Several studies have estimated the impact of violent crime rates on overall economic growth. This approach tries to capture the overall cost of crime by measuring the economic growth sacrificed for violent crime. Though this covers only a part of cost crime because even if crime didn't negatively affect economic growth, societies would likely still be willing to pay for crime reduction (World Bank, 2006). There are several proposed mechanisms on why crime deters economic growth. Firstly, crime crowds out the productive types of Govt. resources which are now used for prevention and remedy of crime. Secondly, it increases security costs for business. Thirdly, as criminals make a life out of expropriating the citizens who work in legal means, crime makes property rights less secure (Josten, 2003). Fourthly, it also discourages domestic and international investment as investment climate deteriorates.

Many studies seek to find the effect of crime on economic growth. Benyishay and Pearlman (2013) from studying the Mexican microenterprises that employ less than ten workers found that property crimes have a significantly adverse effect on expansion and income growth. Peri (2004) from using data on long period found that annual per capita growth is negatively correlated with homicide rates after controlling for other variables. Càrdenas (2007) found that in Columbia decline in economic performance is due to increase in homicide rates. Burnham et al. (2004) in exploring the effect of central-city crime on US county-level found that income growth is negatively affected by crime. Chatterjee and Ray (2009) report that there is no association between crime and economic growth. Goulas and Zervoyianni (2015) observe that effect of crime depends on economic conditions. During the periods of worsening economic conditions, there are potential gains from crime reduction whereas when economic conditions are sufficiently satisfactory, crime does not seem to affect economic growth. So there are conflicting opinions regarding the effect of crime on the economy. In a study on India, Kumar (2013) suggest that higher crimes may reduce the level of per capita income and its growth rate

Roman (2010) suggests that criminologist believe tough economic times lead people to commit crimes. As people cannot afford things they were able to afford during the times of prosperity, there will be more property crimes as well as homicides. In bad times as the consumption of mind-altering substances like drugs becomes high, there may be more crime. There is also another opinion on good times generating more crimes. As consumption of luxury products increases, people who cannot afford these luxury products will be envious. So people tend to fill the gap by stealing. According to Gary Becker, criminals are rational economic agents whose decision to commit crimes depends on the expected benefits and costs of committing the crime. With an increase in GDP, the benefits of committing crime increases. Increased crime again further may lead to increase in consumption of illegal goods and services, which increases the crime rate. Also, Tauchen, Witte and Long (1991) suggest that increased income leads to abusive husbands involved in domestic violence. Ragnarsdóttir (2014) didn't find any evidence increased GDP in raising crimes. Kathena and Sheefeni (2017) found bidirectional causality where crime and GDP affect each other.

2.4.13 Material Prosperity and Economic Security

As both material prosperity and economic security are important dimensions of development, we need to study the connections existing between the two dimensions. Okun's law suggests that Changes in unemployment is related to changes in economic growth. The reason is that as output is positively related to the amount of labour used in the process of production, so there is a positive relationship between output and employment. As employment and unemployment are inversely related, there is an inverse relationship between output and unemployment. But, it may happen that high times material prosperity is also associated with high household indebtedness. So material prosperity and economic security may not be moving together.

2.4.14 Material prosperity and environmental quality

Environmental degradation across the world has produced a sharper decline in the quality of life. Industrialisation and urbanisation have generated environmental pollution which adversely affected the health of people. Natural capital revolves around the concept that the components from natural environment play a significant role in sustaining economic development. Natural assets can be categorised into four parts such as water resources, biological resources, mineral and energy resources and soil resources. It affects our life

by giving us food, water, plant materials from which we eat, drink, and prepare medicines for our health. If poorly managed the depletion of natural capital will impose significant costs on our future development. As the temperature continues to rise, many environmental experts predict that this will cause a massive reduction in crop production. Water scarcity not only threatens agricultural production, but it also threatens industrial development. So in this context to ensure sustainable development, it is important to take into account the relationship between material prosperity and environmental quality and examine the trade-off involved between them.

While the past decade the world experienced spectacular material prosperity, there has been a significant incidence of environmental pollution. Environmental Kuznets curve hypothesis suggests a relationship between income-per-capita and environmental pollution. Historically there has been debate among the economists regarding scarcity of natural resources. In 1972, the Club of Rome report "The Limits to Growth" suggested that economic development has significant impacts on the environment and the future world will be growth-less as growth will reach its physical limits concerning agricultural production, non-renewable resources and excessive pollution. Many economists argued that even if production depends on depleting natural resources, through substitution and technological progress, consumption can be sustained. However many environmental economists argued that even if technological change is continuous, substitution is limited by physical laws (Klassen and Opschoor, 1991).

After some years it came to light that because of new resource discovery and technological progress world is not going to collapse. In the nineties, fresh shreds of evidence suggested that developing countries have capabilities, to protect their environment and economic growth can help in solving environmental problems (Tahvonen, 2000; Stern, 2004). The World Development Report in 1992 states that some environmental problems are exacerbated by the growth of economic activity and some are associated with the lack of economic development (Ekins, 1993).

According to Dinda, (2004), basic philosophy behind EKC-hypothesis is that that environmental quality deteriorates in the early stage of economic growth and improves in the later stage as an economy develops. The inverted-U relationship between economic development and environment derives its name from the work of Simon Kuznets who in

Kuznets (1955) advanced a similar inverted-U relationship between income inequality and economic development.

According to Kaika and Zervas (2013), Empirical studies test the EKC-hypothesis using the following general reduced-form model (Dinda, 2004):

$y_{it} = a_i + \beta_1 x_{it} + \beta_2 x^2_{it} + \beta_3 x^3_{it} + \beta_4 z_{it}$

Where y is the explained variable of environmental degradation, x is the independent variable of income; and z reflects other variables that may affect y.

i. If $\beta_1 = \beta_2 = \beta_3 = 0$ then there is no relationship between x and y.

ii. If $\beta_1 > 0$ and $\beta_2 = \beta_3 = 0$, then a monotonic increasing or linear relationship exists between x and y. iii. If $\beta_1 < 0$ and $\beta_2 = \beta_3 = 0$, then a monotonic decreasing relationship between x and y exists.

iv. If $\beta_1 > 0$, $\beta_2 < 0$ and $\beta_3 = 0$, then an inverted U relationship (EKC) exists.

v. If $\beta_1 < 0$, $\beta_2 > 0$ and $\beta_3 = 0$, then a U-shaped relationship exists.

vi. If $\beta_1 > 0$, $\beta_2 < 0$ and $\beta_3 > 0$, then there exists an N-shaped relationship.

vi. If $\beta_1 < 0$, $\beta_2 > 0$ and $\beta_3 > 0$, then there exists an inverted N-shaped relationship.

Only the (iv) case indicates an EKC-relationship. The turning point arises when $x^* = -(\beta_1/\beta_2)$.

Possible causes of an EKC

1- Equity of income distribution: Many researchers have examined whether resulting income inequality is a factor behind EKC-pattern (Magnani, 2000; Torras and Boyce, 1998). According to Torras and Boyce (1998), environmental degradation is mitigated or generated depends on relative powers of those who bear the cost of pollution and those who cause pollution. With economic growth, if income distribution improves, then those who suffer from environmental degradation can be capable of imposing regulations on those who produce pollution.

2- International trade and the pollution haven hypothesis: When income and environmental regulations rise substantially in developed countries, it may result in a shift

of domestic production of polluting goods from developed countries to less developed countries, where environmental regulation is lax. This is called Pollution Haven Hypothesis (Dinda, 2004). Cole (2004) and Kearsley and Riddel (2010) found little evidence of the existence of pollution havens.

3- Structural change and technical progress: Structural change and technological progress may be one of the driving forces behind EKC-pattern. Structural change refers to shift of process of production from polluting to the non-polluting service sector, or technological change in less use of material inputs and/or use of less polluting processes (Dinda, 2004).

4- Institutional framework and governance: With an increase in income, it is expected that Governments will place policies, regulations to protect the environment from market failure. Some studies suggest that developed countries have better political institutions and Governance mechanism that helps in reducing pollution. Bhattarai and Hammig (2001) suggest that deforestation process is more caused by institutional factors than the income or other macroeconomic conditions.

5- Consumers' preferences: Many studies found that environmental goods are sorts of luxury goods whose income elasticity of demand is higher than 1. So with improvement in material prosperity, it is expected that the consumption of dirty goods would decline significantly and that of clean goods will increase (Kaika and Zervas, 2013).

Critiques on the EKC-concept

1- Normal distribution of world income: The researchers on Environmental Kuznets curve relationship use average per capita income of each country, and from there they try to estimate the turning point of EKC. This methodology presupposes that world income is normally distributed. Many studies have found that world income is highly skewed (Stern et al., 1996). A necessary consequence is if large parts of the people live less than average income, then turning point of income is of little value.

2- Problem of expecting developing countries to follow the growth trajectory of developed countries: The developed and developing countries do not share same historical paths. So the growth possibilities of developing countries are limited by many aspects, and it was not same as that of developing countries because of colonial history and lack of unfavourable geographical conditions etc. (Roberts and Grimes, 1997).

Besides, Pollution haven hypothesis suggests that the rich countries import their pollution-intensive goods from underdeveloped countries. So in a finite world, there will be lack of exporting countries for developing countries to export pollution-intensive products. In this circumstance, the developing countries may be forced to sacrifice their economic growth, for reducing pollution (Cole, 2004).

3- Consumption pattern: Consumption pattern is one of the critical issues here. If the domestic economy is not import-dependent, the income elasticity of consumption is biased towards polluting goods, and the preference remains the same with the increase in income, then the countries will continue producing and consuming pollutants (Kaika and Zervas, 2013).

4- Type of pollutant: There are certain types of pollutants with long-term effects, the little immediate impact on human health and a comparatively high abatement costs such as CO_2 emissions and of greenhouse gases, for which many studies have found that there are positive rather than curve-type relationships.

5- Econometric issues: Studies on EKC suffers from lack of quality data on pollutants and other econometrics issues such as lack of long period time-series data, heteroscedasticity, the presence of non-stationary variables (Kaika and Zervas, 2013).

2.4.15 Political Voice and Social Connections

There are many reasons to believe that social connections have an impact on political voice of people. According to Putnam (2000), social connections generate interest in politics. Association membership helps the leaders to mobilise people for participation (Leighley, 1996). Social connections help citizens learn skills that make participation easier (Verba et al. 1995). Similarly, many studies also found interpersonal aspects of social connections such as playing cards, attending dinner parties, or being married by enhancing interpersonal trust and adherence to social norms may make people more likely to participate in political activities (Timpone 1998, Putnam 2000). Similarly, Mcclurg (2003) argue that social interactions create opportunities for individuals to collect information about politics which can expand the range of information beyond arising from personal resource constraints. Mcclurg (2003) found that the effect of social interaction on political participation depends on the number of political discussions occurring at the network. Zhang and Chia (2006) using data from a telephone survey in

Clarksville, Tennessee in 2002 found that people's social connectedness enhances both civic and political participation.

2.4.16 Political Voice and Personal Security

While political voice is vital in many respects, particularly it can help in securing personal security for disadvantageous groups. It is because firstly, the presence of women in decision and law-making processes gives a different perspective on justice. Their experience may help in improving the functioning of the police, bureaucracy and other executive officials. Secondly, when the participation of dis-advantageous group increases in policymaking, there is an improvement in perception and bias against them. Bias and discrimination tend to become less with the involvement of women in policymaking. Thirdly, by seeing women or other dis-advantageous people in top position, attitude and confidence of women go improving. People from poor and disadvantageous groups can be confident, that their voice is going heard as they hope they can get assistance in this regard by the members of their community. Iyer et al (2012) in their study on effect of increased political voice i.e. rising women's participation on crime, found that reported crime rates increased because of increased representation of women in local Government institutions, which is a good thing as it is reflecting not actual increase in crime against women but reporting of crime. Other studies also found higher Civic participation was associated with reduced crime rates (McCarthy et al. 2002, Rosenfeld et al. 2001). Administration of justice is an essential responsibility in part of the government as speedy disposal of cases protects whatever rights people have in the current system, and it instils confidence among the public.

2.4.17 Personal Security and Social connections

In literature, it is suggested that there are two potential crime reducing effects of social connections on crime. Firstly, Social connections decrease the costs of social transactions, which help in the peaceful resolution of conflicts. Second, the communities with stronger trust among its members are better equipped to organise themselves to overcome the free-rider problem of collective action on crime prevention. Social disorganisation theory suggests that disorganised communities share the characteristic structural features of ethnic heterogeneity and family disruption, and these features are likely to be associated with a lack of active social networks and civic participation and lowered trust among members. With lack of informal control, the crime rate goes on increasing (Shaw and

McKay, 1942). Furthermore, Communities with high levels of social connectedness are likely to be able to secure public services, including law enforcement services. The ability to obtain adequate public services to enforce law and order will lead to low crime and violence in the community (Roh and Lee, 2013). However, there are also possibilities that social capital may lead to more violent crime as individuals that involve in crime using social networks can reduce the cost of coordinating in a crime (Glaeser et al., 1996)

There is also an effect of crime on the social organisation of the community. In one hand, Taylor (1996) found that controlling for residential stability and education, people living in neighbourhoods experiencing more crime were more attached and engaged with each other than those living in lower crime neighbourhoods. However, in Skogan's (1990) study on the effects of neighbourhood social and physical disorder, it was found that increased crime generated social withdrawal and constrained co-operation among neighbours. The crime perception strengthened people's sense of isolation that if they face difficulties, then none will come to help them. Saegert and Winkel (2004) found that crime has a discouraging effect on participation.

Empirically, Rosenfield et al. (2001) found that depleting social connections is associated with increased crime rates, thus supporting the view that social networks reduce crime rates. Saegert et al. (2002) found that social connections can prevent crimes in low-income housing. Buonanno et al. (2009) found that civic norms and associational networks, by suggesting guilty and shame to criminal attitudes have a negative and significant effect on property crimes across Italian provinces.

2.4.18 Personal Security and Economic security

One of the most researched areas in the criminology literature is the effect of unemployment on crime. Cantor and Land (1985) suggest that the effect of effect of unemployment on crime can be of two types- motivation and opportunity. From the motivational point of view, Becker (1968) argues that with unemployment, there is a decrease in the probability of participating in legal, economic avenues of livelihood. So the unemployed youths are more likely to be engaged in criminal activities. The opportunity or guardianship hypothesis, on the other hand, suggests that a decrease in economic activity will decrease the availability of criminal targets more people will stay at home (Cook, 2010). As more people will stay at home, this will increase guardianship of properties and hence reduce the incentive to engage in crime which suggests a negative

relationship between crime and unemployment. In addition, due to lower tax revenues of governments, declining economic activities might cause a reduction in the policing. This may result in falling detection and conviction rates, which may increase crime rates (Fallahi and Rodríguez, 2014).

While economic theories are more concerned about rationality point of view, sociologists give more importance to social institutions and interpersonal relationships. Here strain theory of crime suggests that a person is more likely to be engaged in crime when he receives a negative stimulus, i.e. he is not treated in the way he wants and unable to fulfil desired goals of earning money, gaining social status etc. Furthermore, social control theory suggests that an individual's likelihood of committing a crime increases when no person or institution monitors that person's activities, i.e. people are likely to be inclined towards social deviant behaviour when they no longer feel the necessity of succumbing to pressures of social norms. Unemployment generates social isolation, as it frees them from Social interaction and social control imposed by workplace and judgment from colleagues. In these ways, strain theory predicts the effect of unemployment on crime will be high.

Although most of the theories anticipate the existence of a positive relationship between unemployment and crime, empirical studies have found conflicting results. For instance, out of 68 works reviewed by Chiricos (1987) regarding the effects of unemployment on crime rates only less than half of these studies have found positive and significant relationship between unemployment and crime rates. Most of these studies have shown either a negative or no relationship between crime rates and unemployment.

2.4.19 Economic Insecurity and Social connections

At the individual level, the importance of social networks on employment is widely acknowledged. Most of the individuals obtain information about jobs from the informal sources. Many studies find that the positions which are obtained through informal contracts carry high wage and low quit rates. For instance, Mark Granovetter (1995) found in a survey of residents of a Massachusetts town that over 50 per cent of jobs were obtained through social contacts. Previous work by Albert Rees (1966) also found in a similar study over 60 per cent jobs obtained through informal networks. Informal communication among network-connected individuals lowers coordination failures and

alleviates the problem associated with search frictions.   So the impact of social connections on the labour market is expected to be pervasive.

2.5 Geographical Economics and Clustering

There has been massive evidence of regional variation across the world not only on the range of income but other aspects also. In this section, we will review the theoretical and empirical literature pertaining to spatial clustering of different regions. Mainly, we will discuss studies on spatial clustering concerning dimensions such as Income, health, education, unemployment, environment and social connections etc.

2.5.1 Income

Geographical economics starts from an empirical observation that economic activities are not randomly distributed across space and one tends to discover spatial clustering in various dimensions of economic activities. There is a rich literature on agglomeration which tends to show that regions with high GDP per capita tend to be located close together and likewise for areas with low per capita GDP (Bosker, 2007). Though these clustering can be partly attributed to differences in underlying characteristics such as natural geography, resource endowment and technology, a major explanation of spatial concentration relates to the existence of externalities, agglomeration economies, which means that spatial concentration itself determines the location of firms (Brakeman et al. ,2009). As firms are cluster together in a region, they reap benefits agglomeration economies. With the concentration of firms in a region, the firms reap benefits of external economies of scale. External economies of scale arise from the presence of a large number of competing suppliers, labour market pooling through which increase chances of matching of demand and supply of specialised workers, consequently reducing search costs and knowledge spillovers between the firms.

The interaction of increasing returns, transport costs, and demand creates a circular causation process. The concentration of economic activities in a location creates a favourable environment that supporting further concentration. Hirshman (1958) argued that economic progress does not appear in every place and once it appeared, there will be spatial concentration around initial starting points. Similarly, Myrdal (1957) suggests that forces in the market usually tends to increase, rather than to decrease, the inequalities between regions. In the presence of increasing returns to scale, to minimise costs of

transportation, producers tend to locate where the back ward and forward linkages are strong, and both the upstream and downstream firms benefit from the location of the firms in that region (Venables, 1996). Krugman (1991) suggested another cumulative mechanism. According to Krugman (1991), the concentration of production in one location attracts other mobile factors of production. Where production is concentrated, workers have a better opportunity of job and consumption. This migration of workers where production is clustered tends to eliminate inter-regional wage differential. The consequent clustering of labour force demands more consumption goods in that location which makes the location even more attractive for producers. If there are cross-sector linkages, this could take the form of segregation of regions in the form of boom-regions and rust-belts.

Against these centripetal forces, there are some centrifugal forces like congestions, higher rent and housing prices, global technological spillovers which benefits all the regions, environmental degradation and immobility of factors also operate. These factors work for dispersion of economic activities.

In addition, the spatial dependence may happen because of a variety of reasons. Technology transfer and spill over, labour and non-labour migration, commodity trade flows may bind together the fortunes of neighbouring regions. Increased export to and cheaper import from a growing neighbourhood, positive effects of knowledge spillover may stimulate the growth of a region that is in proximity to growing areas. Bosker (2007) using a sample of 208 European regions over 1977-2002 period compared the effect of agglomeration of a particular region on same regions' economic performance (within-agglomeration) with the effect of agglomeration of neighbouring regions on a region's economic performance (between-agglomeration). He found that effect of between-agglomeration is higher than the impact of within-agglomeration. Similarly, in case of China, BAI, MA and PAN (2012) document strong and positive regional growth spillover effect across provinces. Growing neighbouring regions stimulate the growth of a particular region.

The spatial distribution of infrastructure, both physical and human capital, has significant implications for changing regional disparities and by implication, for the process of convergence. Many recent studies have pointed to the existence of spatial externalities (or spillovers) of infrastructure investments. Neighbouring regions can reap output gains

because of stock of infrastructure in a particular region. Further, it is possible that infrastructure investment may influence regional disparities by the changing the competitive and comparative advantages of neighbouring states. When factors of production are mobile, public infrastructure investments in one location can draw production away from other locations or provide access to adjacent locations not previously accessible. Empirically many studies have attempted to test the spillover effects infrastructure investment. For instance, Tong et al. (2013) found that there are positive spillovers from investment in road infrastructure to agricultural output of neighbouring states.

Similarly, many studies also investigated the role of technological spillovers. Contact between researchers may be a function of distance. For instance, Coe and Helpman (1995) in the case of 22 OECD countries found that research and development spillover are substantial. In another study, Coe, Helpman and Hoffmaister (1997) found that research and development spillovers from industrialised countries to developing countries are significant.

Easterly and Levine (1998) found that growth rate of an African nation is correlated with those of its neighbours. They found the evidence for operation of Spatial multiplier effect which implies that if one country improves its human capital, then all countries benefit and if all nations could enhance human capital together then the gain in growth is higher than what one country's improvement. Easterly and Levine (1998) suggest that this result may be due to policy imitation by the neighbours. Another channel is the foreign direct investment. There exists a variety of technological, legal, and institutional costs associated with adopting technology to local conditions. If the local conditions are similar among the neighbouring countries, the MNCs may find guidance regarding investment in the countries from their previous experience of success and failure in neighbouring countries. Another source of contagion which the authors discussed is trade through which performance of one country spills over to neighbouring countries.

Using the methods of economic geography, many authors study the phenomenon of convergence club literature, where the regions and countries are converging within groups. Many authors suggest that location is a determining factor in club convergence. There are many reasons proposed in literature why convergence club will have a spatial dimension (Abreu, 2005). Firstly technology diffusion, which is an important factor that

encourages convergence, is a function of geography. Secondly, Initial levels of technology and institutions may be a function of geography. In addition, there exist other types of spillover which have a localised dimension. All these factors may add geographical dimension to club convergence.

2.5.2 Health

There are discussions of Spillovers in the literature on health, as health markets exhibit strong externalities. In a famous study by using randomised control trials, Miguel and Kremer (2004) document positive effects of a deworming program not only on non-treated students in schools and but also on students from neighbouring schools. Pauly and Pagan (2007) document that increasing the proportion of insured people benefits the uninsured individuals in the community. Many studies highlight the potential reasons for why health outcomes may be subject to spillover from neighbouring regions. In response to health gap, the open and interrelated nature of the provincial units induces immigration of health workforce among the provincial units. Zhu, Fu, Liu and Mao (2018) argue that size of the health workforce in one region may not only be explained by demand and supply side factors in the local area but also by the spillovers from neighbouring regions. For instance, if Government expenditure on health in one region is higher than that of other regions, then a particular region may attract health workers from adjacent regions through migration flows. Public healthcare expenditure in one region may be associated with neighbouring region due to common shock (e.g. an epidemic associated with a geographical area) or policy interdependence (Costa-Font and Pons-Novell, 2007). There is evidence regarding the presence of the demonstrative effect, i.e. the performance of a unit may affect its neighbours' behaviours and, consequently, its expenditure patterns (Grassetti and Rizzi, 2014). The transfer of knowledge and information, which will then translate into local spending, occurs more naturally between neighbouring policymakers than between those who are far apart (Moscon et al., 2007). While Moscone et al. (2007) find support for spatial dependence in local mental health expenditure in England, Bech and Lauridsen (2009) document spatial spillover effects in Danish general practice expenditure.

Other than public expenditure, another source of externalities is the knowledge spillover among the physicians. According to Chandra and Staiger (2007, p.133), sizeable medical literature has documented the vital role of social networks in the adoption of advanced

technologies by physicians, suggesting that the pervasiveness of knowledge spillover. The physicians are more likely to practice advanced treatments in a market with advanced medical technologies. Similarly, agglomeration prospective indicates that hospitals may operate more efficiently, due to geographical concentration. Hospitals may benefit from geographical clusters through labour market pooling (matching of prospective employers and workers), knowledge spillovers, and closed proximity to input suppliers etc. (Baltagi and Yen, 2014).

Similarly, in the public health literature, Gatrell & Rigby (2004) discussed the use of spatial distribution of various diseases such as HIV/AIDS, Breast cancer, skin disease etc. Other scholars also have considered the spatial distribution of various diseases such as Dengue and Tuberculosis. As regional health care systems are not strictly separated, the health outcomes are subject to spatial externalities. According to Felder and Tauchmann (2013), Competition for patients and migration of patient may result in positive spillover effects on quality and efficiency. All these factors may generate clustering of neighbouring regions.

2.5.3 Education

Though few, some studies have attempted to examine regional externalities in the context of education. As education acts as a public good and magnifier of productivity, higher of individuals living in a region, there will be a gap between private and social returns (Rudd, 2000). Social returns to schooling generate externalities in multiple ways, for example, it will leak from one worker to another and attain its maximum with regions with high concentration of skilled workers (Easterly, 2001; Tselios, 2008). As a consequence, workers will increase their productivity by interacting with each other, through the exchange of ideas, learning by doing and imitations (Acemoglu and Angrist, 2001: 14). These types of externalities are technological or non-pecuniary. But pecuniary or market-mediated externalities can arise as a high human capital investment may encourage greater investment by firms. If knowledge and skill have economic returns, then individuals will respond to incentives by accumulating more Knowledge (Easterly, 2001; Tselios, 2008). Wolf (2002) argues that the presence of complementary skilled individuals, greater will be the incentives to acquire further qualifications. So in the presence of interregional externalities, we may find regional interdependence of education. Other than productivity, education also generates spillover in many ways.

Regions with higher levels of education tend to be associated with a wide range of amenities such as crime reduction, excellent public services, leisure and entertainment,) which improve the quality of life (Roback, 1982; Glaeser et al., 2001).

In literature, there are several mechanisms suggested which claim that spillover generated in one region may affect earning in other regions. As knowledge diffuses beyond administrative and political boundaries, an individual's earning ability, in addition to his investments becomes a function of investment in the education of those who live in his region and adjacent regions (Vaya, López-Bazo, Moreno, and Surinach; 2004). These externalities depend on the physical distance between regions as interaction among the agents is limited by distance and time. If spatial transaction costs are low and regions are more homogeneous in traits and motivation (Dowrick and DeLong, 2003: 206), then there are more possibilities of higher fractions of knowledge spillover. These externalities are more likely to be higher if neighbouring regions may share goods and labour market and have a similar capital or managerial talent at their disposal (López-Bazo et al., 2004). Rodrıguez-Pose and Tselios (2012) report that in addition to positive private returns, workers benefit from interregional educational externalities. Similarly, Sousa et al. (2015) report the existence of positive supra-regional spillover.

However, some studies also report the existence of negative human capital spillover. For instance, Olejnik (2008) finds that the level of human capital in nearby locations has a negative influence on the level of per-capita income in a given region. According to him a possible explanation for this is that an increase in the level of human resources in one region is primarily caused by the migration of the educated individuals from neighbouring regions, which tends to have a negative impact. There are also many empirical studies which find that spatial clustering in education. For instance, Karahasan and Uyar (2009) report strong spatial dependency for primary and secondary education in the economically and educationally lagging regions of Turkey.

2.5.4 Unemployment

Contini and Trivellato (2005) suggested that there is evidence of the existence of spatial dependency in unemployment, i.e. neighbouring regions tend to have similar unemployment rates. Cracolici et al. (2007) found that regions characterised by low unemployment, as well as those marked by high unemployment, tend to be spatially clustered. In addition to knowledge externalities, information spillover (Topa, 2001), the

interconnectedness of Labour markets of neighbouring regions may be the cause of these clustering of employment. According to Overman and Puga (2002), if unemployment reflects the underlying skill composition, then the regions with a large proportion of highly skilled individuals may have low unemployment rate and the regions with a large percentage of low skilled individuals will have a high unemployment rate. If these high- and low-skilled regions are proximate to one another, then this could explain why neighbouring regions may have similar unemployment outcomes. Another reason might be the change in sectoral composition. Employment shifts from agriculture, industry and mining to services, and these sectors are regionally concentrated. Without sufficient migration, there may be unemployment in the regions which are specialised in declining sectors. Another explanation is from the predictions of geographical economics. New economic geography predicts that because of agglomeration of economic activities and cross-sector linkages, there are possibilities of emergence of booming regions and peripheral regions. The booming regions will be associated with high employment and peripheral regions low employment. All these factors may give rise to the phenomenon of clustering of regions according to unemployment.

2.5.5 Conflicts

Growth rate of a country surrounded by a political unstable neighbour may be lower due to refugee problem, lower FDI and disruption of trade routes. Ades and Chua (1997) find that neighbouring countries' political instability has a significant negative impact on domestic growth and reduces the steady-state level of income per capita in the domestic economy. Similarly, Murdoch and Sandler (2004) document that civil wars within a distance of 800 km have a negative impact on growth.

2.5.6 Crime

Like population density, age, income and poverty, unemployment, distribution of crime also has a spatial dimension, i.e. locations of crime often denote a spatial clustering (Chakravorty, 1995). Ratcliffe (2010) discuss that higher property crime rates were reported in more affluent locations. So we can expect a spatial pattern in crime also.

2.5.7 Social Connections

Studies on social connections examine the spatial distribution of civic participation, to the extent people feeling connected to their family, friends, neighbours etc. Putnam (2000)

found that social capital varies within the United States. While, the West, North Centr al, and Mountain states showing high levels of social capital, the Southeast and Mid-Atlantic states showing low levels.

2.6 Conclusion

In this chapter, we have reviewed the literature on themes which is relevant to present study. While GDP continues to be the leading indicator of economic development, many scholars argue about the fact that there are severe limitations of GDP and it should be supplemented with other measures of progress. Economics of happiness literature suggests that after a certain point GDP does not lead to improvement in the happiness of people. Other than GDP, many aspects including health, social connections, crime affect the happiness of people. This leads us to the pertinence of a multidimensional view of development. Stiglitz et al. (2009) is a recent study which discusses effective ways of measuring progress using a multidimensional approach. We have also reviewed Ray et al. (2018) and Ray et al. (forthcoming) which implement approach proposed by Stiglitz et al. (2009) in Indian Context. From the literature on inter-linkages, we observe that all dimensions of development may not move together. Improvement in one dimension may lead to diminishing achievement in other dimensions. There are theoretical reasons as well as empirical evidence on the existence of different channels through which one dimension affect other dimensions. We have also discussed the literature on geographical economics and clustering which suggest about the pattern of spatial clustering across many dimensions. The review of the literature on inter-linkages and geographical economics has enabled us to acquaint with the field and to conceptualise the research design which is dealt with in next chapters- Chapter 3 and chapter 4. In the next chapter, we undertake an analysis on inter-linkages using correlation and multiple regression methods. Chapter 4 contains an analysis of exploratory data analysis using k-means cluster method for finding meaningful similarities of states across the different dimensions.

Chapter-3

Inter-linkages and trade-offs among dimensions of developments

Introduction

In assessing development performance of nations and states crucial importance is usually placed on material prosperity. However, recently there has been interest in both material and non-material aspects of economic development. For instance, Stiglitz, Sen and Fitoussi commission report (2009) suggests that in addition to material prosperity, other dimensions of quality of life are also vital for well-being of citizens of a state or a region. Many strands of literature such as capability approach and economics of happiness literature suggest that contributions of non-material aspects to quality of life are critically important for just and happy society. As economic and social progress is multi-dimensional in nature, it is important to test the inter-linkages that exist between different dimensions of development. This will tell us how each dimension influences other dimensions and enable us to understand the trade-offs and interactions that exist between various dimensions of development. As discussed in the last chapter there is a whole range of theoretical as well as empirical literature that seeks to check inter-linkages that exist between various dimensions of development. For policy analysis it is important to see whether such suggested inter-linkages actually exist. For instance, many scholars have highlighted the virtuous cycle that exists between the different aspects of human development like education and health stimulating material prosperity and higher material prosperity leading to greater amount of resources being directed towards health and education. Theoretical and empirical literatures suggest not only positive reinforcement but trade-offs. For example, an exogenous improvement in health may reduce the material prosperity of the masses by raising population and subsequently reducing land and capital per work, which may lead to decline in per capita income. In this context, relationships among various dimensions of development are a key to understand the broader picture of the development performance of Indian states.

Though there are a number studies that explore the inter-linkages most studies are conducted at the level of two dimensions. Here our study expands the analysis by taking into account a multidimensional approach, which comprises of eight dimensions of development. In particular, this chapter focuses on the interrelationships that exist

between education, health, material prosperity, political voice, social connections, economic Security, personal security and environmental conditions. Theoretical literature suggests that there exist interdependence relationships among various dimensions of development. One of the best ways to manage the simultaneity or the problem of reverse causality is to use a Simultaneous equation approach. Here we use a 3SLS method to check the inter-linkages and trade-offs.

The remainders of the chapter are structured as follows. The following section discusses the objectives of the empirical analysis. Section 3.2 describes the data for endogenous variables and their source. Section 3.3 discusses the exogenous variables used for multiple regression analysis and their sources. Section 3.4 presents correlation analysis. Section 3.5 discusses the multiple regression methodology, Simultaneous equation model specification, and identification and 3SLS estimation techniques and analyses the findings. Section 3.6 concludes the chapter.

3.1 Objective

In this chapter, our purpose is to explore the existence of inter-linkages and trade-offs among various dimensions of development performance of Indian states for the time period 2014-15. We use the multidimensional development index developed by Ray, Agarwal and Parameswaran (2018) to explore the possible inter-linkages. In their study the authors assessed the performance of twenty-eight Indian states across eight dimensions such as material prosperity, education, health, political voice, social connections, economic security, personal security and environmental conditions. Our objective is here two fold. First objective is to check the determinants of the development performance of Indian states along each of the eight dimensions. Then among the dimensions, we investigate the possible linkages and trade-offs. The purpose our exercise in this chapter is therefore to understand whether the dimensions of development influence each other. In order to do so, correlation and multiple regression analyses are considered. Correlation analysis enables us to assess the strength and direction of relationships between pairs of dimensions. The theoretical and empirical literatures suggest that there are possibilities of reverse causality problem among the dimensions. In addition, the equations may be correlated as they are the result of common development process. For example, the states may choose the amount of health or education they require. For particular level of health they may demand certain level of education. So

choice of one dimension of development may affect other dimensions. 3SLS method takes into account of these correlations across the equations. To address cross-equation correlation problems, potential endogeneity issues and to investigate the bi-directional relationship, we use the Three-stage least squares (3SLS) method.

3.2 Data: Definition, Components of endogenous variables and sources

This chapter studies inter-linkages and trade-offs among various dimensions of development performance of Twenty eight Indian states for the year 2014-15. Data from this study are taken from Ray, Agrawal and Parameswaran (2018). They developed a multidimensional index of development as well as indices of development for eight dimensions of development such as material prosperity, education, health, political voice, social connections, economic security, personal security and environmental conditions. They have ranked the states according to performance across various dimensions. Using these ranks as endogenous variables we check the possible inter-linkages and trade-offs. We present here a brief description on each of the eight dimensions and their components.

Material prosperity is a very important dimension of quality of life. Apart from income, wealth and consumption as proposed by Stiglitz et al (2009), Ray et al. (2018) considered many other parameters. They constructed the index for material prosperity using the following eight indicators: (1) Per capita income, (2) Household assets, (3) Share of non-food items in monthly per capita consumption expenditure, (4) Per cent of households having pucca or semi pucca houses, (5) Percentage of households having access to safe drinking water, (6) Percentage of households having latrines in their premises, (7) Road density and (8) Non-BPL population.

Knowledge and education constitute another important dimension of development which affects many other dimensions such as health, economic growth, political voice etc. They have captured it by two indicators such as (1) Percentage of graduate population, and (2) Learning outcome.

Health is not only important for economic development as an instrumental worth but it is an end in itself. It is captured by (1) IMR, (2) Prevalence of illness, (3) Percentage of children fully immunized, (4) Vitamin supplementation.

Political voice refers to participation in political discourses and public policy making, and to express dissent. It also incorporates a corruption-free governance structure, devoid of biases, to ensure individual's rights and freedoms irrespective of class, caste, gender, race and other considerations. They have constructed this dimension of political voice and governance by the following variables (1) Voter turnout, (2) Women's political participation, (3) Ratio of court cases pending to court cases disposed.

Social connections is broadly the measure of people's connection, interaction with each other. The variables Ray et al. (2018) considered for measuring dimension of social connections are (1) Marital Stability and (2) Suicide rates.

Personal security is a dimension of development that entails security from all risks that may potentially violate their physical integrity. The authors included the following three variables in constructing this dimension: (1) Crime rates, (2) Dowry deaths and (3) Deaths due to road accidents.

The authors of Ray et al. (2018) constructed dimension of economic security by using the following four indicators: (1) Unemployment rates, (2) Dependence on agriculture, (3) Informal sector workforce, and (4) Debt free households.

Ray et al. (2018) measured environmental conditions through (1) Forest cover and (2) Water treatment.

3.3 Description of Exogenous variables

In order to perform a regression analysis apart from the above endogenous variables, this study uses the following exogenous variables. We here present a brief description of definitions, motivations for inclusion, and data sources of these variables.

Education is an important component of Human development. Increased government spending on education is expected to result in better outcomes. Educational expenditure (EDEXPPC) refers to annual public expenditure incurred by state governments on education per thousand populations in 2014-15 (in crores). Data for edexppc obtained from RBI state finances: a study of budgets and EPW Time Series.

Labour force is one of the key drivers of a country's economic performance. LFPR is defined as the number of people in the workforce, which includes both employed and

unemployed. Labour Force Participation Rate (LFPR) is defined as the number of persons in the labour force per 100 persons.

$LFPR = 100 * (No. of\ people\ employed + No. of\ people\ unemployed)$/Total population.

Data for LFPR is obtained from 4th annual employment-unemployment Survey for the year 2013-14 for persons aged 15 years & above according to Usual Principal Status Approach (UPS) for each State/UT.

Land is also another key determinant for material prosperity. Here ARLAND refers to state-wise arable land in thousand hectors for the year 2012-13. The data on arable land comes from the Statistical yearbook of India 2017, Ministry of Statistics and Programme Implementation, Government of India.

There are streams of literature which suggest that rich natural resource can have a negative effect on economic growth of a country. For instance, Arezki and Van der Ploeg (2011) found that even after controlling for geography, rule of law and trade openness, resource abundance (stock of natural capital) has a significant negative effect on income per capita. Initially, economists saw natural resources as escaping from the low saving-low capital development trap. But it was later found that economies with richer natural resources have actually tended to grow less rapidly than resource scarce economies. Many researchers such as Sachs and Warner (1995, 1999), Sala-i-Martin and Subramanian (2003) and Ross (2014) have worked in this field. To test the effect of natural resources on material prosperity, we have included the value of all minerals in our regression equation for material prosperity. NRVALUE indicates the value of all minerals in thousand rupees for the year 2013-14 for all states. The data on value of natural resources comes from the Statistical yearbook of India 2017, Ministry of Statistics and Programme Implementation, Government of India.

Many authors argue that public provision for healthcare can ameliorate impoverishment of human life, boost economic growth while promoting equity and reducing poverty. Our purpose is here is to test whether the public expenditure on healthcare raises the outcome of health in Indian states. Health expenditure (HLTEXPPC) refers to annual public expenditure incurred by state governments on medical and public health and family welfare per thousand populations in 2014-15 (in crores). Data for public expenditure on

education (EDEXPPC) and HLTEXPPC obtained from RBI state finances: a study of budgets and EPW Time Series.

There are many studies that suggest that economic inequality affects political voice. They argue that income inequality has a political implication (Bartel, 2008). The relationship between income inequality and politics may manifest in many competing ways. Income inequality may be conducive for political participation. Conflict Theory (Solt, 2008) suggests that with higher level of inequality, poor people will be aware of their economic conditions, so they will vocally support redistributive politics. On other hand wealthy people will oppose them because implementation of these policies will cost them. So this theory predicts that higher inequality is associated with higher level of political participation across all level of social spectrum. Contagion theory suggests that in contexts of high inequality participatory behaviours that are more common among wealthy individuals will be adopted by low status individuals. So both rich and poor people will participate in politics. Another competing theory suggests that higher level of inequality reduces social trust. As social trust is associated with political engagement, inequality depresses political participation. Again some scholars argue that a low status individual may discourage with government and politics as she observes that redistributive politics has no effect on his fortunes. It may lead to withdrawal from political participation.

Similarly, there are many theories that link inequality to a personal security. In Marxist approach, equality and crime were considered to be directly connected. According to a Marxian criminologist Bonger (1916) the exploitation and oppression of the poor by a powerful and rich minority produces criminal behaviour as a primitive form of uprising against the ruling elite. Rational choice approach says criminal behaviour depends upon expected payoff from crime in comparison to legal economic opportunities. In an unequal society, if the expected income from robbery is equal to the mean income of the society, the spread between mean income and the income from the legal opportunities may reflect the expected pay-off from the crime which is high for the individuals who are in the lower end of the society. So with inequality crime is postulated to go up. Similarly sociological theory strain theory suggests that in every society some goals are worth achieving. However social barriers make it difficult achieve this goal for some people, consequently creating a strain and pushing those people into criminal activities where goals outweigh the possible illegal means through it is achieved. So major theories like

Marxist, rational choice, and strain predict a positive relationship between crime and inequality.

So to test the effect of Inequality on political voice and personal security, we include Both state-wise Rural (GINIRM) and Urban (GINIUM) Gini Coefficients on the distribution of consumption for the year 2009-10 using Mixed Reference Period approach. The rural and urban Gini coefficients are not highly correlated. Data for Gini Coefficients comes from Planning Commission.

Similarly, many studies suggest about the potentially harmful effects of ethnic/cultural/ linguistic fractionalisation on various human activities including economic growth and crime. Population heterogeneity reduces trust in the society and thereby may cause more crimes and hinder personal security of people. Researchers have suggested that provision of public good becomes difficult as there are dissimilar tastes and lack of cooperation among the people. Fahey and La Free (2015) also demonstrate that the level of terrorist attacks and fatalities is influenced by country-level social disorganization. As good infrastructures such as national security, police are important for control of criminal behaviour, under provisioning of them may influence crime. Similarly, under-provision of education may have a direct effect on crime and because it's adverse effect on inequality, may influence crime indirectly through inequality channel (Pridemore, 2005). Poverty and deprivation may increase due to lack of quality institutions, which may aggravate economic insecurity and raise crime rates. This issue may be important for understanding personal security because Indian society is very much cleavage in nature. For this reason, we try to test the effect of various types of fractionalisation such as caste, language and religion on personal security. To capture ethnic fractionalisation, we have constructed an index of heterogeneity by using the Herfindahl-Hirschman method. Following Alesina et al. (2003), we construct indices of religious, caste and linguistic fractionalization for a set of states. We use the same formula to compute indices of fractionalisation:

$$FRACT_j = 1 - \sum_{i=1}^{n} s_{ij}^2$$

Where s_{ij} is the share of group i in state j. For constructing religious heterogeneity, we have taken data for seven religious groups and others from Census 2011. In order to construct Linguistic heterogeneity for 22 major language groups and 100 minor language

groups and others, data is from census 2001 which is the latest in this regard. For caste based fractionalisation index, we take population composition data from three social groups such as general (including OBC), SCs and STs from Census 2011. As caste fractionalisation (HETC), religious fractionalisation (HETR) and linguistic fractionalisation (HETL) are uncorrelated we use all three indicators of heterogeneity.

Similarly, it is argued that No. of police personnel is important for controlling crime and ensuring personal security. To capture the effect of no. of police personnel, we take no. of police per thousand populations (POLICEPC) for the year 2015 as an explanatory variable. This data on came from Indiastat Portal.

Government expenditure on social security is expected to alleviate the problem of economic insecurity. For this purpose, we have included total (both capital and revenue) social security expenditure incurred in lakh by state governments per thousand populations (SSEXPPC) in the year 2014-15 as an explanatory variable for economic security. The data on came from EPW Time Series portal

Financial inclusion helps in consumption smoothing, ability to face business cycle fluctuations, reduces vulnerability during hospitalisation, and makes long-term financial planning feasible and benefit from saving. We have constructed an index of financial inclusion following the methodology developed by Sarma (2015). Index of Financial Inclusion (IFI) is constructed by using three dimensions such as Banking penetration, Availability and Usage. The banking penetration is measured by the state-wise proportion of deposits account per thousand populations by March 2014. Availability dimension is indicated by state-wise No. of Banking centres in 2014 and Number of ATMs in September 2015. In constructing availability dimension, No. of Banking centres is given 1/3rd weight and Number of ATMs is given 2/3rd weight. Usage Dimension is captured by volume of credit and deposit as a proportion of state GDPs. All these data are assessed from RBI Basic statistical returns portal.

Among the factors that cause serious damage to the environment is population. The rise in population causes massive generation of wastes, poses threat to biodiversity, the rapid growth of towns and cities, deforestation, land degradation, climate change etc. To capture the effect of population, we have used population density (POPDENS) as a determinant of environmental conditions. Population density is a measure of the intensity of population, expressed as the number of people per square kilometre. We have taken the

data for state-wise population density corresponding to the year of 2011 from the data portal of NITI Aayog, Government of India.

The states that follow industrialisation strategies are prone to environmental degradation through pollution generated by "dirty" industries such as fertilizers, iron and steel, chemicals and refineries that have led to land, air and water pollution. To capture the effect of Industrialisation, we have used the share of Industry (INDSHARE) to state GSDP. Data for the share of Industry for the year 2011 is taken from EPW time series.

3.4 Correlation Analysis

Correlation analysis helps us to evaluate the degree of association that exists between any two dimensions of development. As the development performances of states are expressed in ranks, we use Spearman's rank correlation method to examine the degree of association between different dimensions of development, for year 2014-15 for 28 Indian states. The spearman rank correlation is computed as

$$\rho = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}$$

Where d = difference between ranks and n = no. of observations.

The correlation coefficients among any two dimensions and their significance have been presented Table-3.1. From this table we find while in many instances there are insignificant correlations among the dimensions are observed, there are significant correlations that exist between many dimensions. Here we discuss below the correlations that are significant and possible inter-linkage relationships that may underlie these correlations.

3.4.1 Material prosperity and health

From the table, it is observed that material prosperity is positively correlated with health and the Spearman's coefficient of correlation stands at 0.48 at 1% level of significance. This result is consistent with the findings of literature. There are several reasons for expecting the positive correlation between material prosperity and health. For instance, Health may influence educational outcomes positively, which in turn influence material prosperity. Similarly, increased material prosperity may increase the demand for health.

Again there are also reasons for expecting the impact of geographical factors which may influence both the disease environment and material prosperity.

3.4.2 Material prosperity and education

Similarly, material prosperity is also found to be positive correlated with education (Spearman's rho = 0.669 at 1% level of significance). This high correlation is consistent with the results from micro studies such as labour economics and macro studies on growth. Micro studies on wage suggest that earning responds significantly to the level of education. Graduates from college earn significantly higher salary than graduates from high school. Labour economists suggest that an additional year of education raises earning by 6-10%. While micro studies labour economics provides evidence on private returns on education, the macro studies provide an idea on overall contribution of education. Whereas the growth theories developed by Uzawa (1965) and Lucas (2000) suggest that level of output depends on level of human capital, endogenous growth models predict that steady state growth rate is a function of level of human capital. Many empirical studies have found evidence in favour of these models. So our result which suggests that the states which are good in education are also good is similar in these lines. However it may be possible that states which are good in material prosperity may have also capacity to spend more on education, and provide quality infrastructure because of their higher taxable capacity. So the positive correlation may indicate both the education's impact on material prosperity as well as the reverse.

3.4.3 Health and Education

Health is also strongly and positively correlated with the education (Spearman's rho = 0.61 at 1% level of significance). This result may stem from the fact that the effect of health on education and education's effect on health. For instance there are sociological mechanisms which suggest that educated people more healthy for various reasons. Educated people have more self-control capacities, so they can pursue healthy life styles. These people have more resources at their disposal and have capacity to cope with stress, they have deeper understanding of and ability to process health related information, etc. which in micro level has impact on health. Similarly, positively correlation may be due to the fact that health has also positive impact on education. Many studies found that healthier students self -select into higher education. There is also evidence that prevention of communicable disease Prevention of communicable disease raises enrolment in

schools. Being healthy creates a complementarity situation where investment in education more likely to bring positive returns. Sound a health increases cognitive ability of students, which raises their long term performance.

3.4.4 Health and political voice

Similarly, we find that correlation coefficient between health and political voice is positive, moderate and significant (Spearman's rho = 0.4 at 5% level of significance). This suggests that the states which rank high on political voice are also high scorer in health. Though there are many studies that examine effect of democracy on health, the mechanism through which political voice affects the health performance is not clear. Democracy gives space to social networks and pressure groups for advocating health promoting policies, it provides opportunities for women empowerment, better access to information, and better recognition by government of people's needs. These things may mediate the impact of political voice on health. Amartya Sen has argued about that uncommonness of famines occurring in democratic regimes. Lake and Baum (2001) developed an economic theory of state, in which the state is a monopoly provider of public services and democracies is contestable than autocracy, where barrier to exit is low. The authors predict that democratic states will seek fewer monopoly rents and produce higher level public services. They have tested this prediction and found that democracies have significant effects on democracy to a variety of public health outcomes. Similarly, Grépin and Dionne (2013) argue that while democracies are associated with improved health care access, dictatorships on other hand depress public health provisions. They found that democracies have lower infant and maternal mortalities and higher life expectancies. Simiilarly, Bisley and Kudamatsu (2006) observe a strong (conditional) correlation between life expectancy and democracy which is robust to controlling for the initial level of human capital and political histories. In addition, there are studies that highlight difference in the provision of social services between male- and female-led village council. The evidence from Panchayati Raj institutions from an important study by Beaman, Duflo, Pande and Topalova (2006) suggest that the elected women politicians perform better in immunisation and clean drinking water facilities. Clean drinking water may lead to large improvements in children's health through their preventive effect on water-borne and diarrheal diseases. So the authors argue that elected women office bearers perform better in health dimension.

3.4.5 Health and economic security

We also find significant and positive correlation between health and economic security (Spearman's rho = 0.43 at 5% level of significance). The states which are good in health also perform better in the dimension of economic security. This may suggest the roles of socio-economic factors shaping health outcomes as well as socio-economic outcomes are influenced by health. Household indebtedness and unemployment may certainly have an adverse impact on health individuals. Individuals that find difficulties in repaying debt also exhibit poor psychological health (Gathergood, 2012). There are evidence about both debt affecting and health and health being affected by debt. Debt, stress and unemployment may aggravate smoking behaviours. Brzoska and Rasum (2008) found indebtedness and unemployment correlated slightly with mortality. Münster et al. (2009) suggested that indebtedness leads to illness and illness also leads to indebtedness. So the dimensions of economic security and health may move together.

3.4.6 Education and economic security

There is a positive and significant correlation between education and economic security (Spearman's rho = 0.56 at 1% level of significance). This implies that those states perform better in the dimension of education also perform better in achieving economic security among the citizens. As we have seen in the chapter on literature review, education endows people with human capital and educated people are more successful in getting better-paid jobs. Educated people also have low unemployment rate. As educated people are selected for employment because of signalling the less educated people have more chances of being unemployed. Less educated people have more chances of working in informal sectors. All these things may contribute towards positive effect of economic security on education. Likewise, the positive correlation may stem from the fact that when people more secure, they are more educated. There are many studies that find that students from economically vulnerable families have less chances of continuing or completing higher education (Bozick, 2007; Titus, 2006). As education requires costs and investment the family of students that are more secured economically and are not burdened with unemployment, debt etc. will have more chances of accessing higher education.

3.4.7 Education and Political voice

The states' performance on education is positively correlated with their performance on political voice (Spearman's rho = 0.47 at 5% level of significance). This implies that education has a positive effect on political voice. Lipset hypothesis suggests that education is an important ingredient for democratisation. It broadens the mind of people, helps them sorting out differences by voting and deters them from subscribing to extremist and violent methods. Putnam (2000) found evidence about education's effect on political participation. Huntington (1991) argues that education was one of the determining factors for "Third Wave of Democratization" in the 1970s and 1980s. Similarly, democracy through its effect on social capital may enable citizens putting pressure on Govt. for allocating more resources on education, which may generate educated citizenry. For instance, studies like Brown and Hunter (1999), Kaufman and Segura-Ubiergo (2001) and Stasavage (2004) found that democratisation positively influence spending on education. Vollmer et al. (2009) reached the result that democracy has a positive impact on the literacy rate. So the observed correlation between two dimensions is consistent with the findings of literature.

3.4.8 Education and Social connections

We find a significant and negative correlation between education and Social connections (Spearman's rho = -0.359 at 10% level of significance). This may point to the fact that the states which are high in education may have also high divorce and suicide rates. With rise women's education, their range of choice of partners increases which in turn may potentially destabilise marriages. In Indian context where the cost of marriage is high, educated women may have the ability and willingness for bearing the cost. When costs of divorce come down this effect of education on marital stability may not significant or may be negative. As religions works at emotional levels and educated people are less religious, they may be more prone to suicide. One may wonder education may leads to isolation. So we may find negative correlation between education and social connections.

3.4.9 Political voice and Social connections

Similarly political voice is also but significantly negatively correlated with the social connections, which indicates a possibility of trade-off between these dimensions (Spearman's rho = -0.39 at 5% level of significance). This result is strange in the sense there are possible mechanisms through which social connections positively affect political voice. But, Atkinson and Fowler (2004) found that social connections can be

substitute towards political participation (voting) because of several reasons. Firstly, as voting requires time, more involvement in community activities may consume more time which is a finite resource. Secondly, if the community itself is politically heterogeneous and provides conflicting opinions on voting, then more social connections may depress voting. Finally as many scholars argue that people vote because they derive satisfaction from voting, but with their limited time as community involvement provides another avenue of satisfaction, people may not participate in voting. Apart from voting tightly bonded social connections may promote orthodox values and create oppressive social order which may not encourage women's participation in electoral politics.

3.4.10 Social connections and economic security

Social connections and economic security are negatively correlated with one another which indicate a possible trade-off among these dimensions (Spearman's rho = -0.51 at 1% level of significance). This is also another counter-intuitive result. The result may reflect the concept of social connections which we have used, which is strong ties i.e. bonding social capital. This may be due to the fact that with strong ties connections, the chances of being successful in getting job are less (Granovetter, 1973). People who have strong bonding social capital, may be unable to invest in bridging social capital and may not find the opportunity to work in formal sectors and end up working in informal and agricultural sectors.

3.4.11 Social connections and environmental conditions

Similarly social connections are also negatively correlated with environmental conditions (rho = -0.4 at 5% level of significance). This is another puzzling result because it goes against the common presumption that social capital, by fostering collective action at the local and national level, is good for the environmental quality. Jin (2013) observes that social capital does not always promote pro-environmental behaviours. Likewise, Grafton and Knowles (2004) by focusing on environmental quality outcomes found little evidence that national measures of social capital influence a country's environmental performance. They suggest that higher social capital may be associated with the higher monitoring by Non-Government organisations, which may reduce pollution. On other hand, High level social capital may be high associated with high level of income, which, in turn, can contribute to increased environmental degradation. In addition, it may happen that with shift in values of the society higher levels of social connections may not be pro-

environmental. In case of adverse economic conditions, because of livelihood concerns people who have strong social connections may be associated with destruction of forests for logging for timber, farming and hunting etc. So the negative correlation is not unusual in many such contexts.

3.4.12 Economic security and environmental conditions

From the table we find that Economic security and environmental conditions are positively correlated (Spearman's rho = 0.3984 at 5% level of significance). It implies that when people are economically secure, then the environmental quality improves. It is intuitively obvious as environmental behaviour requires monetary contribution people who are economically vulnerable will not be able to sacrifice money on environment-friendly life-styles. As environmental products are of luxurious good nature, when people are immune from economic insecurity they will be able to afford it.

3.5 Regression Analysis: Simultaneous equation model

Correlations can be highly sensitive to presence of outliers. Our analysis which may consist of outliers in terms of performance may influence the size of correlation coefficient. Still there can be justification in using the correlation analysis as the outliers also carry useful information. Secondly, the correlation which have observed may not indicate causation. It just indicates that two variables move together. To understand complete underlying relationships we move on to our next statistical analysis in the form of estimating a simultaneous equation model.

In presences of simultaneity, random errors and endogenous regressors are correlated. So the Ordinary least square (OLS) estimator is biased and inconsistent. Therefore, it is not appropriate to use a single equation estimation model like OLS. The Three-stage least squares method has the advantage of allowing not only for simultaneity among various dimensions development, but also for contemporaneous correlation among the error components across equations. So it is considered to be more efficient than Two-stage least square method. As this method is a kind of system method, it estimates all identified structural equations together as a set. 3SLS is also called a full-information method because it utilizes all zero restrictions in the entire system when estimating the structural parameters. Because it utilises all the available information it has a smaller asymptotic variance-covariance matrix than single equation estimators.

The study examines the Development performance of Indian states within a seven-equation simultaneous equation system. The primary hypothesis is that each of the dimensions of development is a function of other dimensions such as Education (EDUR) , Material Prosperity (MATR), Health (HLTR),   Political Voice (POLR), Personal Security (PERR), Economic security (ECOR), Environmental conditions (ENVR), and some control variables. So we have seven regression equations. The analysis uses a cross-section design with 28 states for the year 2014-15.We simultaneously estimate all the equations using 3SLS method. In our first equation, we regress education (EDUR) on material prosperity (MATR) economic security (ECOR) and education expenditure per capita (EDEXPPC). In our second equation material Prosperity (MATR) is regressed on education (EDUR), health (HLTR), political voice (POLR), social connections (SOCR), labour force participation (LFPR), arable land (ARLAND) and value of natural resources (NRVALUE). In next equation, health is regressed on education (EDUR), material Prosperity (MATR), economic security (ECOR), social connections (SOCR), environment (ENVR), and health Expenditure (HLTEXPPC). In next equation, political voice (POLR) is regressed on education (EDUR), social connection (SOCR), Gini rural (GINIRM) and Gini Urban (GINIUM), as both measures of inequality are not highly correlated. In next equation, Personal Security is regressed on economic security (ECOR), material prosperity (MATR), political voice (POLR) , social connections (SOCR) , Gini rural (GINIRM) and Gini Urban (GINIUM), all three measures of Fractionalisation (religious heterogeneity (HETR), caste heterogeneity (HETC) and linguistic heterogeneity (HETL)) as these measures are not highly correlated and per capita police rate (POLICEPC). In next equation, economic security is regressed on material prosperity political voice (POLR), health (HLTR), education (EDUR), social connections (SOCR) and index of financial inclusion (IFI). In last equation, environmental conditions (ENVR) is regressed on material prosperity (MATR), education (EDUR), economic security (ECOR), population density (POPDENS) and industry share (INDSHARE).

Education: $EDUR_i = \beta_{10} + \beta_{11}MATR_i + \beta_{12}ECOR_i + \beta_{13}EDEXPPC_i + \varepsilon_{1i}$

Material Prosperity: $MATR_i = \beta_{20} + \beta_{21}EDUR_i + \beta_{22}HLTR_i + \beta_{23}POLR_i + \beta_{24}SOCR_i + \beta_{25}LFPR_i + \beta_{26}ARLAND_i + \beta_{27}NRVALUE_i + \varepsilon_{2i}$

Health: $HLTR_i = \beta_{30} + \beta_{31}EDUR_i + \beta_{32}MATR_i + \beta_{33}ENVR_i + \beta_{34}SOCR_i +$

$\beta_{35}HLTEXPPC_i + \varepsilon_{3i}$

Political Voice: $POLR_i = \beta_{40} + \beta_{41}EDUR_i + \beta_{42}SOCR_i + \beta_{43}GINIRM_i + \beta_{44}GINIUM_i + \varepsilon_{4i}$

Personal Security: $PERR_i = \beta_{50} + \beta_{51}ECOR_i + \beta_{52}MATR_i + \beta_{53}POLR_i + \beta_{54}SOCR_i + \beta_{55}GINIRM_i + \beta_{56}GINIUM_i + \beta_{57}HETR_i + \beta_{58}HETC_i + \beta_{59}HETL_I + \beta_{591}POLICEPC_i + \varepsilon_{5i}$

Economic Security: $ECOR_i = \beta_{60} + \beta_{61}MATR_i + \beta_{62}POLR_i + \beta_{63}HLTR_i + \beta_{64}EDUR_i + \beta_{65}SOCR_i + \beta_{66}SSEXPPC_i + \beta_{67}IFI_i + \varepsilon_{5i}$

Environmental Conditions: $ENVR_i = \beta_{70} + \beta_{71}MATR_i + \beta_{72}EDUR_i + \beta_{73}ECOR_i + \beta_{74}POPDENS_i + \beta_{75}INDSHARE_i + \varepsilon_{7i}$

Rank Regression

As the endogenous variables are expressed in ranks, we used rank regression method for our multiple regression analysis. Iman and Conover (1979) suggest that when dependent variables are monotonic, rank regression fits reasonably. He suggests that rank regression method predicts quite well.

Testing for identifications

In the first step of our empirical analysis, it is crucial to ascertain the identification properties of the model. In order to test Identification, we classify the variables into categories of exogenous and endogenous variables.

The seven endogenous variables are EDUR, MATR, HLTR, POLR, PERR, ECOR, and ENVR.

The Sixteen exogenous variables are EDEXPPC, SOCR, LFPR, ARLAND, NRVALUE, HLTEXPPC, GINIRM, GINIUM, HETR, HETL, HETC, POLICEPC, SSEXPPC, IFI, POPDENS, and INDSHARE.

Order Identification condition: "*If an equation is to be identified, the number of predetermined variables excluded from the must be greater than or equal to the number of included endogenous variables minus 1*"[3].

Let's now check order condition by every equation.

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[3] Kennedy (2003), page-194

1- The first equation (education) excludes 15 exogenous variables such as SOCR, LFPR, ARLAND, NRVALUE, HLTEXPPC, GINIRM, GINIUM, HETR, HETL, HETC, POLICEPC, SSEXPPC, IFI, POPDENS, and INDSHARE. It includes 3 endogenous variables such as EDUR, MATR, and HLTR. So this equation is over-identified.

2- The second equation (material prosperity) excludes 12 exogenous variables such as EDEXPPC, HLTEXPPC, GINIRM, GINIUM, HETR, HETL, HETC, POLICEPC, SSEXPPC, IFI, POPDENS, and INDSHARE. It includes 4 endogenous variables such as EDUR MATR, POLR and HLTR. So this equation is also over-identified.

3- The third equation (health) excludes 14 exogenous variables such as EDEXPPC, LFPR, ARLAND, NRVALUE, GINIRM, GINIUM, HETR, HETL, HETC, POLICEPC, SSEXPPC, IFI, POPDENS, and INDSHARE. It includes 4 endogenous variables such as EDUR MATR, POLR and HLTR. So this equation is also over-identified.

4- The fourth equation (political voice) excludes 13 exogenous variables such as EDEXPPC, LFPR, ARLAND, NRVALUE, HLTEXPPC, HETR, HETL, HETC, POLICEPC, SSEXPPC, IFI, POPDENS, and INDSHARE. It includes 2 endogenous variables such as EDUR, AND POLR. So this equation is also over-identified.

5- The fifth equation (personal security) excludes 9 exogenous variables such as EDEXPPC, LFPR, ARLAND, NRVALUE, HLTEXPPC, SSEXPPC, IFI, POPDENS, and INDSHARE which is greater than 4 endogenous variables included such as PERR, POLR, ECOR, and MATR. So this equation is also over-identified.

6- The sixth equation (economic security) excludes 13 exogenous variables such as EDEXPPC LFPR, ARLAND, NRVALUE, HLTEXPPC, GINIRM, GINIUM, HETR, HETL, HETC, POLICEPC, POPDENS, and INDSHARE. It includes 5 endogenous variables such as ECOR, MATR, POLR, HLTR, and EDUR. So this equation is also over-identified.

7- The second equation (environmental conditions) excludes 14 exogenous variables such as EDEXPPC SOCR LFPR ARLAND NRVALUE HLTEXPPC GINIRM, GINIUM, HETR, HETL, HETC, POLICEPC, SSEXPPC, and IFI. It includes 4 endogenous variables such as EDUR, MATR, HLTR, POLR, PERR, ECOR, and ENVR. Consequently, this equation is also over-identified.

As each equation has been found to satisfy the order condition for identification we can now estimate the model. The three-stage least squares model involves the following procedures:

- "The first stage involves obtaining estimates of the residuals of the structural equations by two-stage least squares of all identified equations.
- The second stage involves computation of the optimal instrument, or weighting matrix, using the estimated residuals to construct the disturbance variance-covariance matrix.
- The third stage is joint estimation of the system of equations using the optimal instrument"[4]

   Using Stata, we have estimated the 3SLS model. We present the result in Table-3.2.

3.5.1: Results and their analysis

The Table-3.2 shows the Three-stage least-squares estimates of seven equations. Many of the dimensions have impacts on each other and they are significantly different from zero.

Education

Our equation for explaining Education (EDUR) consists of two endogenous variables such as material prosperity (MATR) and economic security (ECOR) and one exogenous variable such as education expenditure per capita (EDEXPPC).

As expected the relationship between material prosperity and education has been found to be positive. Material prosperity is found to have a positive and significant effect on education at 1% level of significance. It may be due to the reason that the states which are more prosperous and faster growing may find it easier to provide educational infrastructure. Secondly, as Bils and Klenow (2000) document, higher anticipated growth increase enrolment by reducing discounting rate. So According to Bils and Klenow (2000), even a skill neutral technological change can increase demand for schooling. Foster and Rosenzweig (1996) found evidence for skill-biased technological change can

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[4] https://www.encyclopedia.com/social-sciences/applied-and-social-sciences-magazines/least-squares-three-stage

also influence returns to schooling and enrolment. They document that those Indian states that have experienced technological advancement in agriculture caused by green revolution in the 1970s have also experienced, high returns to schooling and enrolments. Also, similar results are found in Foster and Rosenzweig (2001) who use the data for 240 Indian villages observe that expected growth rates in agricultural productivity had significant effects, on secondary school construction and enrolment rates.

Another significant result is the effect of educational expenditure not having any impact on the educational outcome. This is counter-intuitive, as it suggests the link between public expenditure and development outcomes have been severed. But in many empirical studies on this issue on the effect of educational expenditure on educational outcomes the results are mixed. While Hanushek and Kimko (2000) found the absence of any impact of school resources on test scores, Al Samarrai (2002) found that public primary education spending (% GNP) has a negative and significant effect on the enrolment ratios. Gupta, Verhoeven, and Tiongson (2002) found that both educational outcomes such as primary and secondary school enrolment ratios, primary school drop-out rate and persistence through Grade 4 are correlated with overall sector spending and the intra-sectorial allocation of public funds. One of the reasons suggested in the literature is related to the crowding-out hypothesis. It implies that an increase in public expenditure leads to crowding out of private spending, so additional public spending has a negligible net impact on educational outcomes. Another argument advanced in the literature focuses on inefficiency in Government spending. These studies present a range of reasons for the inefficiencies of government spending such as corruption by government officials, failure to act as profit maximizers (Pritchett, 1996), lack of transparency and accountability (Campos and Pradhan, 1996), inefficient composition of public expenditures (Filmer et al. , 2000) etc. Rajkumar and Swaroop (2007) found that in countries with good governance, public spending on primary education becomes more effective in increasing primary education attainment. Another explanation might be that it is not that current expenditure ensures improvement in educational outcomes, but accumulated interventions over a long period may influence the results of social policies. For instance states like Kerala have seen interventions in education over a long period, which may be the reason for her impressive performance.

We find that economic security has a significant and positive effect on education. It implies that when people more secure economically the achievements in education is

higher. As education requires investment, the economic resource available to parents facilitates children's success in school. Conley (2001) observes that parental wealth is a strong predictor of enrolments in college and the completion of college. Similarly, parental unemployment may have an impact on children's performance which may be positive or negative. Unemployment gives parents the opportunity to spend quality time with children which may increase their performance. On the other hand, parents absorption with financial distress may reduce the level and quality of time they spent with children, increase the stress on students and reducing the students' performance. So the effect of unemployment on education is an empirical question. Ruiz-Valenzuela (2015) studies the effect of parental job loss on children's school performance during the Great Recession in Spain. She found that students experience a negative and significant decrease in average grades of about 13% of a standard deviation after father's job loss. Some studies, for instance, Öster (2006) found that while the fathers' unemployment has a negative impact on Children's' performance mother's unemployment has a positive impact on Children's performance. Nilsson (2005) also found similar results. One explanation he suggested that for the differing results across genders could be that women can better cope with unemployment and able to do something productive such as spending quality time with children that increase their performance.

Material Prosperity

Here our equation for explaining material prosperity (MATR) contains three endogenous variables such as education (EDUR), health (HLTR), political voice (POLR), and four exogenous variables such as social connections (SOCR), labour force participation (LFPR), arable land (ARLAND) and value of natural resources (NRVALUE).

Here, we find that education has a significant impact on material prosperity. The effect is expected and positive at around 1% level of significance. Several reasons in the literature back this result. Education helps in enhancing the human capital inherent in labour force leading to a higher level of output (Mankiw, Romer, and Weil, 1992). Education stimulates innovation (Romer, 1990) and helps in the diffusion and transmission of technology (Nelson and Phelps, 1966). All these factors explain the positive effect of education on material prosperity.

Here we find that there is no effect of health on material prosperity. From a theoretical perspective, the impact of health on material prosperity (income) is not clear. Lower

mortality can enhance total output by increasing the productivity of existing resources. In the presence of Malthusian effects it may on the other hand, accelerate population growth and thus reduce growth in income per capita. Unified growth theory suggests that demographic transition is a crucial turning point for many direct and indirect channels through which life expectancy affects income per capita. This is strange in the sense that in theoretical literature there are many reasons for expecting the effect of health on material prosperity. For instance, Bloom, Canning, and Sevilla (2004) found that a one-year increase in life expectancy raises output by 4 per cent. Similarly, Jamison et al. (2007) conclude, among other things, that improved health conditions account for 10-15% of economic growth in the later decades of the 20th century. Cervellati and Sunde (2011) suggest that the adverse effect of population growth may operate before the inception of demographic transition. They document that while post-transitional countries have a positive causal effect of health on per capita income the opposite is true for the pre-transitional countries. As we have adopted a linear model by pooling states that are at various levels of demographic transition, so the effect of health on material prosperity might be insignificant.

We observe that political voice has a positive and insignificant effect on material prosperity. While many studies find both positive and negative impact of democracy on material prosperity, many studies also find no significant impact of democracy on material prosperity (for example, Londregan & Poole, 1996; Burkhart & Lewis-Beck, 1994, Helliwell, 1994; Barro, 1996; Rodrik, 2000). Doucouliagos and Ulubaşoğlu (2008) in their meta-analysis on the effects of democracy found that the causal relationship between democracy and growth is inconclusive. Barro (1996) found that there is a non-linear relationship between economic growth and democracy with a lower level of political rights democracy induces growth and in a higher level of political rights democracy retards growth. Theoretically, democracy can have both a positive and negative effect on economic growth and per capita income. Sen (1999) argued that available comparative studies suggest that there is no relationship between economic growth and democracy in either direction. Przeworski et al. (2000) also suggest that 'in the end, total output grows at the same rate under the two regimes.

Similarly, we did not find social connections having any effect on material prosperity. Many scholars like Putnam et al. (1994), Knack and Keefer (1997) and Whiteley (2000) found that correlations between elements of social capital, especially trust, and indicators

of aggregate economic performance are significant. Putnam et al. (1994) argue that North Italy has developed faster than South Italy due to its high social capital level. Whiteley claims that, if all other factors are controlled, social capital is equally important as human capital in explaining national growth. There are also scholars who are sceptical about these results. Schneider, Plummer and Bauman's (2000) study showed that in driving economic growth in the (sub-national) regions of Europe economic rather than social factors were more important. Casey (2004) similarly documents that though correlations between trust, civic associations and economic performance across the regions of Great Britain are observed to be positive; the correlations between economic associations (such as trade unions) and economic growth are found to be negative. Similarly, Casey and Christ (2005) do not find any effect of social capital on economic performance. Our results are similar to these lines of literature which does not find any relationship between material prosperity and social connections.

As expected, arable land is found to have a weekly positive effect on material prosperity. But we do not see any impact of the labour force participation rate on material prosperity. It may imply as labour force participation contains both employed and unemployed people so its effect may not be significant. Similarly, we do not find any effect of the natural resource on material prosperity. It may imply that there seems to be no concrete evidence either in favour of or against the existence of "resource curse" in the context of Indian states. Our result is similar to Ministry of Finance (2017) who found little evidence of the resource curse hypothesis in the context of Indian States.

Health

Here our equation for explaining Health (HLTR) contains five endogenous variables such as material prosperity (MATR), economic security (ECOR), education (EDUR), environmental conditions (ENVR) and social connections (SOCR) and one exogenous variable such as health expenditure (HLTEXPPC).

Here we find that expected education having a positive and significant effect on Health. It suggests that the states which score high on education are also performing well in health. As we have seen in the literature, there are several reasons why education affects health. Psychological mechanism explains that more educated people have more self-control mechanism which helps the educated people perusing healthy lifestyles (Ross and Wu, 1995). Education helps in stress control and increase social support (Mirowsky and Ross,

2003). Educated people have more resource at their disposal, so it helps them become healthier than those less educated.

We do not find any effect of material prosperity on health. This result is little strange in the sense that the states which have more resources at their disposal, they can use it for health financing. On the other hand Economic security is found to have a positive and significant effect on the health at a 5% significance level. So there is evidence the states whose performance in economic security dimension is high also perform well in health dimension. It points out to the role of economic security is one of the most important factors for poor health outcomes. This result conforms to the many studies which find the adverse effect of unemployment and debt on health. For instance while, Lenton and Mosley (2008) found that debt levels have a negative effect on both physical and psychological health. Richardson, Elliott and Roberts (2013) observe that the level of the household has been associated with a range of health outcomes. This result also points out to the association between unemployment and health outcomes.

Social Connections is also found to be positively significant at 5% level of significance. This suggests that positive role of social connections in improving health may come due to improved access to health-related information, informal healthcare and support during illness and role of advocacy for demanding health-promoting public goods In the political economy channel through well-organised, connected groups. Our study finds similar results of studies like Folland (2007) in the case of the USA and D'Hombres et al. (2010) of for a set of eastern European countries, who found the positive effect of Social connections on Health.

Environment (ENVR) is one of the determining factors for health. It is positively significant at 5% level of significance. Health may be influenced by the environment through direct effects of water, air, soil and noise pollution, also indirectly through the quality of the environment in the place of work. As pollution has a directly negative effect on health, a good environment is beneficial for health.

Health Expenditure (HLTEXPPC) does not appear to be significant in explaining health outcomes. This case is similar to that of the educational expenditure not having any effect on Education. One reason may be that the inputs may result in outcomes with a lag. Increased public expenditure on health may crowd out the private expenditure so the overall effect may be zero. Another reason may be the inefficiency of public intervention

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due to various reasons. Previously, many studies also have found that public intervention may be anaemic when faced with bureaucratic inefficiency, lack of transparency and accountability, corruption, the improper composition of expenditure (Filmer and Pritchett, 1997; Filmer, Hammer, and Pritchett, 1998; Musgrove, 1996; Pritchett, 1996 etc.).

Political Voice

The explanatory variables used for explaining Political voice include one endogenous variable Education (EDUR), and three exogenous variables namely social connection (SOCR), Gini rural (GINIRM) and Gini Urban (GINIUM)

Here we find education (EDUR) is only significant factor in explaining political voice albeit at 10% level only. So the states that score well in education also score well in Political voice dimension. This provides weak evidence in favour of the modernisation hypothesis which suggests that education by broadening the outlook of people, make them sort out the difference by voting than violent and extreme methods. It empowers the citizens with the skills and resources needed for political pursuits. The more educated individuals are more likely to understand political issues, candidates and campaign. Many studies found results in a similar direction. For example, according to Glaeser et al. (2007), the correlation between education and democracy is very high. Likewise, Putnam (1995) argues that, education is the best predictor of political participation.

We do not find any evidence that about Social connections (SOCR) affecting Political Voice. While many researchers such as Putnam (1993) Brehm and Rahn (1997), Uslaner (1999), Norris (2001) and Mishler and Rose (2005) reported has positive effects of social capital on various kinds of political participation, Park et al. (2006) shows no effect or negative effect of social connections on political voice. This is little surprising in the sense that there are several ways through which Social connections influences political participation, for instance, trust reduces the riskiness of political participation.

Similarly, the effect of inequality (GINIRM, GINIUM) is not significant. This may be due to that reason that disposal of cases in the judiciary reflects the structural pattern and is not responsive to the socio-economic conditions. Regarding political participation, theoretically, the effect can be positive and negative. Conflict theory and contagion theory predicts that higher levels of inequality may raise political participation because of it is in both the parties interest and low economic status individuals imitate rich people's

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political behaviours respectively, because of withdrawal, low economic status people may be discouraged from participating in politics. In contrast, Schroeder (2009) suggests that there is no single effect of inequality on political participation and economic segregation on spatial scale, i.e. the condition of having many homogeneously wealthy and many homogeneously poor neighbourhoods in the same region may lower rates of political participation. This may be the region for which we do not find any unique effect of inequality on political voice.

Personal Security

Here our equation for explaining Personal Security contains three endogenous variables namely material prosperity (MATR), political voice (POLR), economic security (ECOR) and six exogenous variables namely social connections (SOCR), Gini Rural (GINIRM), Gini Urban (GINIUM), religious fractionalisation (HETR), caste fractionalisation (HETC), and linguistic fractionalisation (HETL).

Here we find evidence that economic security is one of the determining factors in respect of personal security. Economic security is positively significant at 10% level of significance. The states which score high on Economic security also score high on Personal Security. So when people are economically secure, they engage less in the activities that are illegal and cause personal insecurity for other members of the society. High economic security may reflect the existence of legal avenues of livelihood and people are treated with dignity because of economic security. It may imply that with economic security people are subject to the control of their peers. So they find less motivation for engaging in crimes that will endanger the economic security of other members of the society.

Material prosperity does not seem to have any effect on personal security. While criminologists argue that tough economic times make more people willing to commit crimes, many economists claim that better economic times associated with people having luxurious products which generate resentment and envy. Better economics times also imply more demand for drugs and related violence. The fact that material prosperity does not have a clear effect on personal security can be interpreted as evidence that the level of prosperity does not induce criminal behaviours of various kinds. Fajnzylber, Lederman and Loayza (2000) did not find any effect of per capita income on crime.

Political Voice (POLR) and Social connections (SOCR) now lack statistical significance. While many theories posit that civic participation can reduce crime by requiring individuals to contemplate competing positions about what choices are best, persuades them to reflect on the perspectives and interests of fellow citizens (de Tocqueville, 1969) and settle disputes through voting rather than violent methods. But many studies also fail to find the causal effect of political participation on crime reduction (Gerber et al., 2016). Similarly, Social connections theoretically can affect Personal Security both positively and negatively. We do not find the evidence in either direction.

Similarly, Inequality measures also do not appear to be significant. While urban inequality (GINIUM) has a negative sign, it is not significant. This is surprising as major theories of crime like Marxist, economic approach, and strain models predict a positive relationship between crime and inequality. Our result that there is no significant impact from inequality on personal security is in line with the findings of those of Neumayer (2005) and Baier (2014). Gini index, as Messner and Rosenfeld (1997) suggested, may fail to capture the complex social concepts of strain. Similarly, the index may not be a good proxy for expected net return from crime. Another explanation based on Veblen's conspicuous consumption approach; suggested by Hicks and Hicks (2014) is that rather than disparity, whether people are flaunting their riches matters for the crime. The authors found that the relationship between conspicuous consumption and crime rates is much robust than the link between income inequality and crime. By highlighting the role of information in determining crime, the authors suggest that crime may be linked to inequality in visible expenditure, but not to the inequality of total spending.

While Caste heterogeneity and religious heterogeneity are found be having no role in explaining personal security, linguistic fractionalisation has a strong positive effect on personal security around 1% level of significance. It suggests that the states which are linguistically diverse are more secure personally than homogeneous states. This result is surprising because from theoretical literatures it was expected that Fractionalisation would have a negative effect on personal security. The constitutional protections given to linguistic minority communities may have softened the possible negative consequences of fractionalisation. The linguistic minorities may be members of Tribal communities, whom the constitution provides extra protection in the form of provisions from Prevention of SCs and STs Atrocities act. This may ensure some degree of economic security to them by preventing crime against the members of marginalised communities.

As in India people from various groups are living here for centuries and millennia the accumulated wisdom of tolerance, mutual respect, and migration within and outside the state and multilingual culture in diverse parts of the country may have played a role in this positive effect.

As expected per capita police rate has a negative effect on crime at 1% level of significance. The result implies that the number of police officers helps in controlling crime and help in ensuring personal security.

Economic Security

Here our equation for explaining Economic Security contains five endogenous variables such as material prosperity (MATR), political voice (POLR), health (HLTR), education (EDUR) and social connections (SOCR) and two exogenous variables such as Social Security expenditure per capita (SSEXPPC) and index of financial inclusion (IFI).

Material prosperity (MATR) does not appear to be significant, which suggest a disconnection between the health of the economy of a state and the well-being of the household. It may be possible that high material prosperity associated with joblessness and the informal economy. This may dampen the possible positive effects of material prosperity on Economic Security.

Political voice is a negatively significant at 5% level of significance. This result indicates the existence of a trade-off between political voice and economic security. The states which score high on political voice score low on economic security. More political participation may encourage competitive populism or "short-termism" which may not really help people.

Health does have a positive and significant effect at 5% level of significance. It implies that poor health may cause lengthen the duration of unemployment, financial loss and indebt the household. Owing to their spending on hospital care, households seem to be at greatest risk of indebtedness, and this implies that provision of quality health care may make people less financially vulnerable. Khan, Bedi and Sparrow (2015) for poor urban households in Bangladesh found that serious illness causes income loss, increase in the level of debt and depletion of assets.

Similarly, education is also found to be significant though weakly at 10% level of significance. Education widens the opportunity for people. Better educated people are capable of more secure and better-paid jobs. As employers employ the highest educated people for the job, individuals are with the low level of education are ended up with the most significant chance of unemployment. As education increases income and opportunity cost of working in the informal economy, the less educated people are those who also work in the informal economy.

Social connections (SOCR) is found to be negative and significant at 1% level of significance. This result is slightly surprising because it implies a trade-off between Social connections and economic security. In literature, many scholars argue that social capital helps in reducing economic insecurity, but we find here a contradictory result. The form of the social capital aspect we here considered is bonding social capital, i.e. strong-ties social connections. Many scholars argue that weak-ties social connections, i.e. the bridging form of social capital are important for employment outcomes (Bardy, 2015). Granovetter (1973, 1974) suggested that those who had the strongest relationships and friendships i.e. those who possess bonding social capital were not the most successful job seekers, which bonding social capital. In fact, successful job seekers had widespread, weaker relationships, which arise from bridging social capital. Carter and Maluccio (2002) suggest that the existence of bridging social capital might enable informal insurance mechanisms to help households cope with economic shocks. Because of negative effects of bonding social capital people who have dense bonding capital may be unable to invest in bridging social capital and do not find the opportunity to work in formal sectors and end up working in informal and agricultural sectors.

Social security expenditure (SSEXPPC) is found to be not a significant factor in explaining economic security. In literature it is suggested that it is not the amount of expenditure but how the expenditures are managed makes the difference. Social security expenditure may be ineffective in ensuring economic security due to the reasons for the inefficiency of the public sector, corruption, leakage, lack of transparency and improper composition of expenditure etc. Similarly, Financial Inclusion (IFI) does not seem to be significant.

Environmental Conditions

Here we regress environment on three endogenous variables material prosperity (MATR), education (EDUR) and economic security (ECOR) and two exogenous variables namely population density and share of industry in state GDP.

Material prosperity (MATR) is negatively significant at 5% level implying a trade-off between material prosperity and environment. This implies material prosperity has a cost to the environment. The production may be associated with inputs that are polluting in nature. And policies that promote material prosperity should be evaluated on whether they hurt the environment or not.

Education (EDUR) is also significant at the 5% level. This implies that states that score high on education also score high on the environment. Education promotes pro-environment practices, enable people to comprehend the complex and technical concepts relating to the environment, by making them patient and long-term oriented make them aware of the long-term effects of environmental pollution. Our finding is similar in the line of Meyer (2015) who found that education causes individuals to behave in a more environmentally friendly manner.

Economic security (ECOR) does not appear to be significant. Economically vulnerability may force people to follow unsustainable environmental practices. Similarly, the pro-environmental behaviour which requires time will increase with unemployment. So both the effect may net out each other.

As expected Population density (POPDENS) is negative and significant at 5% level. It suggests that as population increases the pressure on environment increases. But we did not find any effect of sectoral composition, i.e. the share of industry (INDSHARE) having any effect on the quality of the environment. This may be due to the reason that production structure may be polluting in general and pollution is not specific to any sector as such.

3.6 Conclusion

In this chapter, we used to correlation as well as multiple regression analysis to understand interlinkages and trade-offs among the dimensions of development. Using the development ranks constructed by Ray et al. (2018) we used Spearman's rank correlation

method for correlation analysis as well as Three-stage least squares (3SLS) method for regression analysis. Our regression and correlation results suggest that there are significant interlinkages among the dimensions. For instance, 3SLS results suggest that while material prosperity and economic security affect education, education also affect material prosperity. Education, economic security, environmental conditions and social connections influence health. Education is also found to have an impact on political voice. We observe that economic security has an impact on personal security. While political voice and social connections are found to affect economic security negatively; health and education affect economic security positively. Finally, material prosperity and education are found to have an impact on environmental conditions. So we observe that the relationships between the development dimensions may not only two ways, they are mediated by other dimensions also. So dimensions of development are interconnected in nature. Many of these dimensions are not only are end in themselves, they are also mean to achieve other outcomes. However there are trade-offs among the dimensions of development. In our next chapter, we explore similarity of states with respect to their performance across various dimensions of development. For the purpose of finding meaningful clusters of states, we use cluster analysis. This will help us in observing the distinctive characteristics of states.

Table 3.1 Results from Correlation Analysis

	MATR	HLTR	EDUR	POLR	SOCR	PERR	ECOR	ENVR
	C1	*C2*	*C3*	*C4*	*C5*	*C6*	*C7*	*C8*
MATR	1							
HLTR	0.48*** (0.0097)	1						
EDUR	0.669*** (0.0001)	0.611*** (0.0005)	1					
POLR	0.281 (0.14)	0.408** (0.031)	0.473** (0.0109)	1				
SOCR	-0.154 (0.43)	-0.143 (0.4651)	-0.359* (0.0606)	-0.39** (0.03)	1			
PERR	-0.144 (0.46)	-0.002 (0.99)	-0.04 (0.83)	-0.298 (0.12)	0.069 (0.72)	1		
ECOR	0.3622* (0.05)	0.4316** (0.02)	0.568*** (0.001)	0.311 (0.1)	-0.51*** (0.005)	-0.23 (0.22)	1	
ENVR	0.042 (0.83)	0.238 (0.22)	0.278 (0.152)	0.282 (0.14)	-0.407** (0.03)	0.126 (0.52)	0.39** (0.03)	1

Note: terms in parenthesis denotes the p-value. *** show 1% level of significance.
**show 5% level of significance, and* show 10% level of significance.

Table 3.2 Results from Regression Analysis

	EDUR	MATR	HLTR	POLR	PERR	ECOR	ENVR
Independent Variables	C1	C2	C3	C4	C5	C6	C7
EDU (e)		1.52*** (0.39)	1.48 ** (-0.13)	0.694* (0.36)		0.92* (0.48)	1.11** (0.49)
MATR (e)	0.389* (0.06)		-0.13 (0.23)		-0.224 (0.15)	-0.189 (0.23)	-0.476** (0.21)
HLTR (e)		0.025 (0.18)				0.65*** (0.181)	
POLR (e)		0.24 (0.21)			0.258 (0.17)	-0.7*** (0.21)	
PERR (e)							
ECOR (e)	0.171** (0.081)		0.508 ** (0.24)		0.332* (0.19)		0.14 (0.23)
ENVR (e)			0.52 ** (0.23)				
SOCR		0.096 (0.29)	0.628** (0.26)	-0.353 (0.27)	0.14 (0.2)	-0.8*** (0.25)	
EDEXPPC	2.64 (1.95)						
LFPR		-.21 (0. 21)					
ARLAND		.0003285** (0.0001)					
NRVALUE		-5.57e-09 (1.16e-08)					
HLTEXPPC			-28.77 (20.24)				
GINIRM				-12.5 (21.78)	27.525 (17.828)		
GINIUM				7.7 (22.34)	-10.434 (21.35)		
HETL					18*** (5.77)		
HETR					-7.32 (5.07)		
HETC					-2.15 (7.03)		
POLICEPC					-1.45*** (0.55)		
SSEXPPC						0.061 (0.20)	
IFI						-5.463 (9.82)	
POPDENS							-0.01** (0.00)
INDSHARE							.017 (0.10)
Constant	8.58*** (1.44)	-8.87 (19.9)	-33.75*** (11.02)	8.956 (11.23)	7.6 (12.08)	0.0585 (0.2)	3.21 (7.28)
R-squared	0.52	0.354	0.197	0.328	-0.298	0.121	0.323
Chi2 -statistic	62.00 (0.00)	44.61 (0.00)	30.90 (0.00)	10.22 (0.03)	15.18 (0.12)	39.37 (0.00)	22.89 0.0004
Obs	28	28	28	28	28	28	28

Note: e indicates endogenous variables. Standard errors are in parenthesis. P-values are in Parentheses for chi2.*** indicates Significant at the 1% level. ** Significant at the 5% level and * indicates significant at the 10% level.

Chapter 4

Clustering of States according to development performance

Introduction

After analysing the interlinkages and trade-offs among the dimensions of development, now we intend to cluster the states according to their performance. There has been overwhelming evidence about wide regional variation across Indian states on a range of key variables such as economic, political, social indicators. We here intend to classify states based on their performances across various dimensions. This clustering will help us in finding states which are similar in different aspects of development. The similarity between the states in achievement may be the results of similar structures, institutions and policies and geographical spillovers. Using Ray et al. (2018) indices on various dimensions of development we undertake a cluster analysis. Here we do the cluster analysis at the level of Indicators for each dimension. This helps us in focusing at more detailed level. After doing the clustering, we check the geographical distribution of these clusters.

4.1 Data

In this chapter we have use the data from the work of Ray, Agrawal and Parameswaran (2018) on measurement of development performance of Indian states. We have used the value of indicators provided by Ray et al. (2018). The authors have normalised indicator is to the following formula.

$$i = \frac{ideal - observed}{ideal + observed}$$

This normalisation method has the property of unitary conversion method limiting the range of to (0,1). This transformation measures the deprivation/shortfall from the ideal value. So higher is the value of the indicator, lower is the performance and vice-versa. This normalization has the also property of level sensitivity, namely, a diminishing valuation of marginal changes with increasing levels.

Ray et al. (2018) have defined the ideal values in three alternative ways. For some cases, authors have chosen 100% (total immunisation) or 0% (crime rate) as ideal. For some

indicators, graduate population or IMR, they have adopted global norm as the ideal. For other indicators, ideal is taken from the maximum or minimum value of Indian states.

For material prosperity

Ray et al. (2018) constructed the index for material prosperity using the following eight indicators: (1) Per capita income(PCI), (2) Household assets (AVA), (3) Share of non-food items in monthly per capita consumption expenditure (NON_FOOD), (4) Per cent of households having pucca or semi pucca houses (HOUSE), (5) Percentage of households having access to safe drinking water (SAFE_WATER), (6) Percentage of households having latrines in their premises(LATRIN), (7) Road density(ROAD) and (8) Non-BPL population(NON_BPL).

The authors have captured Knowledge and education by two indicators such as (1) Percentage of graduate population(GRAD_EDU), and (2) Learning outcome (LEARNING).

Health is captured by (1) IMR, (2) Prevalence of illness (MORBIDITY), (3) Percentage of children fully immunized (IMMUNISATION), (4) Vitamin supplementation(vitamin), (5) wasting (6) Underweight

Ray et al. (2018) have constructed this dimension of political voice and governance by the following variables (1) Voter turnout (VOTE_NORM), (2) Women's political participation (WOMEN_POL), (3) Ratio of court cases pending to court cases disposed (PENDING).

The variables Ray et al. (2018) considered for measuring dimension of social connections are (1) Marital Stability (Marriage) and (2) Suicide rates (SUICIDE).

The authors included the following three variables in constructing Personal security dimension: (1) Crime rates (CRIME), (2) Dowry deaths (DOWRY) and (3) Deaths due to road accidents (ACCIDENT).

Ray et al. (2018) constructed Economic insecurity dimension by using the following four indicators: (1) Unemployment rates (UNEMPLOY), (2) Dependence on agriculture (WORK_AGRI), (3) Informal sector workforce (WORK_INFORM), and (4) Debt free households (DEBT_FREE).

Environmental conditions encompasses (1) Forest cover (FOREST) and (2) Water treatment (WATER_QU). We use these two variables to do our cluster analysis for environmental conditions.

4.2 Methodology

Cluster analysis is a set of multivariate techniques which is designed to cluster similar observations in a dataset, such that observations in the same cluster are as similar to each other as possible, and similarly, observations in different groups are as different to each other as possible. K–means cluster analysis is based on unsupervised learning. K–means cluster analysis partitions the states into a priori specified number of clusters. It groups the observations into specified number of clusters by minimising the distance between them. The distance, most specifically the Eucleadean distance measures the proximity of data points to the centroid and proximity to centroid determines the cluster membership.

K-means method requires to specify the number of clusters in advance to be derived, which is little tricky. One common method of choosing the appropriate cluster solution is to compare the sum of squared error (SSE) for a number of cluster solutions. SSE is defined as the sum of the squared distance between each member of a cluster and its cluster centroid. Thus, SSE can be seen as a global measure of error. In general, as the number of groups increases, the clusters become by definition smaller. So the sum of squared error (SSE) should decrease because of increased number of cluster solutions.

We derived the number of clusters empirically by plotting within group sum of squares against number of cluster solutions. There are several k-means algorithms available. The standard and default algorithm is the Hartigan-Wong algorithm. It minimises the Euclidean distances of all points with their nearest cluster centroids, by minimizing within-cluster sum of squared errors (SSE). The process begins by choosing k observations to serve as centres for the clusters. The first step is to assign initial clusters. These initial clusters can be specified a priori or let the algorithm assign them randomly. The algorithm works in iterations. In every iteration, all the data points are then assigned to one of the clusters based on the nearest distance from the centers. After each observation has been put in a cluster, the center of the clusters is recalculated, and every observation is checked to see if it might be closer to a different cluster. The process continues until no observations switch clusters.

After the cluster solution is selected, then R programming carries out a principal component analysis on the original data set. Each sample is then displayed on a scatter plot of the first two principal axes of the PCA with the resulting clusters. If the clusters are strong at the selected level, there should not be substantial overlap in the distributions of the cluster outlines on the PCA plot.

4.3 Results

4.3.1 Clustering According to Dimensions

4.3.1.1 Material Prosperity

We carried out a cluster analysis for the dimension of health using eight indicators such as (1) Per capita income, (2) Household assets, (3) Share of non-food items in monthly per capita consumption expenditure, (4) Per cent of households having pucca or semi pucca houses, (5) Percentage of households having access to safe drinking water, (6) Percentage of households having latrines in their premises, (7) Road density and (8) Non-BPL population. From the plot of within group sum of squares to number of cluster solutions, we find that the appropriate number of clusters is seven. The Cluster characteristics such as cluster centres and standard deviation are presented in the Table-4.1. Higher the value of the cluster centre, lower is the performance. Figure-1 represents the geographical distribution of different clusters.

The first cluster consists of 2 small states, Sikkim and Goa. Though these states account for 0.17% of population of India, they have a GDP share around 0.59 %. For Household assets indicator, this cluster ranks 3. In the per capita income indicator this cluster's performance is the best. For Share of non-food items in monthly per capita consumption expenditure these states rank 4. For both the indicators such as Per cent of households having pucca or semi pucca houses and safe water cluster-1 ranks 3. For both the indicators such as Percentage of households having latrines in their premises and Road density this cluster ranks second. For non-BPL population, this cluster tops the list. So we can say, in the dimension of material prosperity these two states are one of top-performers.

Cluster 2 has one only one membership i.e. Kerala. While it has a population share of 2.75 per cent of Indian population, its contribution to GDP is around 3.86 per cent. This

cluster ranks first in Household assets, Share of non-food items in monthly per capita consumption expenditure, Percentage of households having latrines in their premises and Road density. With respect to per capita income and Per cent of households having pucca or semi pucca houses and this cluster ranks 2 and three respectively. For non-BPL population, this cluster ranks 2. But in Percentage of households having access to safe drinking water indicator this cluster is in the bottom of the list. So we can say this cluster is one of top performing cluster in many indicators.

The third cluster contains only Arunachal Pradesh. In terms of cluster centres on Household assets, Percentage of households having access to safe drinking water, non-BPL population this cluster is in the bottom of the list. In terms of per capita income this clusters is second worst. In Share of non-food items in monthly per capita consumption expenditure, this cluster performs ranks 2 after Cluster-2 i.e. Kerala. In safe drinking water, Percentage of households having latrines in their premises and Road density this cluster's performance is 5th. Overall this cluster does not perform well in many indicators of material prosperity.

The 4th cluster consists of six states such as Nagaland, Manipur, Meghalaya, Mizoram, Tripura and Assam. All these states are in North-eastern part of India. It ranks 3 in Percentage of households having latrines in their premises and Road density. In terms of indicators such as Household assets, Per capita income, Per cent of households having pucca or semi pucca houses and Non-BPL population these states rank 5. In Share of non-food items in monthly per capita consumption expenditure, safe drinking water this cluster is 6th. So these states do not perform well in many indicators of material prosperity.

The 5th cluster is a set of states consisting of Himachal Pradesh, Punjab, Haryana and Maharashtra. While Maharashtra is situated in the Peninsular India, other three neighbouring states are situated in the north India. These states have share of population around 14.23% and GDP around 22.39%. In household assets, per capita in income these states are the topper after Cluster-2 (Kerala) and Cluster-1 (Goa and Sikkim) respectively. While in Share of non-food items in monthly per capita consumption expenditure, these states have third position, in the indicators such as Per cent of households having pucca or semi pucca houses and safe water, this cluster rank 1st. This cluster ranks 4 and 5 respectively in Percentage of households having latrines in their premises and road

density. In Non-BPL population this cluster ranks 3 after cluster-2 and cluster-1. Overall, this cluster is a set of mixed performing states.

The Sixth cluster consists of eight states such as Jammu and Kashmir, Uttarakhand, Gujarat, Rajasthan, West Bengal, Tamil Nadu, Karnataka and Andhra Pradesh. This cluster ranks 4th in many indicators such as household assets, per capita income, Per cent of households having pucca or semi pucca houses, road density, and Non-BPL population. This cluster ranks fifth and sixth in Share of non-food items in monthly per capita consumption expenditure and Percentage of households having latrines in their premises, respectively. It ranks 2nd in safe drinking water.

The Seventh cluster consists of states such as Chhattisgarh, Madhya Pradesh, Uttar Pradesh, Odisha, Jharkhand and Bihar. All these states are situated in proximity to one another. These states have share of population around 39.4% and GDP around 22.13%. These states are in Northern central part and eastern part of India. In terms of household assets, Per cent of households having pucca or semi pucca houses, Road Density, Non-BPL population ,this cluster secures 6th position, one position ahead of Cluster-2 i.e. Arunachal Pradesh. In terms of per capita income and Share of non-food items in monthly per capita consumption expenditure, Percentage of households having latrines in their premises this cluster is the last cluster. In terms of safe water, this cluster performs average i.e. 4th position among the 7 clusters. So, we can say that this cluster does not perform well in many indicators of material prosperity.

4.3.1.2 Education

We carried out a cluster analysis for the dimension of education using two indicators namely (1) Percentage of graduate population, and (2) Learning outcome. From the plot of within group sum of squares to number of cluster solutions, we find that the appropriate number of clusters is six. The Cluster characteristics such as cluster centres and standard deviation are presented in the Table-2. Higher the value of the cluster centre, lower is the performance. Figure-3 represents the geographical distribution of different clusters. Figure-2 represents the geographical distribution of different clusters with respect to education.

The Cluster-1 consists of six states. These states are Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Mizoram, and Uttar Pradesh. Most of these states   are in north and

central India. This cluster accounts for 36.02% of Indian population and contributes 19.57% to Indian GDP. From Table-4.2, we find while these states are nearest to bottom of the list when it comes to percentage of graduate population. This cluster is in the bottom of the list, when it comes to learning outcome. So we find that this cluster does not perform well in the dimension of knowledge and education.

The Cluster-2 consists of six states. These states are Andhra Pradesh, Gujarat, Karnataka, Maharashtra, Tamil Nadu and Uttarakhand. While these states have a population share of 33.09%, they contribute 46.01% to Indian GDP. In terms of Graduate population indicator this cluster ranks 2. In learning outcomes, this cluster ranks 5. So while cluster performs well in graduate population, it performs badly in learning outcome.

The Cluster-3 consists of six states. It is the largest cluster. These states are Andhra Pradesh, Tamil Nadu, Karnataka, Maharashtra, Gujarat and Uttarakhand. While these states have a population share of 33.09%, they contribute 46.01% to Indian GDP. So this is the cluster of well-off states. From the figure-2, we can find that most of these states are situated in the southern and western part of India. While in graduate population parameter, this cluster is second best, it is second worst in learning outcome.

The Cluster-4 consists of two north-eastern states. This is the smallest cluster. These are Manipur and Nagaland. These two states have a combined population around 0.34% of Indian population and a GDP share about 0.31%. From the table on cluster centres we find that, while this cluster tops in graduate population, in learning outcomes it ranks 3 after cluster-5 and cluster-6. So this cluster performs well in both the indicators of Education.

The Cluster-5 consists of three states. These states are Arunachal Pradesh, Himachal Pradesh and Sikkim. While these states have a population share of 0.73%, they contribute 1.05% to Indian GDP. In graduate population, these states perform average by ranking four out of six clusters. But in learning outcomes, these states top the list.

Cluster-6 contains five states such as Goa, Kerala, Punjab, Haryana and West Bengal. These states account for 14.8% of Indian population and 18.1% of Indian GDP. While in graduate population, these states rank 3, in learning outcomes they rank 2. So we can say that these states are performing well in education.

4.3.1.3 Health

We carried out a cluster analysis for the dimension of health using six indicators namely (1) IMR, (2) morbidity (3) Percentage of children, fully immunized, (4) Vitamin supplementation (5) Wasting and (6) underweight. From the plot of within group sum of squares to number of cluster solutions, we find that the appropriate number of clusters is seven. The Cluster characteristics such as cluster centres are presented in the Table- 4.3. Higher the value of the cluster centre, lower is the performance. Figure-3 represents the geographical distribution of different clusters.

In cluster-1, we find two states such as Goa and Kerala. These states have a population of 2.87% of Indian population and 4.33 per cent of Indian GDP. This cluster is the best in IMR, Vitamin supplementation and immunisation. In underweight and wasting indicators this cluster also ranks 2 and 4 respectively. But in morbidity these states performs the worst.

Cluster-2 consists of six states such as Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha and Rajasthan. Most of these states are situated in central and eastern part of India. This is the largest cluster in terms of population. This cluster has a 28% share of Indian population and it contributes 18% to Indian GDP. In terms of IMR this cluster is second worst. In morbidity, it ranks 2 and In the Vitamin supplementation it ranks 3. It is also 3rd in Immunisation indicator. In wasting it ranks 4 and in underweight it is in the bottom of the list.

Cluster 3 consists of two north-eastern states such as Nagaland and Manipur. This is the smallest cluster in terms of both population and GDP. This cluster has a share of 0.39% of Indian population and 0.31% of Indian GDP. This cluster ranks 2 in IMR. In Prevalence of illness (morbidity) and underweight indicators it tops the list. In wasting it ranks 2. Their rank is 3 in these indicators. In Vitamin supplementation and Immunisation, this cluster does not perform well. It ranks 6 and 7 respectively in these indicators.

Cluster 4 consists of two states such as Meghalaya and Uttar Pradesh. This cluster has a share of 16.74% of Indian population and accounts for 8.61% of national GDP. These two states are situated in north-eastern and northern part of India. While in the IMR and Vitamin supplementation indicators this cluster is in the bottom of the list, in immunisation and underweight it is one position above the bottom of the list. This cluster

performs relatively well in morbidity and wasting. In these indicators it ranks 2 and 3 respectively.

There are five states in cluster 5 such as Arunachal Pradesh, Gujarat, Maharashtra, Tamil Nadu and Tripura. These states account for 20.6% of Indian population and 30.6 per cent of Indian GDP. This cluster ranks 3 in IMR. These states rank 5 in morbidity, Vitamin supplementation, immunisation and underweight. In wasting this cluster is at the bottom of the list. So we can say that these states perform medium in health.

Cluster 6 consists of eight states such as Sikkim, Assam, Mizoram, Punjab, Haryana, Himachal Pradesh, Jammu and Kashmir and Uttarakhand. Some of these states are in the northern part of India and some are in the north-east. While this cluster covers 9.53% of Indian population, it accounts for 11.51 % of Indian GDP. In IMR, it performs medium as it ranks five. In morbidity and Vitamin supplementation, this cluster ranks 4. Cluster-2 tops the list in terms of wasting and in underweight ranks third. So on an average, this cluster performs medium in health.

Cluster 7 consists of four states, such as Andhra Pradesh, Karnataka and West Bengal. While this cluster contains 19.56% of Indian population, it contributes to 21% to Indian GDP. In IMR indicator, this cluster performs medium and ranks 4. Similarly in the indicator of immunisation this cluster ranks 2. Also in Vitamin supplementation indicator, this cluster performs well. It ranks 2 in Vitamin supplementation. In underweight indicator, this cluster performs average and ranks 4. In terms of morbidity and wasting, the states of this cluster are doing badly, this cluster scores one rank above the bottom. So while this cluster performs well in some indicators, it does not perform well in some other indicators of health.

4.3.1.4 Political Voice

We carried out a cluster analysis for the dimension of Political Voice and Governance using three indicators namely (1) Voter turnout, (2) Women's political participation, (3) Ratio of court cases pending to court cases disposed. From the plot of within group sum of squares to number of cluster solutions, we find that the appropriate number of clusters is six. The Cluster characteristics such as cluster centres and standard deviations are presented in the Table-4.4. Here, higher the value of the cluster centre, lower is the performance. Figure-4 represents the geographical distribution of different clusters.

Cluster-1 consists of seven states such as Kerala, Goa, Odisha, West Bengal, Assam, Tripura and Manipur. These states are situated in southern, eastern and north-eastern part of India. These states have a 17% share of Indian population and a GDP share of 15.83%. In terms of Voter turnout, the Cluster-1 is the 2nd. In women's participation this cluster tops the list. In judicial pendency this state performs average. In this indicator this cluster ranks 4 out of six clusters. So we can say this state is one of the top performing states in Political voice and Governance.

Cluster-2 consists of five states such as Arunachal Pradesh, Haryana, Karnataka, Andhra Pradesh, and Tamil Nadu. These states are situated in north-eastern, northern and mostly Southern parts of India. These states have a 20.12% share of Indian population and a GDP share of 26.56%. This cluster ranks 3 in Voter turnout. It ranks 4 in women's participation and ranks 5 in judicial pendency. We can find same pattern from the ranks table. So this cluster is a set of average performing states.

Cluster-3 consists of two states. These states are Mizoram and Jammu and Kashmir. While these states have population share of 1.12% they have a GDP share of 0.95%. This cluster performs worst in voter turnout and is second worst in women's participation but tops the list in judicial pendency.

Cluster-4 consists of five states such as Bihar, Jharkhand, Uttar Pradesh, Gujarat and Maharashtra. These states are situated in western and northern India. These states have a share of 42% of population of India and GDP share of 35%.In terms of voter turnout these states are second worse, In terms of women's participation these states are average and rank 3. In ratio of court cases pending to court cases disposed, this cluster is in the bottom of the list. So we can say this cluster is not a top performing cluster in political voice.

Cluster-5 consists of seven states, such as Rajasthan, Punjab, Himachal Pradesh, Uttarakhand, Madhya Pradesh, Chhattisgarh and Meghalaya. While Most of these states are situated in central and northern parts of India, Meghalaya is situated in north-eastern part. These states have a population share of 17.7% and a GDP share of 16.39%. This cluster ranks 5 in voter turnout. This cluster ranks 2 in women's' participation and ranks 3 in ratio of court cases pending to court cases disposed. So we can say while in some indicators this cluster performs well in others it does not.

Cluster-6 consists of two states Nagaland and Sikkim. This is the smallest cluster in terms of population share and GDP share. These two states are north-eastern states. While in voter turnout this cluster ranks 1, it ranks 2 in ratio of court cases pending to court cases disposed. However, this cluster is in the bottom of the list for women's participation.

4.3.1.5 Social Connections

We carried out a cluster analysis for the dimension of Social Connections using two indicators such as (1) Marital Stability and (2) Suicide rates. From the plot of within group sum of squares to number of cluster solutions, we find that six numbers of clusters is appropriate. The Cluster characteristics such as cluster centres and standard deviations are presented in the Table-4.5. Here, higher the value of the cluster centre, lower is the performance. Figure-5 represents the geographical distribution of different clusters.

Cluster-1 contains five states such as Andhra Pradesh, Goa, Karnataka, Maharashtra and West Bengal. While Most of these states are situated in south and peninsular India, West Bengal is situated in eastern India. These states have a population share of 29% and GDP share of 36.39%. In suicide, these states perform badly; they rank 4 out of six clusters. In marriage stability, these states' performance is average, they rank 3.

Cluster-2 contains two states such as Meghalaya and Mizoram. Both the states are situated in the north-eastern part of India. These states have a population share of 0.33% and GDP share of 0.31%. In suicide, this cluster's performance is average. They rank 2. But in marital stability, these states are in the bottom of the list.

Cluster-3 contains nine states covering approximately 38% of Indian population and 23.93 per cent of GDP. These states are Manipur, Nagaland, Jammu and Kashmir, Punjab, Rajasthan, Bihar, Jharkhand, Uttar Pradesh and Uttarakhand. This is the biggest cluster of states, both in terms of number of states and population. Both marital stability and suicide, this cluster tops the list. So this cluster tops in social connections.

Cluster-4 contains only one state i.e. Sikkim. It is the smallest cluster. While Sikkim is the worst performer in suicide it is 2nd worst performer in marital stability.

Cluster-5 contains seven states such as Arunachal Pradesh, Assam,Gujarat,   Haryana, Himachal Pradesh, Madhya Pradesh and Odisha. This cluster has a share of 19.8 % of

Indian population and 20.6% of GDP. In suicide this cluster ranks 3 and in marital stability, this cluster ranks 2. So this cluster is the set of medium performing states.

Cluster-6 contains four states such as Chhattisgarh, Kerala, Tamil Nadu and Tripura. While this cluster has a population share of 11.13%, it has a GDP share of 14.25%. In suicide, these states perform second worse only after Sikkim. In marital stability, this cluster ranks 4. So this cluster does not perform well in social connectedness with respect to its achievements in income.

4.3.1.6 Personal Security

We carried out a cluster analysis for the dimension of Personal Security using two indicators such as 1) Crime rates, (2) Dowry deaths and (3) Deaths due to road accidents. From the plot of within group sum of squares to number of cluster solutions, we find that the appropriate number of clusters is six. The Cluster characteristics such as cluster centres and standard deviations are presented in the Table-4.6. Here, higher the value of the cluster centre, lower is the performance. Figure-6 represents the geographical distribution of different clusters.

The cluster-1 contains five states such as Andhra Pradesh, Chhattisgarh, Karnataka, Punjab and Rajasthan. These states account for 22% of Indian population and 24% of Indian GDP. In terms of both crime rates and dowry deaths, the performances of these states are average. They rank 4 out of six clusters. In accident indicator their performance is worse. This cluster ranks 5 here. So we can observe that performance of this cluster is not impressive in the dimension of personal security.

There are eight states in cluster-2 such as Gujarat, Jammu and Kashmir, Kerala, Maharashtra, Manipur, Mizoram, Nagaland and Sikkim. Many of these states are geographically close to each other. This cluster accounts for 18.6% of Indian population and 27.4% of Indian GDP. From the table on cluster centres we find that this cluster tops the list in its performance on Crime rates. In terms of dowry deaths also its performance is good. Here it ranks 2 among six clusters. In accident this cluster ranks 3. Its performance in this indicator is mostly similar to Cluster-5 which ranks 2 in accident. So we can say this cluster performs better in the dimension of personal security.

There are three states in cluster-3. These are Tripura, Uttarakhand and West Bengal. These states account for 8.67% of Indian population and 8.34% of Indian GDP. In crime

rates, its performance is good. It ranks 3 among six clusters. But in terms of Dowry deaths its performance is second worst. But in the indicator of accident, this cluster tops the list.

We find that there are six states in cluster-4. These states are Bihar, Haryana, Jharkhand, Madhya Pradesh, Odisha and Uttar Pradesh. All these states are situated in northern India and geographically close to one another. These states account for 39.38% of Indian GDP and 24.11% of Indian population. From the table- 6, we find that in crime these states perform second worst after cluster-5. In the performance on dowry death, this cluster is in the bottom of the list. In accident this cluster ranks 4 out of six clusters. So we can say this cluster does not perform well in the dimension of personal security.

Cluster-5 contains three north eastern states. These states are Arunachal Pradesh, Assam and Meghalaya. These states account for 2.8% population of India and 1.89% of Indian GDP. In crime, the states perform worst. But in indicator of dowry these states perform better. They rank three out of six clusters. In accident, they perform even better. They rank 2 here.

Cluster-6 contains three states such as Goa, Himachal Pradesh and Tamil Nadu. While the states account for population share of 6.64%, they contribute 9.6% to Indian GDP. From the table on cluster centres (Table-6), we find that this cluster is second best in terms of crime rates. In terms of dowry deaths these states tops the list. But in terms of accident this cluster is in the bottom of the list.

4.3.1.7 Economic Security

We carried out a cluster analysis for the dimension of Economic Security using four indicators such as (1) Unemployment rates, (2) Dependence on agriculture, (3) Informal sector workforce, and (4) Debt free households. From the plot of within group sum of squares to number of cluster solutions, we find that the appropriate number of clusters is seven. The Cluster characteristics such as cluster centres and standard deviations are presented in the Table-4.7. Here, higher the value of the cluster centre, lower is the performance. Figure-7 represents the geographical distribution of different clusters.

Cluster-1 consists of four states such as Rajasthan, Tamil Nadu, Karnataka and Andhra Pradesh. Three of these states are from south India. In the indicator of unemployment rates, this cluster ranks 3 among 7 clusters. In dependence on agriculture, this cluster

ranks 4. In Informal sector workforce indicator this ranks 5. In the indicator of Debt free households, this cluster ranks 6.

Cluster-2 is a set of nine states such as Jammu and Kashmir, Gujarat, Punjab, Haryana, West Bengal, Odisha, Jharkhand, Uttar Pradesh and Uttarakhand. This cluster performs medium in unemployment. These states have a less dependency on agriculture. While this cluster performs worst in Informal sector workforce indicator, in debt free household indicator this cluster does not perform well.

Cluster-3 contains six states such as Assam, Bihar, Chhattisgarh, Madhya Pradesh, Himachal Pradesh, and Maharashtra. This cluster ranks 2 in unemployment rate. But the cluster performs worst in Dependence on agriculture, in which it ranks 7. This cluster performs medium in the both Informal sector workforce and debt free household indicators, where it ranks 4.

Cluster-4 consists of a single state i.e. Kerala. In unemployment rate and Informal sector workforce it performance bad. Here it ranks 6. Similarly, it does not perform well debt free household indicator, where it is in the bottom of the list. But in Dependence on agriculture, it performs well, in which it ranks 2. Though in dimensions of human development performance of Kerala is impressive, in economic security dimension, it does perform well.

Cluster -5 consists of two states such as Nagaland and Tripura. In unemployment indicator, this cluster performs worst. This cluster is found to be relatively less dependent on agriculture. It ranks 3 in Dependence on agriculture. It performs well in Informal sector workforce. Here, it ranks 2. In debt free household indicator this cluster tops the list.

The cluster-6 consists of five north eastern states such as Meghalaya, Arunachal Pradesh, Sikkim, Manipur and Mizoram. In unemployment, this cluster performs the best. But in Dependence on agriculture, this cluster does not perform well. It is near the bottom of the list. However, in Informal sector workforce and debt free household indicator this cluster performs well.

Cluster-7 contains a single state i.e. Goa. This state performs medium in unemployment and debt free households. In dependency on agriculture indicator and informal sector employment, this cluster performs the best.

4.3.1.8 Environmental Conditions

We carried out a cluster analysis for the dimension of Environmental Conditions using two indicators such as (1) Forest cover and (2) Water treatment. From the plot of within group sum of squares to number of cluster solutions, we find that the appropriate number of clusters is six. The Cluster characteristics such as cluster centres and standard deviations are presented in the Table-4.8. Here, higher the value of the cluster centre, lower is the performance. Figure-8 represents the geographical distribution of different clusters.

Cluster-1 consists of three states such as Haryana, Uttar Pradesh and West Bengal. These states are three major states in India. While Haryana and Uttar Pradesh are situated in North India, West Bengal is located in eastern part of India. While these states have a population share of 26% of India, they have a GDP share of 19% per cent. From the table on cluster centres we find that this cluster performs worst in the indicator of Water treatment. Similarly, in forest cover also this cluster is in the bottom of the list.

Cluster-2 consists of seven states such as Chhattisgarh, Goa, Himachal Pradesh, Jharkhand, Manipur, Mizoram and Tamil Nadu. While these states have a population share of 11.8%, they account for 13.33% of Indian GDP. In both water quality and forest cover this cluster performs well. In these indicators these states come 2nd after the Cluster containing Arunachal Pradesh. So we can say that these are performing well in environmental conditions.

The third cluster contains Arunachal Pradesh. Its share in Indian Population and GDP are 0.11% and 0.13% respectively. As evident from table- 8, in both water quality and forest cover this cluster tops the list. So we find that Arunachal Pradesh tops the list in environmental conditions.

The Cluster-4 consists of nine states such as Andhra Pradesh, Assam, Bihar, Gujarat, Karnataka, Kerala, Madhya Pradesh, Odisha and Rajasthan. This biggest cluster accounts for 46.08% of Indian population and 42.47% of Indian GDP. We find a geographical pattern in this clustering. Many of these state share geographical boundaries. In water quality this cluster performs medium and ranks three among clusters. But in forest cover this cluster performs poor and is close to the worst cluster, cluster-1.

Cluster- 5 contains four states such as Maharashtra, Punjab, Sikkim and Uttarakhand. In water quality indicator, this cluster performs worse and is one position higher than the worst cluster-1. In forest cover, this cluster performs medium. This may be due to the cluster being a combination of poor performing Maharashtra and Punjab and good performing Sikkim and Uttarakhand.

Cluster-6 contains three north-eastern states such as, Meghalaya, Nagaland and Tripura and Jammu and Kashmir. These states have a 1.74% share of Indian population and 1.5% of Indian GDP. While this cluster performs average in water quality, it performs relatively better in terms of forest cover.

4.3.2 Clustering According to Sub-indices

Besides distinct dimensions of development Ray et al. (2018) also constructed three sub-indices to meditate on three distinct aspects development. These three sub-indices are Human development, Voice and confidence and Human Security. Human development consists of dimensions of material prosperity, education and health. Voice and confidence consists of Dimensions of political voice and social connections. Human security is composed of the dimensions of personal security, economic security and environmental conditions. We undertake a cluster analysis of each of these aspects, to see how similar the states are in relation to one another.

4.3.2.1 Human Development

According to Ray et al. (2018) there are three dimensions such as material prosperity, health and education that constitute human development. As each dimension has different indicators we have taken all these indicators to do a cluster analysis Human development. For material prosperity, we have eight indicators: (1) Per capita income, (2) Household assets, (3) Share of non-food items in monthly per capita consumption expenditure, (4) Per cent of households having pucca or semi pucca houses, (5) Percentage of households having access to safe drinking water, (6) Percentage of households having latrines in their premises, (7) Road density and (8) Non-BPL population. For education, we have two indicators such as (1) Percentage of graduate population, and (2) Learning outcome. Health is captured by (1) IMR, (2) Prevalence of illness, (3) Percentage of children fully immunized, (4) Vitamin supplementation. So we have total 14 indicators on Human development. The plot of within group sum of squares to number of clusters suggests that

appropriate number of clusters should be 6. We present the cluster characteristics such as cluster centres and standard deviation in table-4.9. Here, higher the value of the cluster centre, lower is the performance. Figure-9 represents the geographical distribution of different clusters.

From figure-9, we find that there has been distinct clustering of states according to the geographical dimensions. We find south Indian states in one cluster, most of the north eastern states in another cluster.

Cluster-1 consists of two states such as Kerala and Goa. From table on cluster centres we find that this cluster is one of top performing cluster in many indicators of human development. There are five states in Cluster-2 such as Arunachal Pradesh, Assam, Meghalaya, Mizoram and Tripura. Cluster-3 consists of two other north eastern states Manipur and Nagaland. Cluster-4 consists of six states Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, Sikkim and Uttarakhand. Most of these states are geographically close to one another. These states also perform well in the dimension of Human development. Cluster-5 consists of seven states such as Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, Rajasthan and Uttar Pradesh. All these states are situated in central and northern India. These states don't perform well in the dimension of Human Development. Cluster-6 consists of six states such as Andhra Pradesh, Gujarat, Karnataka, Maharashtra, Tamil Nadu and West Bengal. These states are situated in western, southern and eastern parts of India. These states perform medium in different indicators of Human development.

4.3.2.2 Voice and Confidence

According to Ray et al. (2018) the political voice and Governance and social connections dimension constitute the sub-index on Voice and confidence. So we have taken all the indicators of these two dimensions for undertaking a cluster analysis. Along with the indicators for the dimension of Political voice and governance such as (1) Voter turnout, (2) Women's political participation, (3) Ratio of court cases pending to court cases disposed, we have the two indicators for dimension of social connections such as (1) Marital Stability and (2) Suicide rates. The plot of within group sum of squares to number of clusters suggests that appropriate number of clusters should be 8. We present the cluster characteristics such as cluster centres and standard deviation in table-4.10. Here,

higher the value of the cluster centre, lower is the performance. Figure-10 represents the geographical distribution of different clusters.

Cluster-1 consists of five states such as Goa, Andhra Pradesh, Odisha, West Bengal and Assam. These states account for 20.68% per cent of India's population and 19.9% of Indian GDP. In voter turnout indicator these states perform well. From the table of the cluster centres (table-10), we find that in this indicator they rank 2. In women's political participation this cluster ranks 3. But in judicial pendency, these states are rank 7 out of 8 clusters. In suicide these states do not perform well they rank 6 here. In marital stability, these states perform better, they rank 3.

Cluster-2 consists of consists of seven states such as Bihar, Uttar Pradesh, Jharkhand, Rajasthan, Madhya Pradesh, Maharashtra and Gujarat. These states are situated in western and northern parts of India. While these states have a population share of 53%, their contribution to GDP is around 44.87%. In voting these states do not perform well. They rank in this indicator near the bottom. In women's political participation, these states do not perform very well. They rank 4 here, but they only above than 4 small clusters. In judicial pendency indicator of voice and confidence, this cluster performs worst. In suicide indicator this cluster ranks third according to cluster centres.

Cluster-3 consists of five states such as Uttarakhand, Himachal Pradesh, Punjab, Manipur and Meghalaya. Three of these states are situated in northern India; the other two states are in north eastern part of India. These states account for 4.17% of Indian population and 5.44% of India's GDP. In voter turnout these states perform medium. But in women's political participation this cluster tops the list. In judicial pendency, this cluster also performs well; this cluster comes 4th after three single state clusters. In suicide this cluster performs well it come 2nd after the cluster of Jammu and Kashmir. But in marital stability the performance of this cluster is worse, it ranks 6th only ahead of two single state clusters. So in most of the indicators of voice and confidence, this cluster performs well.

Cluster-4 contains 4 states such as Haryana, Karnataka, Arunachal Pradesh and Nagaland. While two of these states are in north-east, Haryana in north and Karnataka are in south India. These states contribute 10% of Indian GDP and accounts for 7.41% of Indian population. In voter turnout indicator of political voice and governance, this cluster performs well. It ranks third out of 8 clusters. But in women's participation this cluster does not perform well. It ranks third being ahead of Sikkim and Mizoram. In pending

cases this cluster performs medium. Both in suicide and marital stability, this cluster's performance is average. It ranks 4 out of 8 clusters. So we can say this clusters' performance is medium in Voice and confidence.

Cluster-5 contains a single state such as Jammu and Kashmir. This state constitutes 1.03% of Indian population and accounts for 0.85% of Indian GDP. In voters turnout this cluster of Jammu and Kashmir performs worst. This may be due to the insurgency and unrest pervading the state. In women's participation in politics, this state does not perform well. But in judicial arrears this state performs well. In suicide and marital stability this state performs well. So while in some indicators of voice and confidence this state performs well, in others it suffers.

Cluster-6 also contains a single state that is Sikkim. While this state accounts for 0.05% of Indian population, it contributes 0.12% of Indian GDP. This state is situated near northeast. In voter turnout and judicial pendency this cluster tops the list. But in women's participation and marital stability, this cluster is near the bottom. In suicide this state is in the bottom of the list. So while in some aspect of Voice and confidence this cluster performs well in other it does not perform well.

Cluster-7 contains one state which is Mizoram. While this state has a population share of 0.09%, it accounts for 0.1% of Indian GDP. In voter turnout this state does not perform well, it is near the bottom. In women's political participation this cluster is at the bottom. But in Judicial pendency this cluster performs well, it is near the top. While in suicide this cluster performs medium, it performs worst in marital stability.

There are four states in cluster-8 such as Tripura, Chhattisgarh, Kerala and Tamil Nadu. This cluster accounts for 11.13% of Indian population and 14.25% of Indian GDP. In voter turnout, judicial pendency and marital stability indicators, the performance of this cluster is medium. In women's political participation this cluster ranks 2. In suicide, after Sikkim this cluster performs the worst.

4.3.2.3 Human Security

According to Ray et al. (2018) Personal security, economic security and environmental conditions constitute the sub-index of Human security. So for personal security, we have three indicators such as (1) Crime rates, (2) Dowry deaths and (3) Deaths due to road accidents. For Economic security, we have four indicators: (1) Unemployment rates, (2)

Dependence on agriculture, (3) Informal sector workforce, and (4) Debt free households. For Environmental Conditions we have two indicators such as (1) Forest cover and (2) Water treatment. So we have total nine indicators for Human security. The plot of within group sum of squares to number of clusters suggests that appropriate number of clusters should be 8. We present the cluster characteristics such as cluster centres and standard deviation in table- 4.11. Here, higher the value of the cluster centre, lower is the performance. Figure-11 represents the geographical distribution of different clusters. From the figure we observe that geographical factors may influence the pattern of clustering.

The cluster 1 for Human security contains Bihar, Jharkhand, Madhya Pradesh and Odisha. These states are situated in central and eastern India. The cluster-2 consists of six states: Himachal Pradesh, Jammu and Kashmir, Manipur, Meghalaya, Mizoram and Sikkim. Some of these states are in northern part of India and some are in north eastern India. The third cluster contains only one state i.e. Arunachal Pradesh. The fourth cluster consists of two states Assam and Chhattisgarh. The fifth cluster consists of two north-eastern states Nagaland and Tripura. The sixth cluster consists of eight states Gujarat, Andhra Pradesh, Karnataka, Kerala, Maharashtra, Punjab, Rajasthan and Tamil Nadu. All of these states are geographically close to another. Similar is the case with cluster-7. There are four states in the seventh cluster such as Haryana, Uttar Pradesh, Uttarakhand and West Bengal. We have only one state in Cluster-8 i.e. Goa.

4.3.3 Clustering according to Overall Development

Multidimensional development consists of all the eight dimensions of development. We used a K-means analysis procedure to create a group of states. The plot of within group sum of squares to number of clusters suggests that appropriate number of clusters should be 8. Cluster characteristics such as cluster centres and standard deviation are presented in table4.12. Here, higher the value of the cluster centre, lower is the performance. Figure 12 represents the geographical distribution of different clusters. From the figure on clustering suggests the existence of spatial aspects.

Cluster-1 contains five states. These are Gujarat, Maharashtra, Tamil Nadu, Karnataka and Andhra Pradesh. These states are situated in southern and western part of India. Cluster-2 contains two north eastern states Nagaland and Manipur. Cluster-3 contains four states such as Meghalaya, Tripura, Assam and West Bengal. These states are in

eastern and north eastern parts of India. Cluster-4 contains four northern Indian states. These are Himachal Pradesh, Punjab, Haryana, Jammu and Kashmir and Uttarakhand. There are only one state in cluster-5 i.e. Arunachal Pradesh. Cluster-6 contains two states such as Goa and Kerala. There are seven states in cluster-7.These are Odisha, Jharkhand, Bihar, Chhattisgarh, Madhya Pradesh, Uttar Pradesh and Rajasthan. In cluster-8, we have two north-eastern states such as Sikkim and Mizoram.

The clustering with respect to multidimensional development is spatial in feature. Here we observe that Cluster 7 states are BIMARU states plus Odisha. As evident from figure 12, these states are geographically contagious. Similarly we find a cluster of coastal states except Odisha and West Bengal in cluster 1. Members of cluster 6 are geographically bounded by cluster 1. These are also coastal states. The five northern most states are in a single cluster i.e. cluster 4. Only north eastern region in this respect is diverse. It comes four clusters. This result may indicate the operation of geography at multiple levels of development. As many types of human activity such as education, health, and income have spatial clustering aspect, their interlinkages may reinforce the spillover and externalities. So it may be the case that the performance of the states is generally function of their locations, similar to their neighbours than independent of them.

4.4 Conclusion

In this chapter we have clustered the states according to their development performance. By using the development indices constructed by Ray et al. (2018) and Ray et al. (forthcoming) we attempted to find meaningful group of states whose attributes are similar with respect to their performance across indicators. We also clustered the states at the level of sub-indices as well as multidimensional level as proposed by Ray et al. (2018). In many of these dimensions including multi-dimensional development, material prosperity, health and education we observed a pattern of spatial clustering. This may imply as suggested by our literature review on geographical economics the existence of spatial externalities and spillover. Moreover we find that while some states perform well in some indicators they do not perform well in some other indicators. Is some states experiencing trade-offs with respect to these indicators? These phenomenon are worth exploring.

Table 4.1 Clustering of states according to Material Prosperity

	Cluster centres by indicators (k=7)						
	Cluster-1 (n=2)	Cluster-2 (n=1)	Cluster-3 (n=1)	Cluster-4 (n=6)	Cluster-5(n=4)	Cluster-6 (n=8)	Cluster-7 (n=6)
CLUS7SHGDP	0.6	3.9	0.1	2.4	22.4	44.1	22.1
CLUS7SHPOP	0.2	2.8	0.1	3.6	14.2	38.0	39.4
AVA	0.728	0.237	0.280	0.749	0.844	0.875	0.885
PCI	0.221	0.644	0.634	0.742	0.822	0.931	0.832
NON_FOOD	0.412	0.000	0.330	0.476	0.635	0.695	0.281
HOUSE	0.064	0.048	0.043	0.151	0.326	0.331	1.000
SAFE_WATER	0.189	1.000	0.085	0.157	0.635	0.252	0.296
LATRINE	0.160	0.000	0.378	0.588	0.227	0.945	0.454
TOTAL_ROAD	0.676	0.000	0.786	0.784	0.687	0.816	0.973
NON_BPL	0.044	0.056	0.176	0.264	0.495	0.831	0.849

Note: Cluster-1: Sikkim and Goa

Cluster-2: Kerala

Cluster-3: Arunachal Pradesh

Cluster-4: Nagaland, Manipur, Meghalaya, Mizoram, Tripura and Assam

Cluster-5: Himachal Pradesh, Punjab, Haryana and Maharashtra.

Cluster-6: Jammu and Kashmir, Uttarakhand, Gujarat, Rajasthan, West Bengal, Tamil Nadu, Karnataka and Andhra Pradesh

Cluster-7: Chhattisgarh, Madhya Pradesh, Uttar Pradesh, Odisha, Jharkhand and Bihar

Table 4.2: Clustering of states according to Education

	Cluster centres by indicators (k=6)					
	Cluster-1 (n=6)	Cluster-2 (n=6)	Cluster-3 (n=6)	Cluster-4 (n=2)	Cluster-5 (n=3)	Cluster-6 (n=5)
CLUSGDP	19.58	46.01	10.58	0.31	1.06	18.10
CLUSPOP	36.02	33.09	13.29	0.40	0.73	14.80
GRAD_EDU	0.894	0.675	0.902	0.154	0.724	0.683
LEARNING	0.862	0.724	0.587	0.390	0.125	0.364

Note: Cluster-1: Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Mizoram, and Uttar Pradesh

Cluster-2: Andhra Pradesh, Gujarat, Karnataka, Maharashtra, Tamil Nadu and Uttarakhand

Cluster-3: Andhra Pradesh, Tamil Nadu, Karnataka, Maharashtra, Gujarat and Uttarakhand

Cluster-4: Manipur and Nagaland

Cluster-5: Arunachal Pradesh, Himachal Pradesh and Sikkim

Cluster-6: Goa,   Kerala, Punjab, Haryana and West Bengal

Table 4.3: Clustering of states according to Health

	Cluster centres by indicators (k=7)						
	Cluster-1 (n=2)	Cluster-2 (n=6)	Cluster-3 (n=2)	Cluster-4 (n=2)	Cluster-5 (n=5)	Cluster-6 (n=8)	Cluster-7 (n=3)
CLUSGDP	4.3	18.7	0.31	8.62	30.8	11.5	21.2
CLUSPOPSH	2.8	28.56	0.40	16.7	20.6	9.54	19.5
IMR	0.032	0.825	0.103	0.880	0.416	0.580	0.547
MORBIDITY	0.781	0.154	0.014	0.114	0.251	0.174	0.401
VITAMIN	0.118	0.530	0.879	0.954	0.571	0.549	0.364
IMMUNISATION	0.061	0.344	0.827	0.716	0.705	0.390	0.307
WASTING	0.745	0.730	0.313	0.464	0.934	0.290	0.863
UNDERWEIGHT	0.116	0.777	0.096	0.661	0.476	0.153	0.463

Note: Cluster-1: Goa and Kerala

Cluster-2: Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha and Rajasthan

Cluster-3: Nagaland and Manipur

Cluster-4: Meghalaya and Uttar Pradesh

Cluster-5: Arunachal Pradesh, Gujarat, Maharashtra, Tamil Nadu and Tripura

Cluster-6: Sikkim, Assam, Mizoram, Punjab, Haryana, Himachal Pradesh, Jammu and Kashmir and Uttarakhand

Cluster-7: Andhra Pradesh, Karnataka and West Bengal

Table 4.4: Clustering of states according to Political Voice

	Cluster-1 (n=7)	Cluster-2 (n=5)	Cluster-3 (n=2)	Cluster-4 (n=5)	Cluster-5 (n=7)	Cluster-6 (n=2)
			Cluster centres by indicators (k=6)			
CLUSGDPSH	15.83	26.57	0.95	35.60	16.39	0.29
CLUSPOPSH	17.00	20.20	1.13	42.10	17.70	0.21
VOTE_NORM	0.239	0.385	0.841	0.714	0.578	0.058
WOMEN_POL	0.207	0.649	0.852	0.430	0.254	1.000
PENDING	0.684	0.713	0.217	0.883	0.619	0.277

Note: Cluster-1: Kerala, Goa, Odisha, West Bengal, Assam, Tripura and Manipur

Cluster-2: Arunachal Pradesh, Haryana, Karnataka, Andhra Pradesh, and Tamil Nadu

Cluster-3: Mizoram and Jammu and Kashmir

Cluster-4: Bihar, Jharkhand, Uttar Pradesh, Gujarat and Maharashtra

Cluster-5: Rajasthan, Punjab, Himachal Pradesh, Uttarakhand, Madhya Pradesh, Chhattisgarh and Meghalaya

Cluster-6: Nagaland and Sikkim

Table 4.5: Clustering of states according to Social Connections

	Cluster centres by indicators (k=6)					
	Cluster-1 (n=5)	Cluster-2 (n=2)	Cluster-3 (n=9)	Cluster-4 (n=1)	Cluster-5 (n=7)	Cluster-6 (n=4)
CLUSGDPSH	36.4	0.3	23.9	0.1	20.6	14.3
CLUSPOPSH	29.0	0.3	38.0	0.1	19.8	11.1
SUICIDE	0.414	0.184	0.054	1.000	0.283	0.586
MARRIAGE	0.118	0.815	0.093	0.321	0.101	0.189

Note: Cluster-1: Andhra Pradesh, Goa, Karnataka, Maharashtra and West Bengal

Cluster-2: Meghalaya and Mizoram

Cluster-3: Manipur, Nagaland, Jammu and Kashmir, Punjab, Rajasthan, Bihar, Jharkhand, Uttar Pradesh and Uttarakhand

Cluster-4: Sikkim

Cluster-5: Arunachal Pradesh, Assam, Gujarat, Haryana, Himachal Pradesh, Madhya Pradesh and Odisha

Cluster-6: Chhattisgarh, Kerala, Tamil Nadu and Tripura

Table 4. 6 Clustering of states according to Personal Security

	Cluster centres by indicators (k=6)					
	Cluster-1 (n=5)	Cluster-2 (n=8)	Cluster-3 (n=3)	Cluster-4 (n=6)	Cluster-5 (n=3)	Cluster-6 (n=3)
CLUSGDPSH	24.3	27.4	8.3	24.1	1.9	9.6
CLUSPOPSH	22.1	18.6	8.7	39.4	2.9	6.6
CRIME	0.358	0.233	0.353	0.531	0.863	0.294
DOWRY	0.340	0.054	0.405	0.820	0.189	0.047
ACCIDENT	0.601	0.306	0.225	0.342	0.299	0.748

Notes: Cluster-1: Andhra Pradesh, Chhattisgarh, Karnataka, Punjab and Rajasthan

Cluster-2: Gujarat, Jammu and Kashmir, Kerala, Maharashtra, Manipur, Mizoram, Nagaland and Sikkim

Cluster-3: Tripura, Uttarakhand and West Bengal

Cluster-4: Bihar, Haryana, Jharkhand, Madhya Pradesh, Odisha and Uttar Pradesh

Cluster-5: Arunachal Pradesh, Assam and Meghalaya

Cluster-6: Goa, Himachal Pradesh and Tamil Nadu

Table 4.7 Clustering of states according to Economic Security

	Cluster centres by indicators (k=7)						
	Cluster-1 (n=4)	Cluster-2 (n=9)	Cluster-3 (n=6)	Cluster-4 (n=1)	Cluster-5 (n=2)	Cluster-6 (n=5)	Cluster-7 (n=1)
UNEMPLOY	0.182	0.182	0.134	0.628	0.880	0.064	0.169
WORK_AGRI	0.627	0.617	0.809	0.314	0.579	0.759	0.000
WORK_INFORMAL	0.821	0.864	0.632	0.859	0.303	0.318	0.139
DEBT_FREE	0.792	0.417	0.397	0.972	0.092	0.122	0.312

Notes: Cluster-1: Rajasthan, Tamil Nadu, Karnataka and Andhra Pradesh

Cluster-2: Jammu and Kashmir, Gujarat, Punjab, Haryana, West Bengal, Odisha, Jharkhand, Uttar Pradesh and Uttarakhand

Cluster-3: Assam, Bihar, Chhattisgarh, Madhya Pradesh, Himachal Pradesh, and Maharashtra

Cluster-4: Kerala

Cluster-5: Nagaland and Tripura

Cluster-6: Meghalaya, Arunachal Pradesh, Sikkim, Manipur and Mizoram

Cluster-5: Goa

Table 4.8 Clustering of states according to Environmental Conditions

	Cluster centres by indicators (k=6)					
	Cluster-1 (n=3)	Cluster-2 (n=7)	Cluster-3 (n=1)	Cluster-4 (n=9)	Cluster-5 (n=4)	Cluster-6 (n=4)
CLUSGDP	19.0	13.3	0.131946	42.4795	19.12116	1.500605
CLUSPOP	26.1	11.8	0.114299	46.08116	12.45517	1.747608
WATER_QU	0.92	0.054	2.47E-08	0.2511	0.57294	0.305384
FOREST	0.99	0.909	2.03E-07	0.987948	0.957825	0.913059

Note: Cluster-1: Haryana, Uttar Pradesh and West Bengal

Cluster-2: Chhattisgarh, Goa, Himachal Pradesh, Jharkhand, Manipur, Mizoram and Tamil Nadu

Cluster-3: Arunachal Pradesh

Cluster-4: Andhra Pradesh, Assam, Bihar, Gujarat, Karnataka, Kerala, Madhya Pradesh, Odisha and Rajasthan

Cluster-5: Maharashtra, Punjab, Sikkim and Uttarakhand

Cluster-6: Meghalaya, Nagaland and Tripura and Jammu and Kashmir

Table 9: Clustering of states according to Human Development

	Cluster centres by indicators (k=6)					
	Cluster-1 (n=2)	Cluster-2 (n=5)	Cluster-3 (n=2)	Cluster-4 (n=6)	Cluster-5 (n=7)	Cluster-6 (n=6)
ClusgdpSh	4.3	2.3	0.3	9.9	27.2	51.7
Cluspopnsh	2.9	3.3	0.4	6.9	45.1	39.8
ava	0.425	0.872	0.795	0.459	0.859	0.740
pci	0.322	0.824	0.824	0.655	0.921	0.686
non_food	0.099	0.610	0.521	0.462	0.672	0.409
house	0.024	0.455	0.340	0.067	0.315	0.148
safe_water	0.593	0.521	0.752	0.120	0.259	0.128
latrine	0.106	0.296	0.168	0.342	0.928	0.576
total_road	0.228	0.725	0.736	0.854	0.826	0.717
non_bpl	0.028	0.502	0.654	0.128	0.752	0.310
imr	0.032	0.662	0.103	0.510	0.838	0.472
morbidity	0.781	0.083	0.014	0.219	0.159	0.362
vitamine	0.118	0.733	0.879	0.522	0.593	0.415
immunisation	0.061	0.613	0.827	0.388	0.392	0.488
wasting	0.745	0.658	0.313	0.222	0.676	0.923
underweight	0.116	0.375	0.096	0.151	0.769	0.468
grad_edu	0.630	0.890	0.154	0.705	0.901	0.694
learning	0.293	0.522	0.390	0.395	0.821	0.652

Note: Cluster-1: Kerala and Goa

Cluster-2: Arunachal Pradesh, Assam, Meghalaya, Mizoram and Tripura

Cluster-3: Manipur and Nagaland

Cluster-4: Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, Sikkim and Uttarakhand

Cluster-5: Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, Rajasthan and Uttar Pradesh

Cluster-6: Andhra Pradesh, Gujarat, Karnataka, Maharashtra, Tamil Nadu and West Bengal

Table 10: Clustering of states according to Voice and Confidence

	Cluster centres by indicators (k=7)							
	Cluster-1 (n=5)	Cluster-2 (n=7)	Cluster-3 (n=5)	Cluster-4 (n=4)	Cluster-5 (n=1)	Cluster-6 (n=1)	Cluster-7 (n=1)	Cluster-8 (n=4)
CLUSGDSH	19.9	44.9	5.4	10.1	0.9	0.1	0.1	14.3
CLUSPOPSH	20.7	53.8	4.2	7.4	1.0	0.1	0.1	11.1
VOTE	0.271	0.700	0.491	0.302	1.000	0.116	0.682	0.325
WOMEN	0.285	0.395	0.215	0.822	0.704	1.000	1.000	0.269
PENDING	0.781	0.828	0.559	0.672	0.269	0.000	0.164	0.619
SUICIDE	0.358	0.178	0.095	0.269	0.044	1.000	0.284	0.586
MARRIAGE	0.108	0.073	0.205	0.153	0.078	0.321	1.000	0.189

Notes: Cluster-1: Goa, Andhra Pradesh, Odisha, West Bengal and Assam

Cluster-2: Bihar, Uttar Pradesh, Jharkhand, Rajasthan, Madhya Pradesh, Maharashtra and Gujarat

Cluster-3: Uttarakhand, Himachal Pradesh, Punjab, Manipur and Meghalaya

Cluster-4: Haryana, Karnataka, Arunachal Pradesh and Nagaland

Cluster-5: Jammu and Kashmir

Cluster-6: Sikkim

Cluster-7: Mizoram

Cluster-8: Tripura, Chhattisgarh, Kerala and Tamil Nadu

Table 11: Clustering of states according to Human Security

	Cluster-1 (n=4)	Cluster-2 (n=6)	Cluster-3 (n=1)	Cluster-4 (n=2)	Cluster-5 (n=2)	Cluster-6 (n=8)	Cluster-7 (n=4)	Cluster-8 (n=1)
	Cluster centres by indicators (k=7)							
CRIME	0.515	0.356	0.912	0.775	0.212	0.242	0.475	0.455
DOWRY	0.795	0.035	0.077	0.397	0.301	0.215	0.593	0.019
ACCIDENT	0.282	0.329	0.396	0.356	0.119	0.613	0.341	0.605
UNEMPLOY	0.169	0.096	0.050	0.186	0.880	0.209	0.194	0.169
WORK_AGRI	0.769	0.703	0.931	0.878	0.579	0.575	0.611	0.000
WORK_INFORM	0.759	0.464	0.000	0.639	0.303	0.835	0.878	0.139
DEBT_FREE	0.436	0.210	0.116	0.218	0.092	0.701	0.429	0.312
WATER_QU	0.182	0.236	0.000	0.121	0.292	0.314	0.849	0.037
FOREST	0.985	0.864	0.000	0.969	0.911	0.992	0.987	0.966

Notes: Cluster-1: Bihar, Jharkhand, Madhya Pradesh and Odisha

Cluster-2: Himachal Pradesh, Jammu and Kashmir, Manipur, Meghalaya, Mizoram and Sikkim

Cluster-3: Arunachal Pradesh

Cluster-4: Assam and Chhattisgarh

Cluster-5: Nagaland and Tripura

Cluster-6: Gujarat, Karnataka, Kerala, Maharashtra, Punjab, Rajasthan and Tamil Nadu, Andhra Pradesh

Cluster-7: Haryana, Uttar Pradesh, Uttarakhand and West Bengal

Cluster-8: Goa

Table 12: Clustering of states according to Multidimensional Development

	Cluster-1 (n=5)	Cluster-2 (n=2)	Cluster-3 (n=4)	Cluster-4 (n=5)	Cluster-5 (n=1)	Cluster-6 (n=2)	Cluster-7 (n=7)	Cluster-8 (n=2)
Cluster centres by indicators (k=8)								
AVA	0.716	0.795	0.892	0.382	0.885	0.425	0.859	0.807
PCI	0.658	0.824	0.832	0.698	0.832	0.322	0.921	0.616
NON_FOOD	0.339	0.521	0.777	0.429	0.281	0.099	0.672	0.524
HOUSE	0.125	0.340	0.303	0.055	1.000	0.024	0.315	0.225
SAFE_WATER	0.137	0.752	0.453	0.106	0.296	0.593	0.259	0.386
LATRINE	0.592	0.168	0.369	0.388	0.454	0.106	0.928	0.077
TOTAL_ROAD	0.789	0.736	0.519	0.845	0.973	0.228	0.826	0.913
NON_BPL	0.287	0.654	0.413	0.136	0.849	0.028	0.752	0.264
IMR	0.469	0.103	0.677	0.555	0.516	0.032	0.838	0.432
MORBIDITY	0.332	0.014	0.168	0.246	0.221	0.781	0.159	0.058
VITAMINE	0.365	0.879	0.685	0.540	0.905	0.118	0.593	0.555
IMMUNISATION	0.550	0.827	0.541	0.450	0.746	0.061	0.392	0.204
WASTING	0.961	0.313	0.626	0.266	0.856	0.745	0.676	0.331
UNDERWEIGHT	0.449	0.096	0.511	0.169	0.375	0.116	0.769	0.043
GRAD_EDU	0.681	0.154	0.887	0.721	0.846	0.630	0.901	0.721
LEARNING	0.707	0.390	0.514	0.474	0.160	0.293	0.821	0.386
CRIME	0.226	0.314	0.589	0.417	0.912	0.230	0.489	0.189
DOWRY	0.201	0.032	0.357	0.275	0.077	0.041	0.700	0.019
ACCIDENT	0.647	0.095	0.226	0.522	0.396	0.534	0.340	0.269
UNEMPLOY	0.154	0.572	0.304	0.155	0.050	0.399	0.167	0.064
WORK_AGRI	0.628	0.671	0.593	0.610	0.931	0.157	0.779	0.791
WORK_INFORL	0.792	0.333	0.593	0.762	0.000	0.499	0.793	0.341
DEBT_FREE	0.689	0.073	0.202	0.419	0.116	0.642	0.454	0.157
WATER_QU	0.286	0.199	0.475	0.490	0.000	0.152	0.262	0.298
FOREST	0.991	0.865	0.954	0.972	0.000	0.977	0.984	0.766
VOTE	0.521	0.107	0.236	0.634	0.240	0.323	0.628	0.399
WOMEN_POL	0.532	0.578	0.189	0.404	1.000	0.219	0.328	1.000
PENDING	0.759	0.590	0.616	0.504	0.818	0.680	0.828	0.082
SUICIDE	0.439	0.021	0.324	0.139	0.309	0.505	0.204	0.642
MARRIAGE	0.139	0.241	0.259	0.064	0.163	0.137	0.079	0.661

Notes: Cluster-1: Gujarat, Maharashtra, Tamil Nadu, Karnataka and Andhra Pradesh

Cluster-2: Nagaland and Manipur

Cluster-3: Meghalaya, Tripura, Assam and West Bengal

Cluster-4: Himachal Pradesh, Punjab, Haryana, Jammu and Kashmir and Uttarakhand

Cluster-5: Arunachal Pradesh

Cluster-6: Goa and Kerala

Cluster-7: Odisha, Jharkhand, Bihar, Chhattisgarh, Madhya Pradesh, Uttar Pradesh and Rajasthan

Cluster-8: Sikkim and Mizoram

India
Material Prosperity

MATERIAL PROSPERITY
Cluster 1
Cluster 2
Cluster 3
Cluster 4
Cluster 5
Cluster 6
Cluster 7
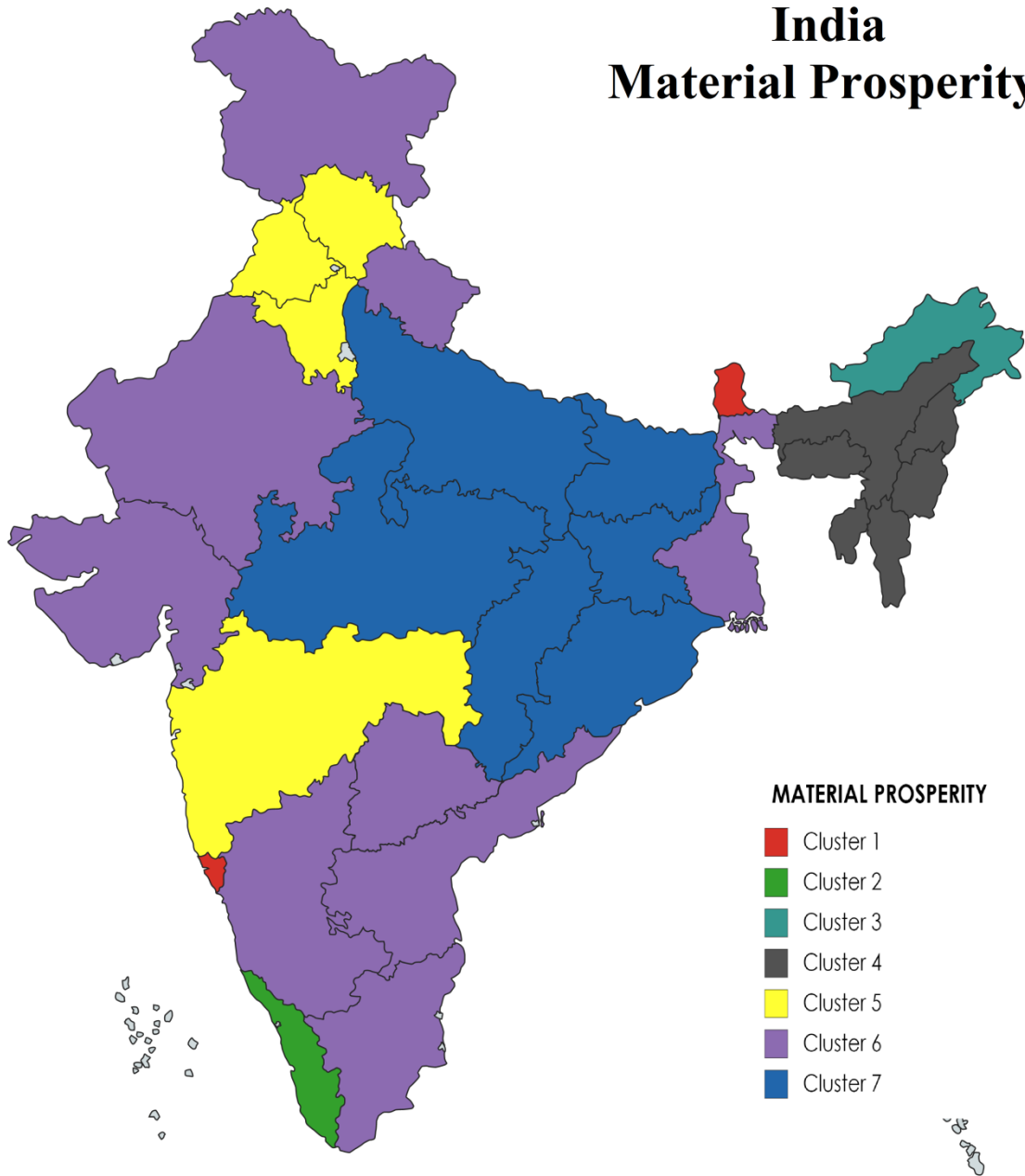
Figure 1

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India
Education

Education

- Cluster1
- Cluster2
- Cluster3
- Cluster4
- Cluster5
- Cluster6
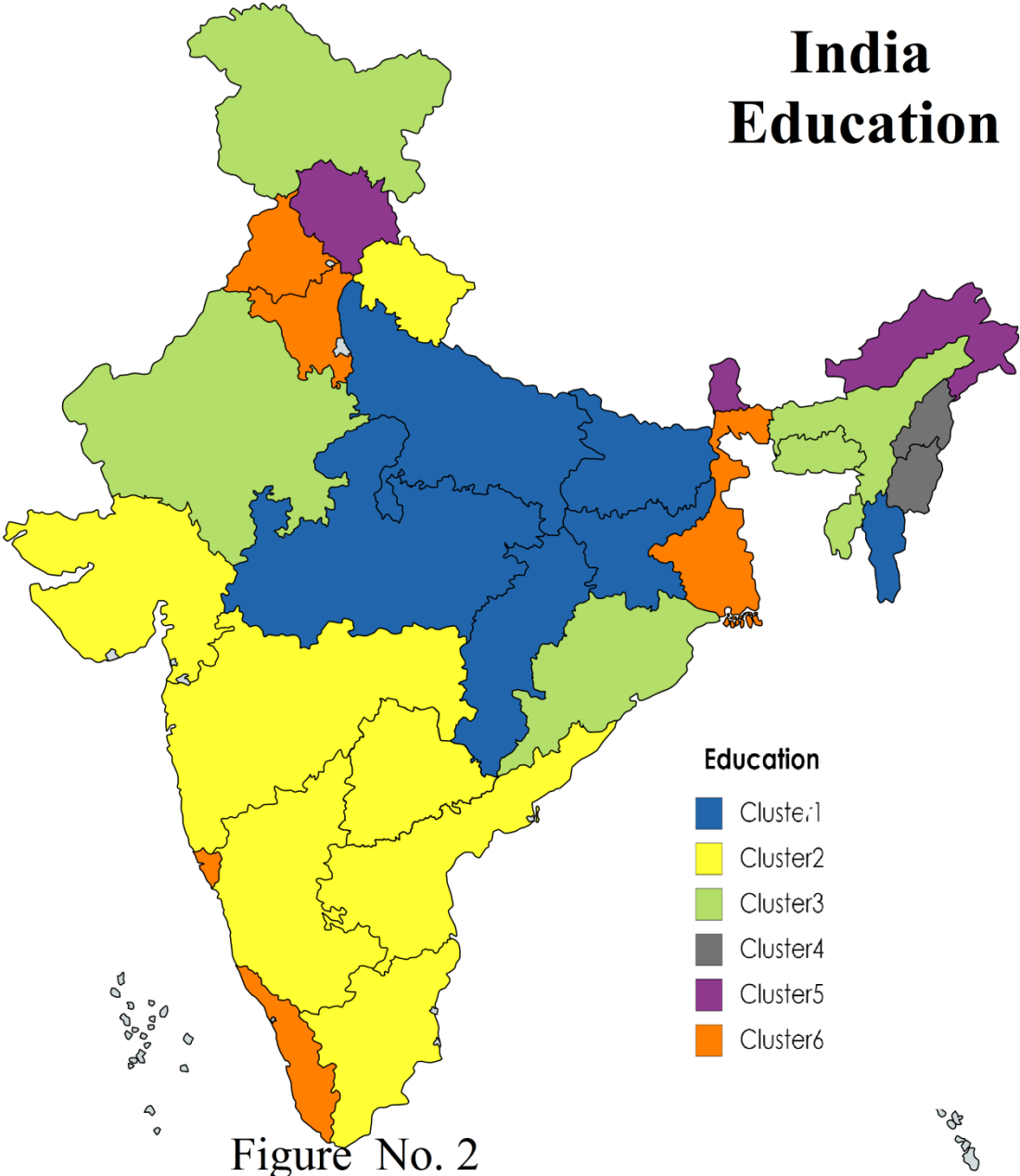
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121

India
Health

Health
- Cluster1
- Cluster2
- Cluster3
- Cluster4
- Cluster5
- Cluster6
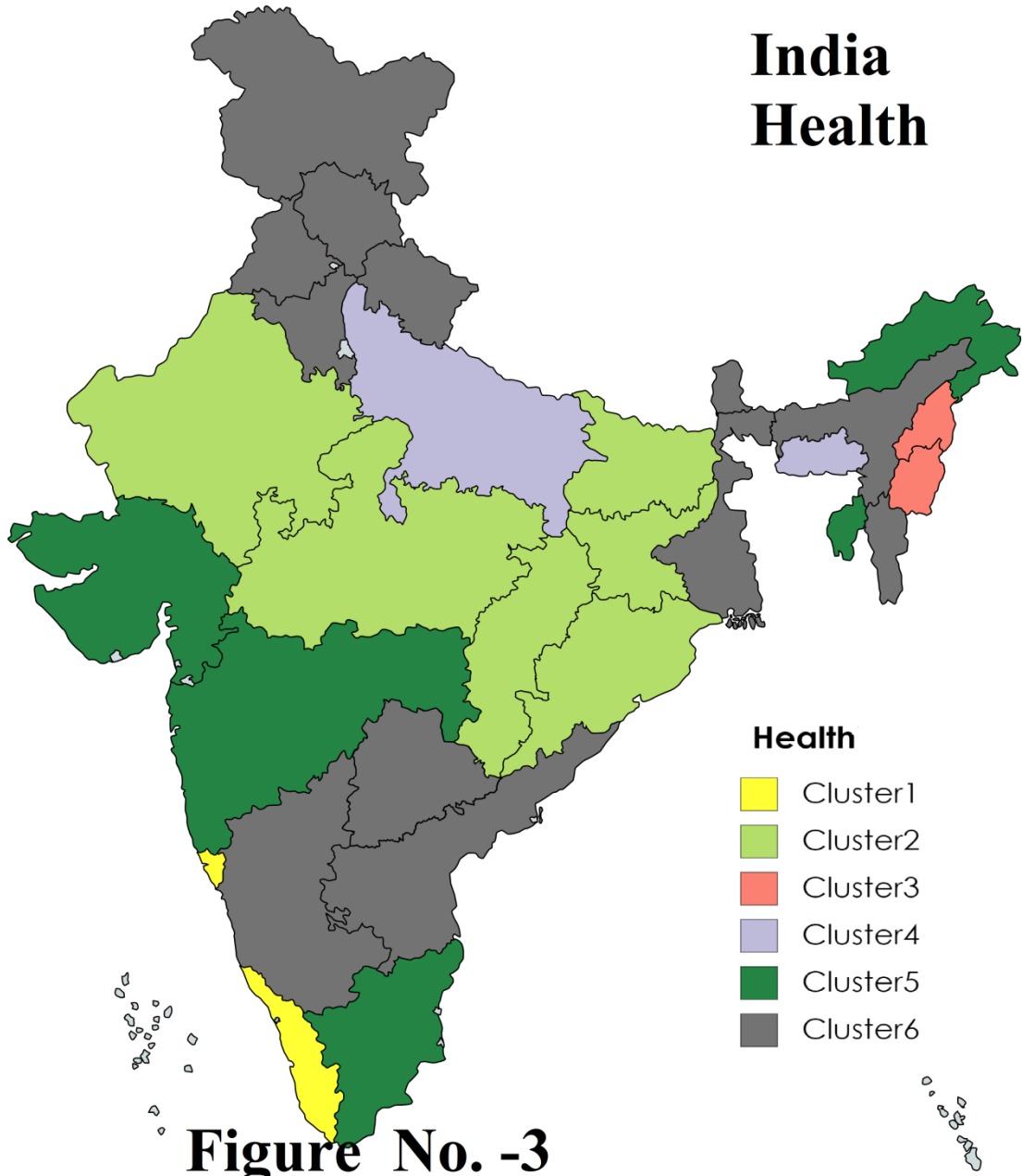
Figure No. -3

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India
Political Voice

Political Voice

Cluster1
Cluster2
Cluster3
Cluster4
Cluster5
Cluster6

Figure-4

India
Social Connections
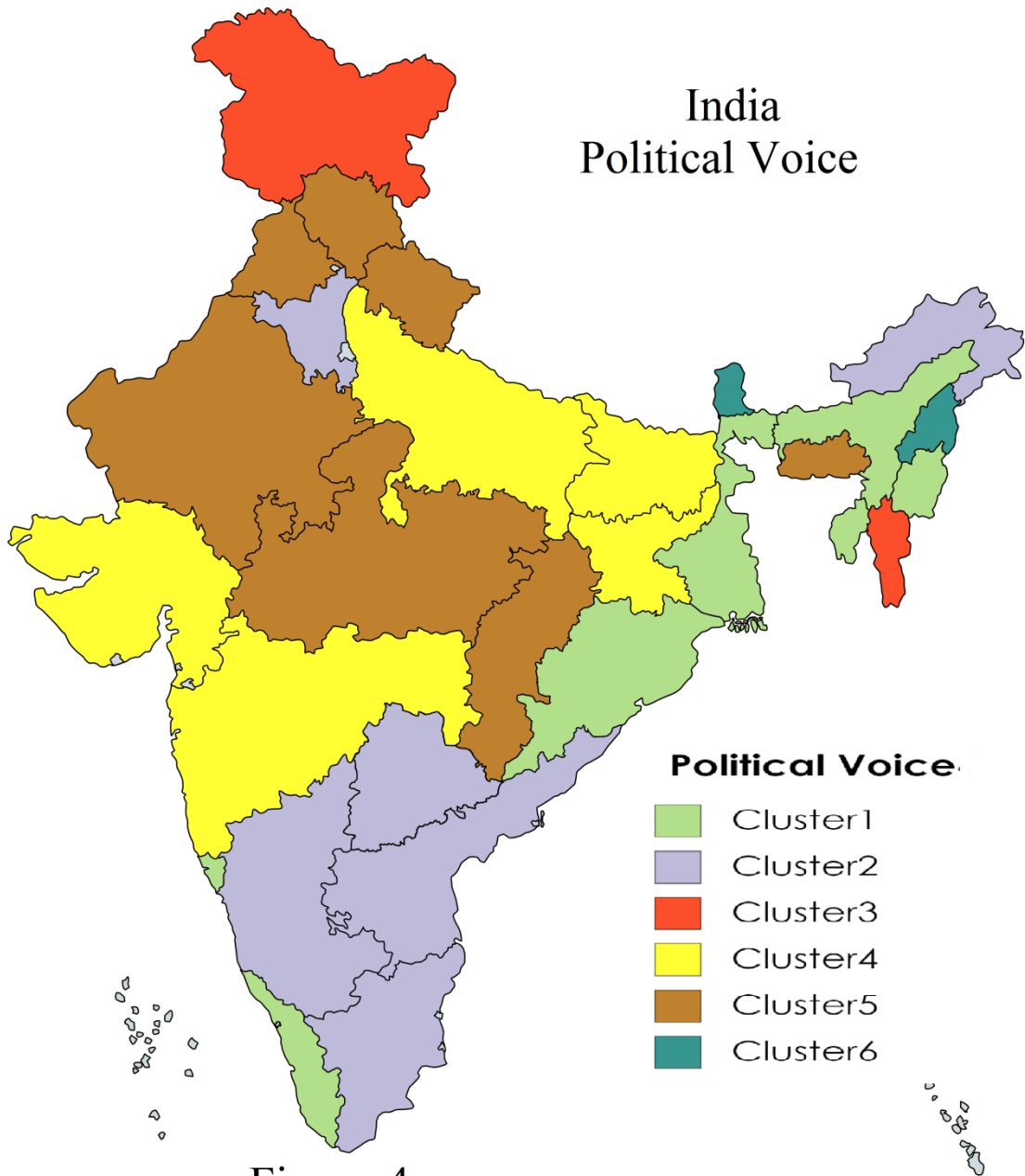
Social Connections
- Cluster1
- Cluster2
- Cluster3
- Cluster4
- Cluster5
- Cluster6
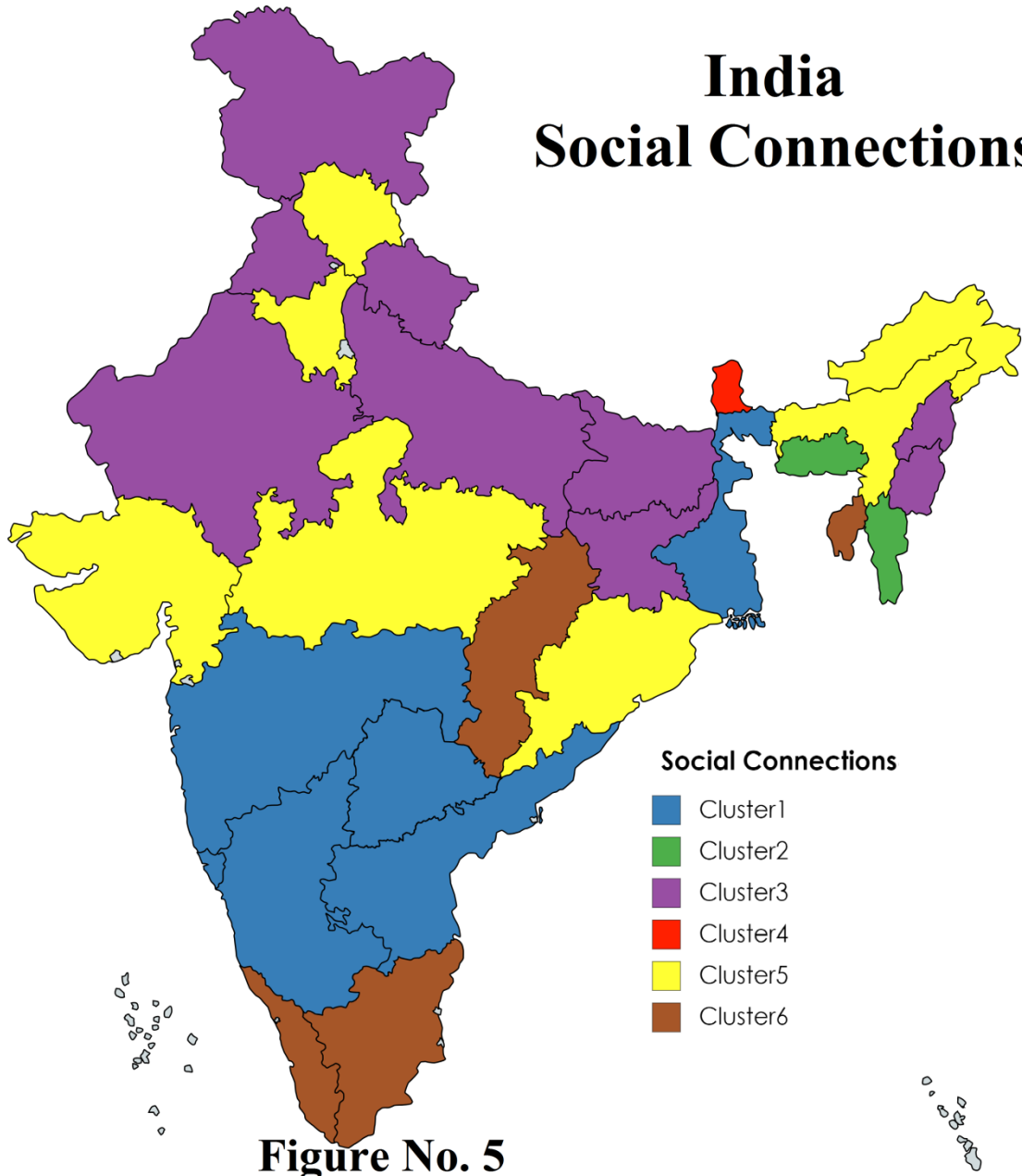
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2

India
Personal Security
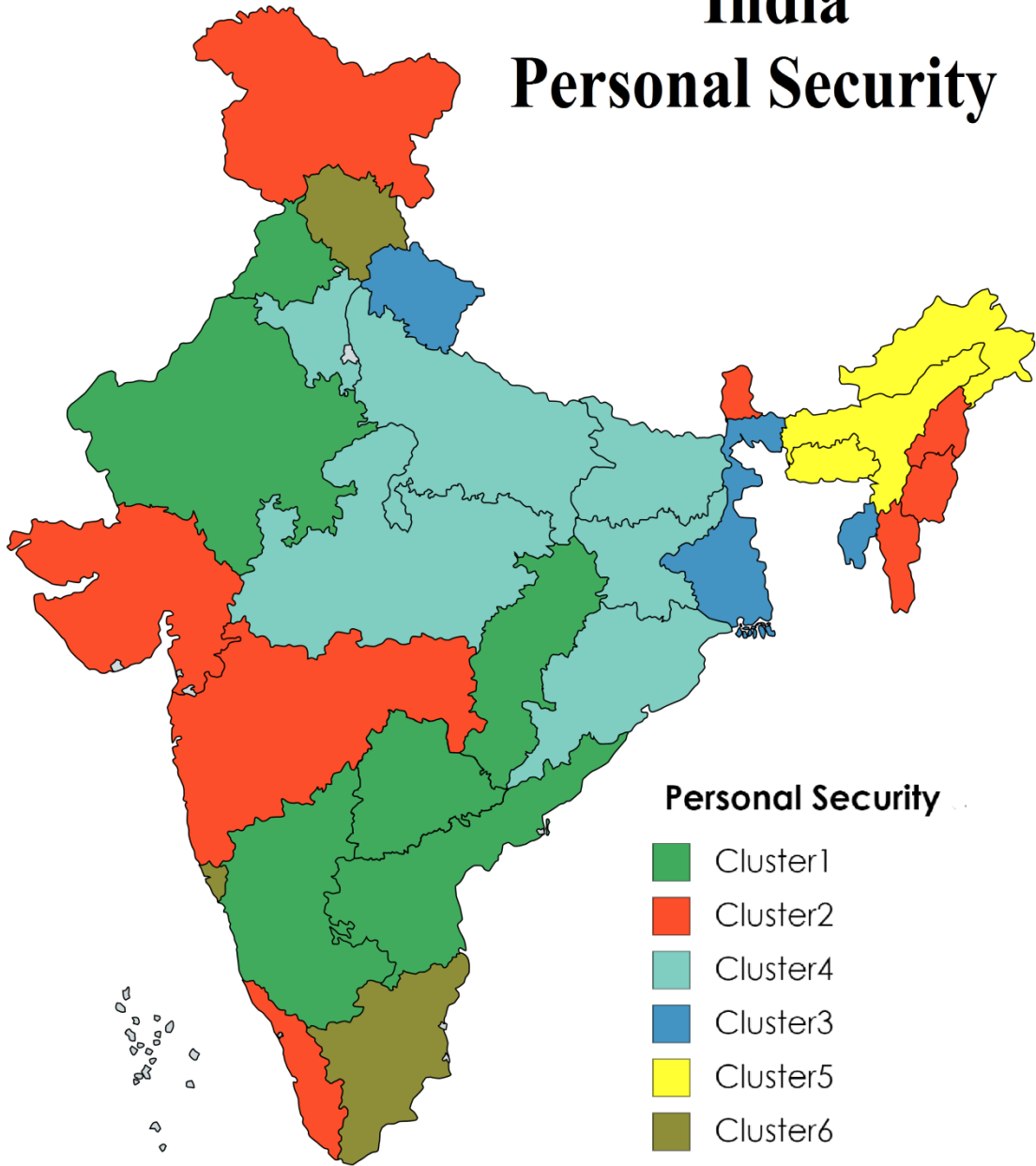
Personal Security

- Cluster1
- Cluster2
- Cluster4
- Cluster3
- Cluster5
- Cluster6

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India
Economic Security

Economic Security.

- Cluster1
- Cluster2
- Cluster3
- Cluster4
- Cluster5
- Cluster6
- Cluster7

Figure No. 7

India
Environmental Conditions

Environmental conditions
Cluster1
Cluster2
Cluster3
Cluster4
Cluster5
Cluster6
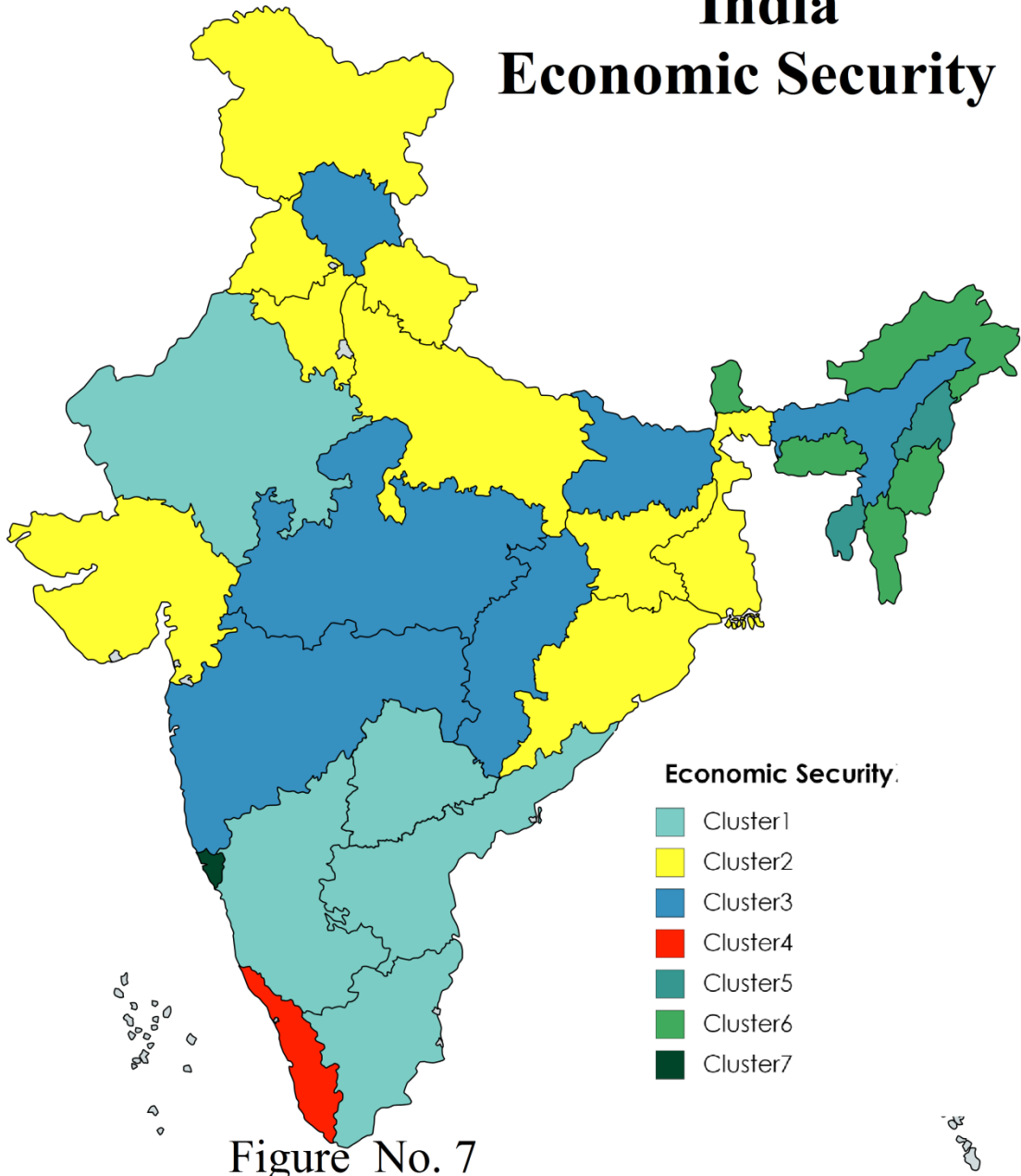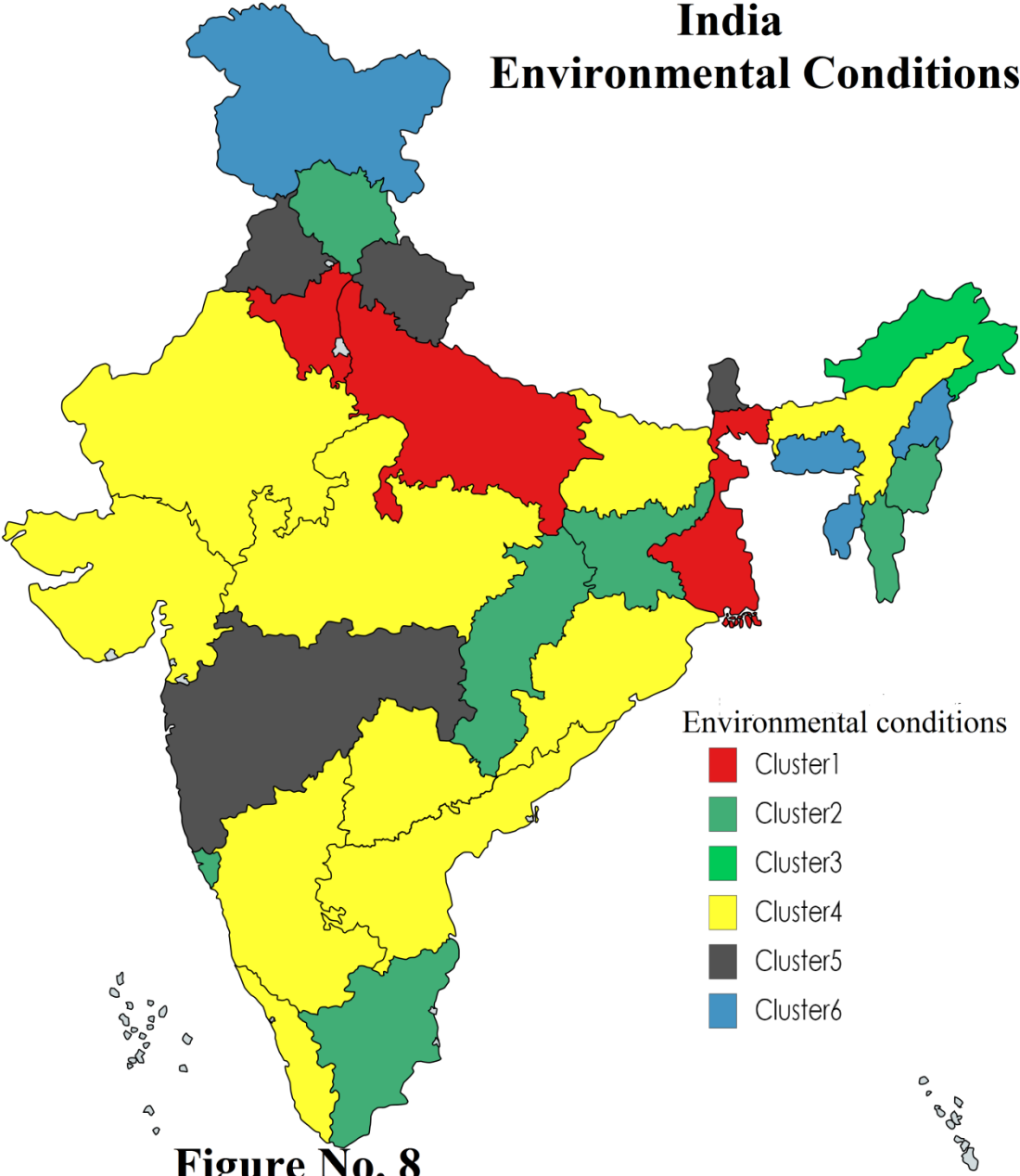
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127

India
Human Development
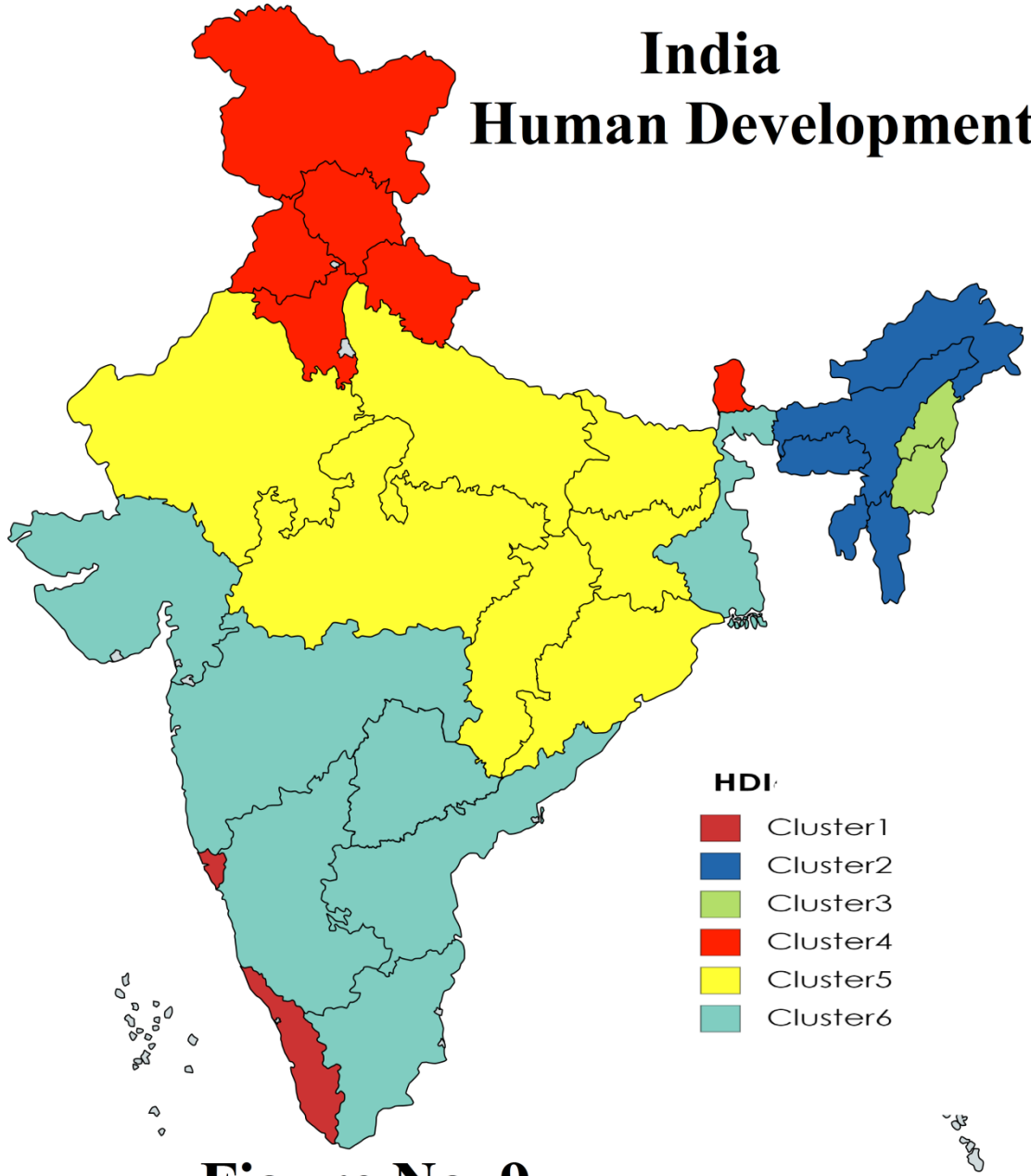
HDI
Cluster1
Cluster2
Cluster3
Cluster4
Cluster5
Cluster6

Figure No. 9

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128

India
Voice and Confidence

Voice and confidence
- Cluster1
- Cluster2
- Cluster3
- Cluster4
- Cluster5
- Cluster6
- Cluster7
- Cluster8

Figure-10

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**India
Human Security**

Human Security

- Cluster1
- Cluster2
- Cluster3
- Cluster4
- Cluster5
- Cluster6
- Cluster7
- Cluster8

Figure No. 11

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India
Multidimensional development

Multidimensional development
- Cluster1
- Cluster6
- Cluster2
- Cluster3
- Cluster4
- Cluster5
- Cluster7
- Cluster8

Figure No. 12

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131
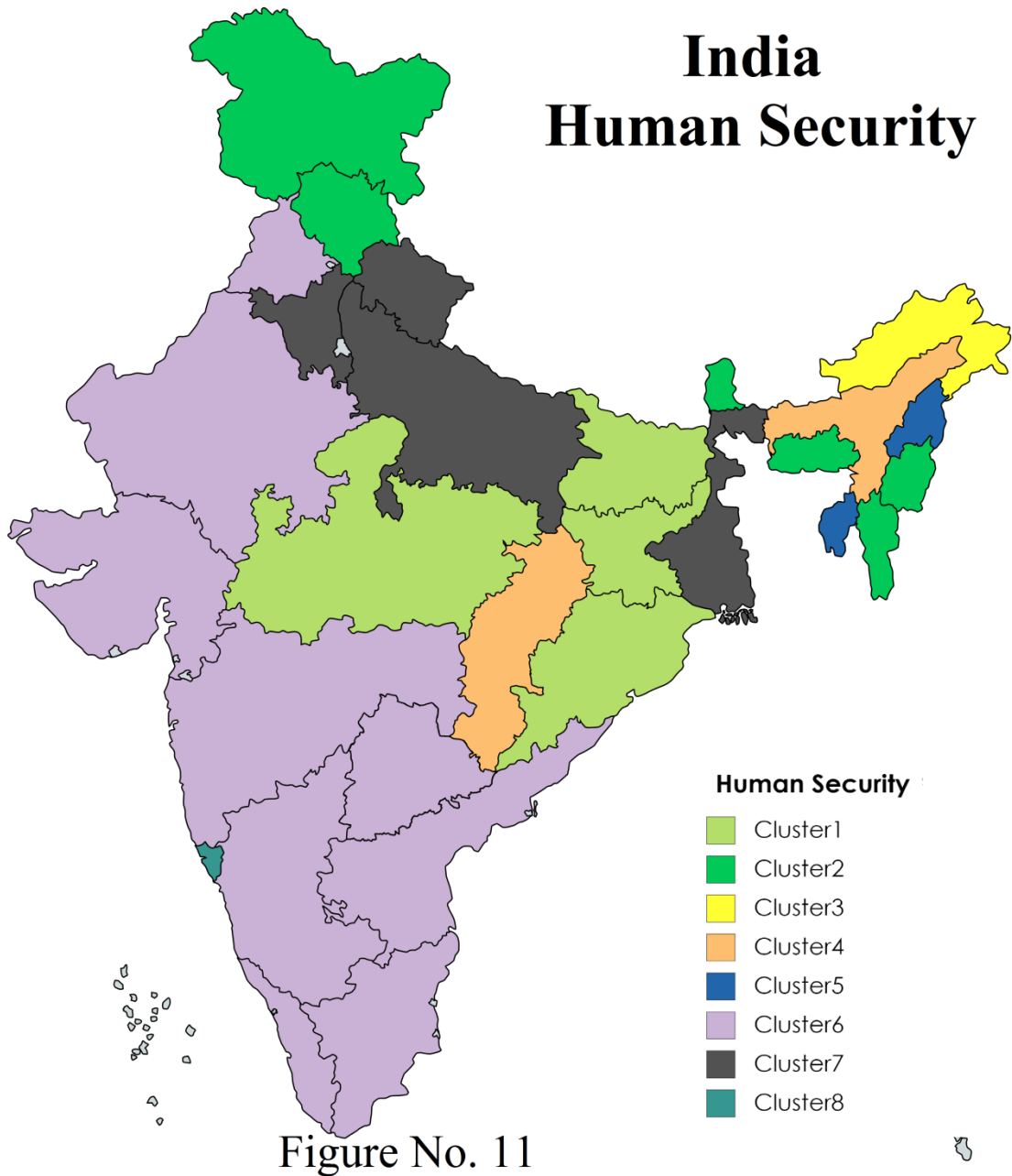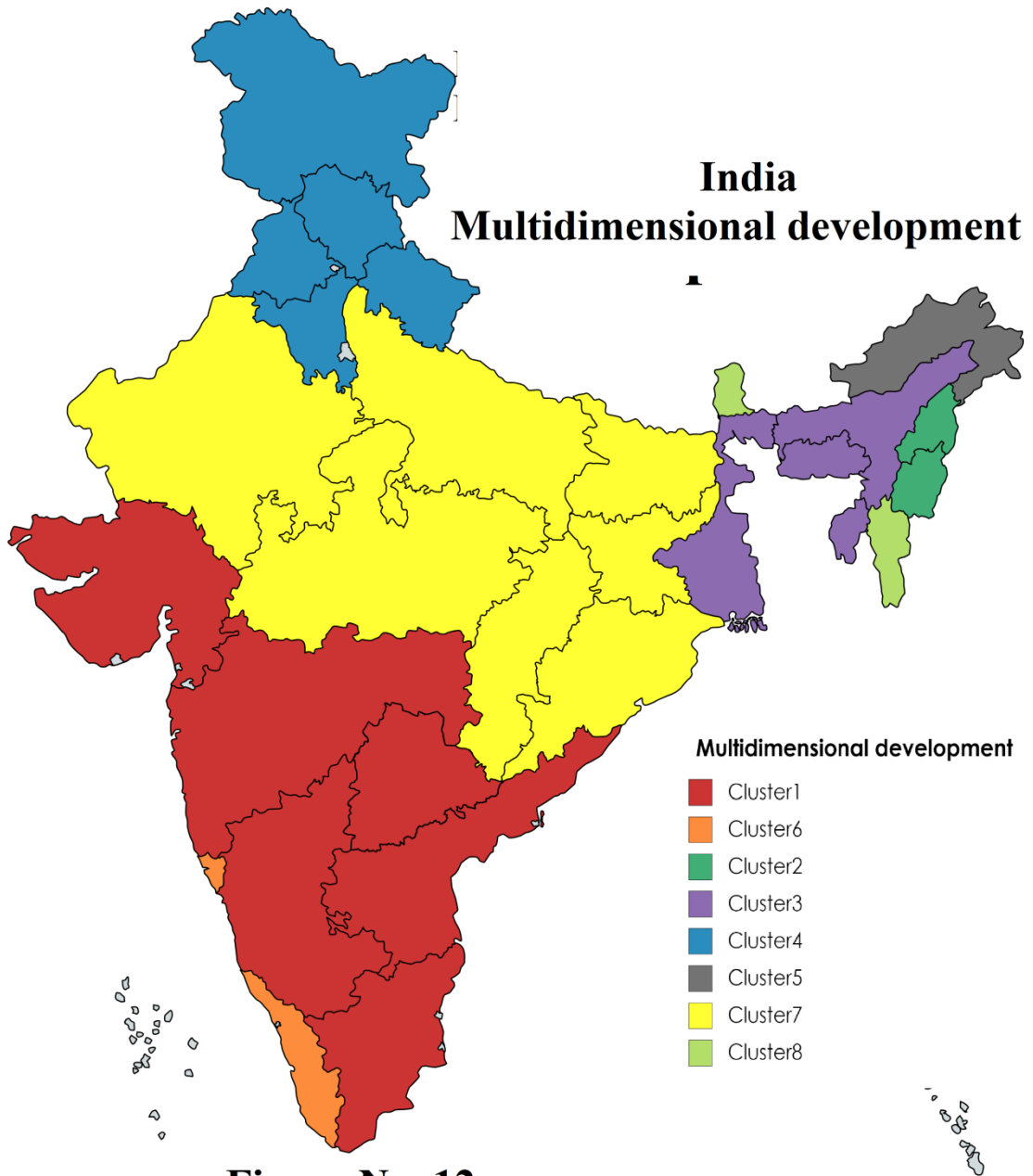
Chapter 5

Conclusion

There has been a paradigm shift in measuring the economic development and social progress from GDP to beyond GDP. As human well-being is multidimensional, in addition to material prosperity other dimensions of development are equally important. While income remains undoubtedly crucial for many public policy purposes, it does not offer adequate insights into a number of critical issues for our present and future development. Recently the quest of measuring other dimensions of development has gained significant interest in both academic research as well as policy debate. Stiglitz et al. (2009) is a milestone effort in this respect. The publication of the above report has created a great impulse in the field of measurement of economic and social progress. They have identified eight key generic dimensions- material prosperity, health, education, personal activities, political voice and governance, social connections, environmental conditions, personal and economic security for measuring economic development effectively. Ray et al. (2018) and Ray et al. (forthcoming) implemented this conceptualisation in the context of Indian states and developed a holistic measure of development on the above eight dimension. Also, they have conceptualised development along with three major components- Human Development, Voice and Confidence and Human Security.

The key research question that we address is whether states perform uniformly across all dimensions. More specifically, we have posed the following questions in this study:

1) Acknowledging the concept of multidimensionality of development, is it possible that a region performs well in some dimensions but poorly in others?

2) If so, what are the inter-linkages and trade-offs among different dimensions?

3) Finally, it is possible to cluster states according to similarity of their performance across different dimensions?

Chapter 3 constitutes an important part of the study. Though all dimensions of development are equally important, they may not move together. There is a whole range of theoretical as well as empirical literature that suggests the existence of inter-linkages and trade-off. So against this backdrop, we used results from Ray et al. (2018) and Ray et

al. (forthcoming) to test the inter-linkage and trade-off relationships. For this purpose, we used correlation as well as multiple regression analysis. Using Spearman's rank correlation procedure, we assessed the strength and direction of relationships between any two dimensions. From the correlation analysis we find that the dimensions may not be moving together. Our pairwise correlation results suggest that there exists trade-off among performance across some dimensions. As there are previous studies suggest about the existence of reverse causality, the simultaneous equation method is appropriate for this analysis. For this purpose we used 3SLS procedure.

By using the development ranks as endogenous variables, we find that there are significant inter-linkages as well as trade-offs among various dimensions of development. Many dimensions affect each other simultaneously. For instance, while health affects material prosperity, material prosperity also affects health. Likewise, we see the existence of trade-offs between environmental conditions and material prosperity. We observe similar inter-linkages exist for many of the dimensions.

In chapter 4 we explore the similarities as well as dissimilarities among the states. While the development outcomes of states are different because of differences in many factors including geographical, economic, political and socio-cultural, as India is a federal country we expect similarities of performance of states. The literature on geographical economics and clustering suggests the existence of geographic similarities among many aspects of human activity. We used k-means cluster analysis to find meaningful clusters among the states. This analysis helps us to find the states which are more similar with respect to various indicators. By using the development indicators developed by Ray et al. (2018), we check to find out the similarities of states. In addition to the eight dimensions of development, as suggested by Ray et al. (2018) and Ray et al. (forthcoming) we used three major components of development such as Human Development, Voice and Confidence and Human Security. We also used all the indicators for finding clusters in multidimensional development. Here we find the evidence of geographical clustering pattern across many dimensions. This may point out towards the phenomenon of spatial externalities and spillover. The clustering of states with respect to multidimensional development gives a spatial conception of development. It entails that performance of the states are independent of but similar to that of their neighbours. We compared the clusters with respect to their performance across the indicators. Our cluster analysis suggests that while some group of states that perform well in one indicator may perform well in other

indicators, there are some cluster of states that perform well in one indicator may not perform well in other indicators. There are various permutation and combination of states to their performance on different indicators. So Cluster analysis compliments chapter 3 where we explored the broad pattern of causality.

Finally, the correlation and regression analysis suggests that there are inter-linkages and trade-offs among the dimensions of development. Cluster analysis enables us to assess development experience at a magnified level-level of indicators and find clusters of similar states. Here we find the evidence of complexities of performance by Indian states at a detailed level. So the multidimensional framework is more illuminating in assessing the development performance.   A broader view of development is rewarding which emphasises the balance of economic, social and ecological well-being of states.

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