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IT CLUSTERS AND REGIONAL DEVELOPMENT IN INDIA'S LEADING STATES

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Abstract

The major theoretical concepts and planning applications from the mid-20th century were hard infrastructure including social overhead investment in human capital. India adopted a balanced growth strategy driven by its large internal market and this was a huge commitment to endogenous development model. All along, India's development plans were built around the supply-side and import substitution approach. In the early 80s the economy witnessed structural changes. GDP growth rate steadily increased from an average of 3.5 to 5.4 per cent. Early 1990s saw India leapfrogged into IT oriented economic development with a globally competitive IT industry. IT sector with its inter-sectoral linkages and resultant multiplier effect on investment and income has helped the development in India. This induces us to look into the impact of the growth of IT on the development of the ten states where IT is prominent. As all states are not equal beneficiaries shift share analysis is done to arrive at these imbalances for two periods - 1998-99 to 2005-06 and 2006-07 to 2012-13. The analysis showed the prevalence of imbalance between states in the different service sectors relating to IT. Besides, a study on the spatial autocorrelation between the states for IT related sectors by calculating Moran's I shows the existence of spatial autocorrelation between six states in transport and trade sector for the initial year of the study and for trade alone in the ending year of the first period of study.

Keywords: -Information Technology (IT), Ten Leading States, Shift-Share, Spatial Correlation, Imbalance.

JEL Codes: -R11, R12

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1. INTRODUCTION:

The major theoretical concepts and planning applications from the mid-20th century were by Rostow (1960) who dealt with the five stage model of economic development, Perroux (1950) pioneered the growth pole theory, Hirschman (1958) focused on balanced verses unbalanced growth, and in the 1970's East Asia's export promotion model. Around this time the neoclassical growth theory emphasized that growth and development are largely a function of labor and capital factor price differentials, *i.e.,* comparative advantage among countries and/or regions. Later, Solow (1959) showed that factor price differentials account for only part of the variance in economic growth, while the other half was due to technological change. However, in the mid-1980's the 'New Growth Theory', emphasized on endogenous factors, *i.e.,* local conditions such as, labour force characteristics, innovation patterns and institutional capacity, management and leadership. Throughout this time supply side or hard infrastructure including social overhead investment in human capital (education and training) was the primary focus.

Contrary to these prevailing models, India adopted a different course of action. It adopted a balanced growth strategy driven by its large internal market. In contemporary terms this was a huge commitment to an endogenous model for its development strategy. For the first 40 years, the five-year development plans were built around a largely supply-side and import substitution approach. During this period the economy witnessed structural changes with the GDP growth rate steadily increasing from an average of 3.5 per cent per year during the first three decades of planning (1950 to 1980) to 5.4 per cent during the 1980s.

Since India's reforms in the 1990s, it has experienced positive growth results. India's GDP increased from 5.7 per cent during the 1990s and further to a little less than 8 per cent during the 2000s. Also, India's average annual rate of real per capita income growth increased from about 1.3 percent in the 1960s and 1970s to about 3.6 percent in the 1990s and 5.9 percent in the decade of 2000, Planning Commission (2013).

It was around the early 1990s that India leapfrogged in a big way into IT oriented economic development and developed a globally competitive information technology services industry that has continued to grow and become globally competitive (although the origins of this industry can be traced to the mid-eighties). The generic term 'Information Technology' sector broadly consists of three segments:

IT Software: covers software customization, coding and testing, IT consulting, system integration, network infrastructure management, product development, *etc.*

Business Process Management (BPM): covers broadly back office jobs, starting from low end functions like call centers and routine data processing, to more knowledge intensive applications in engineering design, multimedia and graphics, medical and legal transcriptions, insurance claim processing, inventory management, *etc.*

IT Hardware: covers networking, assembling and maintenance of computers and peripherals, *etc.*

The key verticals of the IT industry are namely, Banking, Financial Services and Insurance (BFSI), Telecom, Manufacturing, Education, are driving growth across sectors. Research studies by Arora, *et.al* (2002), Kumar, N (2005) and Chatterji, T (2013) discuss the potentials of the IT industry as a tool for development. IT has helped the development of various states in India, however, not all the states are beneficiaries. As IT is directly related to Trade and Communication and indirectly related to Transportation, Banking, Insurance and Other Services, the development of the IT sector would clearly lead to the development of related sectors like Travel, Tourism, Banking, Real-Estate, Education, E-Governance, *etc*. This in turn will benefit the local community and business by creating additional economic opportunities, jobs and incomes. Therefore, we would like to study the impact of the growth of the IT sector on the Service Sectors in different states. A study of the top ten states will help us to look at the imbalances due to the impact of IT and the causes behind them. Thus, a study examining the development of the above sector in the ten states would presents a picture of regional development in these areas.

We aim at studying the extent of imbalance prevailing between these states in the related sectors and the causes behind them. This is the primary objective of the study. The above analysis for the country as a whole and at the regional level is done by use of a shift-share method. This analysis is done to arrive at imbalances for two periods1998-99 to 2005-06 and 2006-07 to 2012-13. Besides the study evaluates the clustering in these regions by calculating Moran's I for the IT related sectors like Transport, Trade, Banking, Real-estate, Ownership of dwellings and Other services to look into their spatial significance. This test for spatial correlation examines the extent of clustering by these states in the respective IT related sectors. The value of Moran's I shows the existence of spatial correlation between the six states in transport and trade sector for the first year of the study and for trade alone in the second year. So far as other sectors are concerned there is no spatial correlation between different states clearly indicating lack of interdependence in sectors.

2. REVIEW OF LITERATURE:

The review of literature deals with the studies improvising the shift-share analysis theoretically and some with empirical applications. While Marquillas, Arcelus, and Casler deal with theoretical improvement of the shift-share analysis, Heynes and Dinc, Lui *et al*, and Randall deal with empirical application of shift-share analysis.

Marquillas (1972) - analyzing the meaning of shift share measures felt that the competitive effect was not reflecting what it is meant at but instead he felt that it was influenced and interwoven with the industry mix effect. Therefore, he aimed at rearranging the formulation in this study. In the new formulation he introduced a new element called homothetic employment in sector i of region j. This homothetic employment he defines as the employment that sector i would have if the structure of employment in such a region were equal to the national structure and this according to the author will overcome the problem mentioned above. Introduction of the homothetic employment according to the author has left something of the regional growth unexplained. To enable this drawback, he introduces another additional component called

the allocation effect. This according to the author will show whether the region is specialized in those sectors in which it enjoys better competitive advantage. A positive sign of the allocation effect is said to indicate regional specialization or otherwise.

Arcelus, (1984) in his paper has tried to extend the shift share analysis from the traditional shift share formulation to introducing a new component as done by Marquillas. This new component has been introduced as the regional growth effect such that it measures the effect of growth of a given region on the industries in its midst (surrounding it). The author has tried to focus sharply on issues of differences in industry mixes among regions. Besides, using the revised shift share model, the author looks into the implications of relation between location quotient and economic base model. The revised model modifies the competitive effect to accommodate the degree of specialization by introducing the allocation effect. This allocation effect is introduced by using the concept of homothetic employment in a sector in a particular region. The author defines this as "the employment that sector i of region j would have if the structure of the employment in such a region were equal to the national structure". This is also used to look into the expected growth effect of the corresponding national factor such that employment in sector i region j is equal to homothetic employment in sector i of region j. Added to this it also looks into the differential effect which measures as the difference between the homothetic employment in sector i region j and the number of people employed in sector i region j. This according to the author is said to be the effect of that growth on the degree of specialization of industry i in region j. Further, the author goes to decompose the regional growth effect to - regional growth effect and regional industry mix effect. This according to the author has helped him in getting rough estimates of the effect of local and export markets.

Casler (1989) analyzing the criticism on shift share analysis, aims at providing a framework which will overcome the criticism of missing theoretical framework in shift share technique. His study tries to provide a framework in terms of a regional input growth model. To this effect he develops a labour demand model within regions which is consistent with the theory of the firm. Using the concept of unbalanced growth and

certain assumptions he sees that his model is adapted to correspond to shift share formulation. Thus, he makes it obvious the assumptions underlying shift share analysis and clears the stand and economic interpretations and analysis of the shift share effects. He also adds that by slightly modifying the model, the linkage effect between various industries and regions and national economy could be specified. Using theoretical arguments, he arrives at the conclusion that "arguments against definitions within theory are far more tenuous where these definitions aid in achieving stated research goals". Continuing with the theoretical arguments, he somehow accomplishes to arrive at formation of models integrating both spatial and aspatial economics and able to predict the balanced growth framework or linkage framework.

Heynes and Dinc (1997), in their work point out that the shift share model measures the combined effect of growth in output and change in productivity on employment while extending the analysis of shift share analysis. The authors try to separate the effects of changes in output and productivity by modifying the Rigby-Anderson extension. Here the contribution of labour and capital to productivity growth are separated for analyzing the regional economic performance. They assess whether the observed changes in employment is due to changes in output or productivity. This is done by using twenty manufacturing sectors at the two-digit level, in twelve states of the US. Of these six were from the snow-belt area and six were from the sun-belt area. The results showed that in both the regions change in employment was due to growth in output, new investment in physical capital and improvement in technology in the investigation period. The authors feel that the crucial role of labour productivity in employment change cannot be ignored.

Liu, *et al*, (1999) carry out an empirical study on Economic Growth and Structural Changes in Employment and Investments in China. The author's analyze the impact of Deng's multi-tier and multi-stage development strategy on economic growth of Chinese regions in terms of GDP, employment and investment for a ten-year period 1985-94. The two objectives of Deng's strategy were to create a few fast growing centers and these should act as a model for the rest of the country to follow.

The study makes use of shift-share analysis, an important tool for spatial analysis to quantify the components of growth of the above three indicators in terms of national component, structural component and the differential (or residual) component. The study points out that the sign and the size of the structural and differential component has important implications in terms of structural adjustment and improvement in local competitiveness. The authors make use of Randall J.N. (1973) concept of Net Relative Change (NRC) which is the difference between actual change and the national component and is regarded as an index of relative performance of regions. The structural and the differential component at the regional level is then determined as a share of NRC.

In order to understand the complexity and diversity of the Chinese economy, the paper analysis each economic indicator on the basis of three different development models namely, the growing center model, the catching up model and the backward model. The results of the study indicate firstly, that regional economic growth in China is characterized by structural changes in GDP, employment and investment from agriculture to industry and services. The authors feel this may be the necessary outcome of industrialization and inevitable as a result of increased agricultural productivity. However, the authors point out that a rapid decline in agricultural investment reflects the myopic view of local governments on the importance of agriculture on which more than 60 percent of the population depends. According to them such structural changes have a distinct regional pattern with important policy implications regarding spatial disparities in economic growth and income.

Secondly, the results point out that industry in China experienced a relative decline, in both the most and the least industrialized provinces having different implications; for the former it meant increasing share of services and for the latter it meant backward adjustment towards agriculture. Finally, the results hint at a relatively high increase in investments accompanied by a low increase in employment in most south-coastal provinces. This according to the authors is an indication of high capital intensity of these provinces than that of the north-western provinces, which can generate greater inequality in future growth.

In conclusion, the authors point out that, although Deng's first objective has been achieved and is visible in the eastern provinces which have performed better than the rest of the country in every respect, his second objective that poor regions would catch up with the rich remained largely unrealized in the data period.

Randall J.N (1973) in his empirical study based on the shift-share model analysis employment change in West Central Scotland (WCS) for the period 1959-68. Further, in his study the author illustrates the problems inherent in the technique and some possible methods of reducing their effect. According to him if the differential decline can be attributed to one or two establishments, perhaps manufacturing a distinctive product or aiming at a particular market, then one is less likely to believe that the negative differential component reflects general factors applicable to most firms in the region. With access to disaggregated data one could have attributed this to structural factors.

The author highlights another important criticism of shift-share analysis *i.e*. its failure to take into account inter-sectoral linkages within the regional economy. Negative differential component can be attributed to linkages to declining specific industries and therefore a concealed structural effect. But, in the absence of regional input-output data the testing of such arguments is difficult. Finally, the author points out that despite these limitations the usefulness of the technique should not be discredited. From the policy making point of view the need is to provide valid generalizations which can form the basis of policy measures.

3. APPROACH TO THE STUDY:

IT/BPM sector has registered tremendous growth over the past decade and a half, achieving iconic status all over the world and a reputation for reliable and cost effective delivery of services. Today India is recognized as an outsourcing destination of choice in the world. The major developed markets are sourcing IT/BPM services from India to improve their competitive edge. Indian IT companies have set up over 600 delivery centers across the world and are engaged in providing services with presence in over 200

cities across 78 countries. As a proportion of national GDP, the sector revenues have grown from 1.2 per cent in FY1997-98 to nearly 9.5 per cent in FY2014-15. IT-BPM revenues are expected to touch USD150 billion with USD 98billion from exports and USD48 billion from domestic market. Exports account for 67 percent share in revenue. E-Commerce is driving the rapid growth of domestic IT-BPM. Domestic market is expected to get a further boost due to central government focus on 'Digital India' and 'Make in India'. India continues to maintain leadership position in the global sourcing arena, accounting for almost 55 per cent of the global sourcing market size in 2015 as compared to 52 per cent in 2012, NASSCOM (2015).

The total IT Software and Services employment is estimated to touch 3.5million in 2015. The indirect and induced employment attributed by the sector is estimated at about 10 million. Indirect employment is generated in several ancillary industries such as telecom, power, construction, transportation, corporate real estate, residential townships, shopping malls, specialty hospitals, catering, security, housekeeping, *etc.* Induced employment is driven by consumption expenditure of employees on food, clothing, recreation, and consumer durables including automobiles, health and other services.

The Indian IT-BPM industry has emerged as one of the most dynamic sectors in India's economic development and is responsible for the global recognition of India as a 'soft' power. In addition to fueling India's economy, the IT-BPM industry has been influencing the lives of its people through active direct and indirect contribution to various socio-economic parameters such as employment, standard of living and diversity. IT industry in India is centered on a few clusters to reap the benefits of agglomeration economies. Bangalore, Mumbai, Delhi along with its suburbs, Noida and Gurgaon, Hyderabad, Chennai, Pune and Kolkata clusters have helped in the emergence of a globally competitive IT industry. Other cities such as Thiruvananthapuram, Ahmedabad, *etc*. are coming up as popular locations, Khomiakova (2007). The spillover of the software industry for balanced regional development hinges on the availability of skilled labour, high speed data communication links and built-up floor space. Research studies like that of Surie, G. (2005) point out that the success of the software industry depends on

whether the benefits of IT are accessible to a wider population. To bridge the digital divide and to support the diffusion of IT to improve productivity the state has to play a more proactive role. These observations have provoked to study the extent to which the IT sector is contributing to regional development in the ten states and the extent of imbalances if any. To examine the above, we have used the shift-share method. This method is a popular tool for analyzing regional growth or decline over time. This method is widely used since the 1960s to assess the regions overall performance relative to other regions by focusing on output, employment and investment by industry sector. The method was introduced by Dunn (1960) and Ashby (1960) and has been extensively discussed in Casler (1989) and Randall (1973). A recent discussion and application of the method is found in Stimson *et al*. (2006) and Liu *et al* (1999).

4. MODEL:

Shift-share technique is an identity describing differences in growth rates, by sectors and by regions. The absolute change in a specific sector in a given region between two time periods (measured either in terms of income, value added, employment, number of establishments) is divided into three additive components. This paper looks at an absolute change in terms of GDP (income):

(a) National Share (NS): explains how much of the regional industry's growth is influenced by the overall health of the national economy.

(b) Industry Mix (IM): represents the share of the regional industry growth explained by the growth of the industry at the national level.

(c) Regional Shift(RS): measures the differential shift due to difference in the rate of growth of the same industry between the region and the nation as a result of factors such as national resources, other comparative advantages and disadvantages, leadership and entrepreneurial ability and the effects of regional policy.

$$\Delta e_i \equiv e_{i,t} - e_{i,t-1} \equiv NS_i + IM_i + RS_i \quad \text{----------} \quad (1)$$

Where:

$$NS_i \equiv e_{i,t-1}(E_t/E_{t-1} - 1) \quad \text{----------} \quad (2)$$

$$IM_i \equiv e_{i,t-1}(E_{i,t}/E_{i,t-1} - E_t/E_{t-1}) \quad \text{----------} \quad (3)$$

$$RS_i \equiv e_{i,t-1}(e_{i,t}/e_{i,t-1} - E_i/E_{i,t-1}) \quad \text{----------} \quad (4)$$

Where:

e_i and E_i respectively are regional and national output in industry i;

e and E respectively are regional and national total output in all industries; andt-1 is the initial period and t the end period of the analysis.

Following Randall (1973), equation 1 can be written as:

$$\Delta e_i - NS_i \equiv IM_i + RS_i \quad \text{----------} \quad (5)$$

The left hand side of equation 5 is the difference between the actual change and the national component. It is called the Net Relative Change (NRC) over the base period. It shows whether the growth of sectors in the different regions is slower or faster than the national growth rate.

Since, number of these states is in close vicinity to one another the study also looked into the interdependencies of sectors between regions. This relationship is said to be measured by spatial auto correlation, which is generally measured by Moran's I[3]. Moran's autocorrelation coefficient is an extension of Pearson's Correlation coefficient ρ. Unlike the ρ, in which xi and xj are assumed to be independent of each other, I, used in the study of spatial patterns and processes expects the close observations more likely to be similar than those far apart. This is quantified by use of weights 1 if they are close to one another and 0 if they are apart. A matrix thus formed for adjacent regions is called as

[3]Patrick Alfred Pierce Moran's autocorrelation coefficient is called as Moran's I. Moran's I is a measure of spatial autocorrelation. Spatial autocorrelation measures the correlation of a variable with itself through space (Gunaratna, N www.purdue.edu).

contiguity matrix where if the region shares the border it is quantified as 1 and if not it is 0.

The formula for I is given as $$I = \frac{n}{S_0} \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} w_{ij} (x_i - \bar{x})(x_j - \bar{x})}{\sum_{i=1}^{n} (x_i - \bar{x})^2}$$

I, could be positive or negative. By positive spatial autocorrelation we mean that it occurs when similar values occur near one another. By negative spatial autocorrelation we mean that it occurs when dissimilar values occur near one another. Here we use it for observing the spatial correlation between the six[4] states in each of the IT related sectors.

5. DATA BASE:

Sector wise GDP data is collected from the state GDP series published by the Central Statistical Organization, India. The all India GDP data sector wise is collected from the sight of MOSPI. The 1993-94 and 1999-00 series data for these states is adjusted for 2004-05 prices and the whole data set of the states as well as central data used are for 2004-05 prices. Although we could not get specific IT sector data, we continue our analysis of comparison with other services by considering the data on Real-estate, ownership of dwellings and business services which includes the share of the IT industry because we could not get the state-wise breakup of such data and also that these are inter related sectors.

6. EMPIRICAL RESULTS AND ANALYSIS:

The above data has been used to fit into the shift-share model and calculations of different components in the model is done through the use of excel sheets. Besides a

[4] Delhi, Haryana, Punjab and Uttar Pradesh have been excluded from the ten states because the other six states are close to one another and have common borders. Whereas the four states mentioned above is located separately away from these six states

contiguity matrix for six out of the ten states *i.e.* excluding Delhi, Haryana, Punjab and Uttar-Pradesh, the Moran's I for different IT related sectors *i.e.* transport, storage and communication, trade, hotels and restaurants, banking, insurance, real-estate, ownership of dwellings and business services, and other services is calculated by using the package Spdep, APE in R.

6.1 Results of the Shift-Share Analysis:

Observations of structural change in the three sectors of Agriculture, Industry and Services by regions in both actual and relative terms for two distinct periods of 1998-99 to2005-06 and 2006-07 to 2012-13 is presented in Table 1A, 1B, 1C and 1D.

Observing these Tables, it is seen that, Agriculture witnessed a relative decline *i.e.* negative NRC in most regions except Kerala in the first period. Some regions (Delhi, Karnataka, Maharashtra and Kerala) even had an absolute decline *i.e.* negative actual change. Much of the negative NRC in agriculture can be explained by the structural component implying a clear shift against agriculture. On the other hand, the services sector was a major gainer in most states. Apart from Maharashtra, Punjab and U.P in the first period (these three states could reverse their declining trend in the second period) all other states in both the periods had higher growth in service industries than the national average. The best performer in services was Kerala in the first period and Haryana in the second (although from a low base) Positive NRC was largely due to the structural component *i.e.* favorable industry mix and to some extent due to regional factors. The Kerala Development Report, Planning Commission (2008) indicates that in the post reform period Kerala witnessed a structural shift towards tertiary sector activities resulting in the growth of skill intensive, high value added sectors such as Software, Communication, Financial Services, Tourism (eco-tourism based on back waters, health tourism based on Ayurveda system of health care), Telemedicine, E-Governance, E-Education, *etc*. Haryana's excellent performance in services can be attributed to the thrust given to the IT sector and promoting tourism in unique ways[i].

Although, the actual growth in industry was positive for all regions except Maharashtra in the first period, in terms of overall NRC the first period had positive growth (*i.e.* 4%) and the second period had negative growth (*i.e.* -7.4%). The results showing poor performance of Maharashtra could be possibly because of reasons brought out by Rath and Tilak (2011). Here the authors find that in Maharashtra industrial activity is concentrated in small pockets - Mumbai, Thane, Pune, Nashik, Aurangabad, and so on. Their study points out that industry in Nashik witnessed a decline during 1998 and 2005 on account of militant unionism which led industry to turn to contract labour. The son of the soil movement also drove workers from northern states out of Nashik. According to them one effect of reforms was that large industry could source their inputs from a variety of vendors. Those who had set up industry in the prime locations within the Nashik MIDCs on the basis of licenses procured in an earlier era, found it difficult to compete with a new brand of an entrepreneur on the one hand, and new, highly specific demand from large clients.

Capital and Industry started moving out of Nashik to be relocated in Baroda as land was available there on a scale to satisfy their needs. The authors emphasize that the industrial stagnation in Maharashtra can be attributed to land issues. Land being within the purview of state policy and action, it is for the state to show the required political skills and innovative administration to overcome all hurdles to acquire land. This willingness was largely missing in Maharashtra. Added to this study the comment of Panagariya *et al.* (2014) stating that, states in the interest of making unused land available for industrial and commercial development need to make the repeal of Urban Land Ceiling Act (ULC Act) more effective, reflects Maharashtra's apathy.

Punjab too has experienced negative NRC in industry in both the periods. This result goes along with Aggarwal's M. Phil Dissertation on the "Growth and performance of the manufacturing sector of Punjab in Liberalization Era", for the period 1991-2007 (Aggarwal 2010) and the Punjab State Development Report both point out that the manufacturing sector is highly capital intensive and therefore unproductive and there is

need to encourage the use of new production techniques, invest in R and D and conduct worker training programmes to make the products competitive.

On the other hand, Gujarat (Panagariya *et al*, 2014) has emerged as one of the most dynamic states as far as thrust given to industrial manufacturing, infrastructure (ports, roads, water, electricity, storage and internet), construction, trade, hotels and restaurants, banking and insurance is concerned. In the post reform period both the secondary and the tertiary sectors have picked up steadily and now comparable to levels reached in China. Since 2009 several mega projects like the Nano car project of Tata motors have come to Gujarat and subsequently followed by Peugeot and Ford. The other industries for which Gujarat is renowned is the ship-making industry, repair and overhaul for auto sector, ship and aircraft. The authors point out that the government offered several concessions and incentives to these mega projects because of their substantial forward and backward linkages and considerable income and employment multiplier effects. The government has encouraged the formation of SEZs and by 2012 Gujarat had sixty SEZs. The other pro industry initiative of the government is its biennial investors' summit called the 'Vibrant Gujarat Summit' which aims at inviting business from within and outside the country to invest in the state. These developments are very well reflected in our results.

There are some interesting results in the services sector at the disaggregated level as shown in Table 2A, 2B, 2C and 2D and Table 3A and 3B: Within the service sector, Transport, Storage and Communication (TSC) and Trade, Hotels and Restaurants (THR) outperformed the national average in the first period and TSC and Banking and Insurance (B and I) in the second period. Although the actual growth of Real Estate, Ownership of Dwellings and Business Services (REODBS) was high, it was marginally lower than the national average at least in the second period. Next we observe these individually:

6.2 Transport, Storage and Communication (TSC):

Observing Table 2A and 2C, it is seen that during the period 1998-99 and 2005-06 all but two states (Delhi and Maharashtra) registered a higher growth rate than the national average as depicted by positive NRC and this was due to favorable structural factors or industry mix. The lower growth rates in Delhi and Maharashtra is because of adverse regional factor, which is reflected in the write up of the State Development Reports which says that Delhi and Mumbai's road transportation sector is subject to severe strain. Although, the Delhi metro and Mumbai's Bandra-Worli sea link have relieved this strain to some extent, satellite towns in Delhi instead of easing pressure on urban roads, have added to the same as they have become residential suburbs with work places continuing to be in Delhi (Planning Commission 2009a). In the period 2006-07 and 2012-13 Delhi, Haryana and Punjab show negative NRC due to unfavorable regional factors. Andhra, Kerala, Maharashtra and Gujarat achieved high NRC attributable to positive local conditions. In the case of Karnataka and Tamil Nadu it is the structural factors that helped them to achieve high growth rates. Although imbalances in the growth of this sector in the ten states prevail in both the periods, it is far more rampant in the first period.

6.3 Trade, Hotels and Restaurants (THR):

Continuing with Table 2B and 2D, it is seen that in this sector during the first period 1998-99 and2005-06 it is the positive or negative regional factors that dominate either high NRC growth rates or low NRCs between states. In the second period eight out of ten states showed lower growth rates than the national average primarily due to adverse structural factors. Only two states *i.e*. Gujarat and Haryana had positive NRCs attributable to regional factors. Overall growth in second period deteriorated and growth in this sector is much less than the growth in the transport sector.

6.4 Banking and Insurance (B and I):

Also depicted in Table 2B and 2D it is seen that the performance in this sector has been different from the above two *i.e*. this sector has performed exceedingly well in the second period with all regions showing positive NRC due to positive industry mix. The best performers were the northern states.

6.5 Real-Estate, Ownership of Dwellings and Business Services (REODBS):

Looking into Table 3A and 3B, it was observed that as in the case of THR, (in Table 2A and 2C) in this sector too favorable and unfavorable regional factors dominate either high or low NRC growth rates in both the periods. In CSO data, the IT sector is subsumed under REODBS. The IT sector being skilled labour and land intensive in nature has strong linkages with the real estate sector and also with the other service sub sectors. The southern states which constitute the IT hub have encouraged not just IT-ITES and hardware industry but other emerging industries like electronics industry, telecommunications, bio-technology, and so on. The IT industry has not only helped in removing infrastructure constraints[ii]but also strengthened the education system by increasing the number of engineering and technical institutes, polytechnics, Indian Institutes of Information Technology. States who through their IT policies provided access to land are the ones where the IT industry has thrived such as, Andhra Pradesh, Karnataka, Tamil Nadu, and Haryana[iii]. Whereas in states like Maharashtra[iv], Kerala and West Bengal the growth of the IT sector has been impacted as these states have declined to offer land through its agencies.

Also, demand for real estate at the regional level comes from strengthening of transport infrastructure (roads, highways, metro's), retail (malls), hospitality (hotels), industrial demand (automotive component industry, pharmaceutical, IT hubs, SEZs, biotech clusters, electronic parks) and so on.

The real estate industry is a manpower driven industry and one of the largest employers in the country. In recent years the IT industry has spread to several smaller cities such as Coimbatore, Mysore, Visakhapatnam, Vijayawada, and Mangalore due to price of land in tier1 cities reaching alarming levels.

6.6 Other Services (OS)

In Table 3A and 3B, other services which include public administration, education, health, *etc*., all states except Kerala had growth rates below the national average in the first period mainly due to adverse structural factors. In the second period in addition to Kerala, Karnataka, Delhi, Haryana and Punjab were able to improve their performance. The reasons for Kerala's positive NRC is clearly brought out in its Human Development Report which states that Kerala is a forerunner in education, healthcare initiatives making a socio-economic impact on the lives of its people. Kerala's HDI score of 0.7 is equivalent to that of Brazil.

Overall, the role of industry mix is dominant in influencing high growth rates in TSC and B and I whereas, it is regional factors in the case of THR, REODBS and OS. The analysis also points out that the imbalances between the states in the second period are far less than in the first.

The inference of the above conclusion for the IT sector is that the formation of IT clusters in India illustrates the significance of local institutions, governance involving political, economic and civil society. Although growth is largely driven by external demand, off late demand for domestic IT-BPM industry has registered healthy growth due to demand for domestic hardware, e-commerce, e-governance initiatives of the government, IT based education in schools and so on (NASSCOM 2015). Finally, variations in state/regional level political and social cultures are responsible for differences in economic outcomes.

7. MORAN'S I:

Analysing Moran's I in Table 4 it is seen that there exists spatial correlation between the six states in TSC and THR for the initial year and for THR alone in the ending year of the first period of study respectively. So far as other sectors are concerned there is no spatial correlation between different states for the first and second year of the study. In the second period in none of the years there is spatial correlation between the states clearly indicating lack of inter- dependence in sectors between states.

8. POLICY IMPLICATIONS:

For the IT sector to develop fully there is need for demand both nationally and internationally. The IT sector in India is more an export oriented sector. This disproportionality in growth between the export and domestic segments needs to be corrected. In the last couple of years' e-commerce is driving the rapid growth of the IT-BPM domestic industry. There is hardly any industry that does not leverage the benefits of IT. It has synergies with banking, financial services and insurance, manufacturing, retail, telecommunication, health care, government, all of which constitute the key business verticals of the industry. This integration needs to be further strengthened for IT to act as a powerful facilitator and catalyst of growth. This in all ways would help in creating employment opportunities and development of the region where it is located.

9. CONCLUSION:

The study while analyzing the extent of growth in GDP in the three broad sectors-agriculture, industry and services and five sub sectors of the service sector - transport, storage and communication, trade, hotels and restaurants, real estate, ownership of dwellings and business services and other services finds that there exist imbalances between states for all IT related sectors. It also observes that in the case of two sectors and two years in the first period there is spatial correlation. So far as other sectors are concerned there is no spatial correlation between different states clearly indicating lack of

interdependence in sectors between states. However, a look at employment and investment trends will give a clearer picture of the economy.

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Appendix

Table 1A: Shift-share analysis of GDP growth by sectors (%)

1998-99 and 2005-06

	GDP growth	GDP growth	Agriculture	Agriculture	Share in NRC%	Share in NRC%
States	ACT	NRC	ACT	NRC	IM	RS
AP	56.6	0.8	28.2	-27.6	141.7	-41.7
Del	58.1	2.3	-10.4	-66.2	59	41
Guj	62	6.2	28.1	-27.8	140.8	-40.8
Har	73.6	17.8	16.5	-39.3	99.3	0.7
Karn	44.2	-11.6	-0.5	-56.3	69.3	30.7
Ker	285.9	230	152.9	97.1	-40.2	140.2
Mah	2.1	-53.7	-51.6	-107.5	36.4	63.6
Pun	34.8	-21	18.4	-37.4	104.4	-4.4
TN	52.5	-3.3	1.5	-54.3	71.9	28.1
UP	34.8	-21	17.6	-38.2	102.1	-2.1
India	55.8	0	16.7	-39.1	100	0

NB: ACT: Actual, NRC: Net Relative Change, IM: Industry Mix, RS: Regional Shift

Table 1B: Shift-share analysis of GDP growth by sectors (%)

1998-99 and 2005-06

	Industry	Industry	Share in NRC%	Share in NRC%	Services	Services	Share in NRC%	Share in NRC%
States	ACT	NRC	IM	RS	ACT	NRC	IM	RS
AP	60.9	5.1	78.3	21.7	72.4	16.6	106.9	-6.9
Del	51.6	-4.2	-95.3	195.3	61	5.2	341.6	-241.6
Guj	65.7	9.9	40.4	59.6	77.1	21.3	83.4	16.6
Har	75.5	19.7	20.4	79.6	120.1	64.3	27.7	72.3
Karn	43.8	-12	-33.3	133.3	72.5	16.7	106.5	-6.5
Ker	312.4	256.6	1.6	98.4	338.8	282.9	6.3	93.7
Mah	-2.6	-58.4	-6.9	106.9	31.4	-24.4	-72.9	172.9
Pun	40	-15.8	-25.3	125.3	46.3	-9.5	-187.3	287.3
TN	59.3	3.4	116.1	-16.1	64.6	8.8	202.4	-102.4
UP	49.4	-6.4	-62.4	162.4	40.3	-15.6	-114.2	214.2
India	59.8	4	100	0	73.6	17.8	100	0

NB: ACT: Actual, NRC: Net Relative Change, IM: Industry Mix, RS: Regional Shift

Table 1C: Shift-share analysis of GDP growth by sectors (%)

2006-07 and 2012-13

	GDP growth	GDP growth	Agriculture	Agriculture	Share in NRC%	Share in NRC%
States	ACT	NRC	ACT	NRC	IM	RS
AP	57.9	4.1	34.6	-19.2	157.8	-57.8
Del	74.1	20.3	36.5	-17.3	175	-75
Guj	68.6	14.8	19.1	-34.7	87.4	12.6
Har	61.6	7.8	18.5	-35.3	85.8	14.2
Karn	46.4	-7.4	19.3	-34.5	87.9	12.1
Ker	56.6	2.8	-3.1	-56.9	53.3	46.7
Mah	57.8	4	17.1	-36.7	82.6	17.4
Pun	45.4	-8.4	9.3	-44.5	68.1	31.9
TN	57	3.2	5	-48.9	62.1	37.9
UP	48.3	-5.5	22.5	-31.3	96.8	3.2
India	53.8	0	23.5	-30.3	100	0

NB: ACT: Actual, NRC: Net Relative Change, IM: Industry Mix, RS: Regional Shift

Table 1D: Shift-share analysis of GDP growth by sectors (%)

2006-07 and 2012-13

	Industry	Industry	Share in NRC %	Share in NRC %	Services	Services	Share in NRC%	Share in NRC%
States	ACT	NRC	IM	RS	ACT	NRC	IM	RS
AP	49.3	-4.5	165.2	-65.2	72.1	18.3	74.9	25.1
Del	2.5	-51.3	14.5	85.5	89.1	35.3	38.8	61.2
Guj	64	10.2	-72.9	172.9	90.6	36.8	37.2	62.8
Har	39.5	-14.3	51.7	48.3	96.6	42.8	32	68
Karn	31.4	-22.4	33.2	66.8	64	10.2	133.9	-33.9
Ker	68.2	14.4	-51.4	151.4	66.2	12.4	110.9	-10.9
Mah	44.7	-9.1	81.2	18.8	72.3	18.5	74	26
Pun	48.8	-5	147	-47	68	14.2	96.4	3.6
TN	59.3	5.5	-133.9	233.9	65.4	11.6	117.7	-17.7
UP	31.2	-22.6	32.8	67.2	72.1	18.3	75	25
India	46.4	-7.4	100	0	67.5	13.7	100	0

NB: ACT: Actual, NRC: Net Relative Change, IM: Industry Mix, RS: Regional Shift

Table 2A: Shift-share analysis of GDP growth of Services sector (%)

1998-99 and 2005-06

	GDP growth	GDP growth	TSC	TSC	Share in NRC%	Share in NRC%
States	ACT	NRC	ACT	NRC	IM	RS
AP	72.4	-1.2	98.9	25.3	207.1	-107.1
Del	61	-12.6	58.4	-15.2	-345.8	445.8
Guj	77.1	3.5	122.1	48.6	108	-8
Har	120.1	46.5	175.3	101.7	51.5	48.5
Karn	72.5	-1.1	109.4	35.8	146.3	-46.3
Ker	338.8	265.2	304.9	231.4	22.7	77.3
Mah	31.4	-42.2	59.3	-14.3	-367.8	467.8
Pun	46.3	-27.3	152.2	78.6	66.7	33.3
TN	64.6	-9	94.5	21	250.2	-150.2
UP	40.3	-33.3	83.9	10.3	510.4	-410.4
India	73.6	0	126	52.4	100	0

NB: ACT: Actual, NRC: Net Relative Change, IM: Industry Mix, RS: Regional Shift, TSC= Transport Storage and Communication, THR= Trade Hotel and Restaurants and B and I= Banking and Insurance

Table 2B: Shift-share analysis of GDP growth of Services sector (%)

1998-99 and 2005-06

	THR	THR	Share in NRC%	Share in NRC%	B and I	B and I	Share in NRC%	Share in NRC%
States	ACT	NRC	IM	RS	ACT	NRC	IM	RS
AP	63.3	-10.3	-20.6	120.6	82.9	9.3	-35.6	135.6
Del	54.5	-19	-11.1	111.1	41.3	-32.3	10.3	89.7
Guj	95.8	22.2	9.5	90.5	72.2	-1.4	235.9	-135.9
Har	129.2	55.6	3.8	96.2	114.3	40.7	-8.2	108.2
Karn	59.4	-14.1	-15	115	111.1	37.5	-8.9	108.9
Ker	339	265.4	0.8	99.2	28.3	-45.3	7.3	92.7
Mah	30.2	-43.3	-4.9	104.9	59.8	-13.8	24.1	75.9
Pun	42.3	-31.3	-6.8	106.8	80	6.4	-51.9	151.9
TN	80.7	7.1	29.8	70.2	60.7	-12.9	25.7	74.3
UP	19.5	-54	-3.9	103.9	74	0.4	-744.3	844.3
India	75.7	2.1	100	0	70.3	-3.3	100	0

NB: ACT: Actual, NRC: Net Relative Change, IM: Industry Mix, RS: Regional Shift, TSC= Transport Storage and Communication, THR= Trade Hotel and Restaurants and B and I= Banking and Insurance

Table 2C: Shift-share analysis of GDP growth of Services sector (%)

2006-07 and 2012-13

	GDP growth	GDP growth	TSC	TSC	Share in NRC%	Share in NRC%
States	ACT	NRC	ACT	NRC	IM	RS
AP	72.1	4.6	137	69.5	27.9	72.1
Del	89.1	21.6	59.2	-8.3	-233.7	333.7
Guj	90.6	23.1	114.3	46.8	41.5	58.5
Har	96.6	29.1	64.3	-3.2	-608.2	708.2
Karn	64	-3.5	70.9	3.4	566.6	-466.6
Ker	66.2	-1.3	121.4	53.9	36	64
Mah	72.3	4.8	118.5	51	38.1	61.9
Pun	68	0.5	48	-19.5	-99.5	199.5
TN	65.4	-2.1	84.8	17.3	111.9	-11.9
UP	72.1	4.6	81.3	13.8	140.9	-40.9
India	67.5	0	86.9	19.4	100	0

NB: ACT: Actual, NRC: Net Relative Change, IM: Industry Mix, RS: Regional Shift, TSC= Transport Storage and Communication, THR= Trade Hotel and Restaurants and B and I= Banking and Insurance

Table 2D: Shift-share analysis of GDP growth of Services sector (%)

2006-07 and 2012-13

	THR	THR	Share in NRC%	Share in NRC%	B and I	B and I	Share in NRC%	Share in NRC%
States	ACT	NRC	IM	RS	ACT	NRC	IM	RS
AP	56.8	-10.7	175.5	-75.5	139.6	72.1	65.8	34.2
Del	63.3	-4.2	451.3	-351.3	145.1	77.6	61.1	38.9
Guj	112.3	44.8	-42.1	142.1	104	36.5	130	-30
Har	109.4	41.9	-45	145	196.2	128.7	36.9	63.1
Karn	44.9	-22.6	83.3	16.7	95.5	28	169.3	-69.3
Ker	27.2	-40.4	46.7	53.3	105	37.5	126.7	-26.7
Mah	43.6	-23.9	79	21	106.1	38.6	123.1	-23.1
Pun	50.9	-16.6	113.8	-13.8	157.6	90.1	52.7	47.3
TN	34.7	-32.8	57.5	42.5	86.1	18.6	255.8	-155.8
UP	43.2	-24.3	77.6	22.4	127.5	60	79	21
India	48.6	-18.9	100	0	115	47.5	100	0

NB: ACT: Actual, NRC: Net Relative Change, IM: Industry Mix, RS: Regional Shift, TSC= Transport Storage and Communication, THR= Trade Hotel and Restaurants and B and I= Banking and Insurance

Table 3A: Shift-share analysis of GDP growth of Services sector (%)

1998-99 and 2005-06

	REODBS	**REODBS**	**Share in NRC%**	**Share in NRC%**	**OS**	**OS**	**Share in NRC%**	**Share in NRC%**
States	ACT	NRC	IM	RS	ACT	NRC	IM	RS
AP	71.6	-2	153.4	-53.4	66.2	-7.3	289.5	-189.5
Del	118.2	44.7	-6.7	106.7	42.5	-31	68.4	31.6
Guj	58.1	-15.4	19.5	80.5	39.8	-33.8	62.9	37.1
Har	184.6	111	-2.7	102.7	38.7	-34.9	60.9	39.1
Karn	90	16.4	-18.3	118.3	39.9	-33.7	63	37
Ker	575.2	501.7	-0.6	100.6	308.4	234.8	-9	109
Mah	18.5	-55.1	5.5	94.5	11.9	-61.7	34.4	65.6
Pun	22.3	-51.2	5.9	94.1	25.5	-48.1	44.2	55.8
TN	87.8	14.2	-21.1	121.1	24.3	-49.2	43.1	56.9
UP	30.6	-43	7	93	42.2	-31.4	67.6	32.4
India	70.6	-3	100	0	52.4	-21.2	100	0

NB: ACT: Actual, NRC: Net Relative Change, IM: Industry Mix, RS: Regional Shift, REODBS = Real Estate, Ownership Dwellings and Business Services, OS= Other Services

Table 3B: Shift-share analysis of GDP growth of Services sector (%)

2006-07 and 2012-13

	REODBS	**REODBS**	**Share in NRC%**	**Share in NRC%**	**OS**	**OS**	**Share in NRC%**	**Share in NRC%**
States	ACT	NRC	IM	RS	ACT	NRC	IM	RS
AP	50.8	-16.7	8.2	91.8	40.3	-27.2	47	53
Del	84.3	16.8	-8.1	108.1	78.6	11.1	-115	215
Guj	38.8	-28.7	4.8	95.2	49.7	-17.8	71.9	28.1
Har	65.4	-2.1	66.1	33.9	91	23.5	-54.4	154.4
Karn	58.2	-9.3	14.6	85.4	72.1	4.6	-276	376
Ker	41.2	-26.3	5.2	94.8	86.2	18.7	-68.2	168.2
Mah	55.8	-11.7	11.6	88.4	61.5	-6	214.6	-114.6
Pun	29	-38.5	3.5	96.5	70	2.5	-504.8	604.8
TN	95.2	27.7	-4.9	104.9	57.8	-9.7	132	-32
UP	83.5	16	-8.6	108.6	67.3	-0.2	6990.8	-6890.8
India	66.1	-1.4	100	0	54.7	-12.8	100	0

NB: ACT: Actual, NRC: Net Relative Change, IM: Industry Mix, RS: Regional Shift, REODBS = Real Estate, Ownership Dwellings and Business Services, OS= Other Services

Table1V - Observed values of Moran's I

Period/Sector	TSC	THR	B and I	REODBS	OS
1998-99	0.25(0.004)**	0.15(0.057)*	0.04(0.44)	0.04(0.41)	0.01(0.62)
2005-06	0.06(0.31)	0.12(0.09)*	0.09(0.20)	0.08(0.22)	0.03(0.45)
2006-07	-0.007(0.76)	-0.025(0.90)	-0.02(0.93)	-0.02(0.89)	-0.03(0.99)
2012-13	-0.02(0.90)	-0.0009(0.69)	0.028(0.50)	0.049(0.39)	0.068(0.30)

Significance codes:`***`0.001, `**`0.01, *0.05, `.`0.1

End Notes

[i] AS per the Haryana Development Report, brought out by the Planning Commission in 2009b, and Haryana Government Gazette-2010, the state promotes Highway tourism, Golf tourism, Farm and Medical tourism.

[ii] Because of the IT industry development there is increased tele-density-both wireline and wireless, local, national and international connectivity by road and air, power supply, financial services *etc*.)

[iii] Haryana government in particular, has a comprehensive Resettlement and Rehabilitation policy for land owners whose land is acquired for Development-Haryana IT policy- 2000

[iv] According to R Nair (2015), it is only Pune's Hinjewadi that has seen IT-ITES growth, thanks to the cities high grade demographic attributes.

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