INTER-STATE DISPARITY IN INDIAN MANUFACTURING : GROWTH, PRODUCTIVITY AND EFFICIENCY

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CERTIFICATE

I, Animesh Naskar, certify that the dissertation entitled **"INTER-STATE DISPARITY IN INDIAN MANUFACTURING: GROWTH, PRODUCTIVITY AND EFFICIENCY"** for the degree of **MASTER OF PHILOSOPHY** is my bonafide work and may be placed before the examiners for evaluation.

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(Animesh Naskar)

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Chapter I

Introduction

The most common feature that has come out while exploring the literatures of economic geography and regional development economics is highly inequitable distribution of economic activities. High-income regions are almost entirely concentrated in a few temperate zones.15% of the world's population produces 50% of world GDP, while, countries covering 10% of the total area of land accounts for 54% of GDP. The poor half of the world population produces 14% of world GDP. The unevenness is also manifest within countries, with metropolitan concentrations of activity.[1] Virtually countries that enjoyed high growth of GDP since centuries past did so by industrializing. Once these countries became successfully industrialized, the polarization of growth process (i.e., cumulative causation) took place.

Spatial inequality is a predominant feature of developing economies. India, being a developing country cannot restrain its widely prevalent spatial inequality in different economic activities. The regional imbalance of industrial growth, even during the era of liberalization and globalization, is a major concern of Indian planners and policy makers. The growing evidence of spatial inequality in manufacturing has evoked considerable attention of many researchers while studying the cause and trend of inequality and, to find out the possibilities of interregional convergence, with the progress of economy. It is no doubt that the material progress of any region

[1] J. Vernon Henderson, Zmarak Shalizi and Anthony J. Venables ,"Geography and Development",;Journal of Economic Geography*1*:81-105 (2001)

broadly depends on the naturally endowed resources, improved social & physical infrastructure, availability of skilled human capital and the existence of potential market. These entire factors cumulatively create a business climate, which attracts industries. In India the variation of investment climate is the result of the persistent pre-independence colonial legacy. Geographical proximity of mineral resources, easily accessible sea transport and the existence of progressive business communities attracted British companies to locate industries in few coastal areas such as Maharashtra, Gujarat, Tamil Nadu and West Bengal, a major portion of hinterlands being neglected since then. Even after 50 years of planning the situation remains unchanged. The growing importance on vertical process[1] of industrial growth in different Five Year Plans was partly responsible for restraining spatial diffusion of manufacturing. During the late 60s and 70s, a spurt in public sector investment took place in eastern region: West Bengal, Bihar, Orissa and Assam, but they have been continually loosing their prominence. The states like Madhya Pradesh, Rajasthan, and Uttar Pradesh and in south India: Andhra Pradesh, Tamil Nadu and Karnataka have been continually increasing their shares in value added in country's manufacturing sector. Several studies have shown that in spite of the widely prevalent regional disparity in industrial development, the spatial concentration has been declining slowly since 1970. After a gradual shift away from the more regulated import substitution policy to market oriented neo-liberal economy, the tendency to fall in concentration has become stagnant. Although, trade liberalization policies have made the domestic industries more competitive by lessening the dependence on small domestic market, the real benefits of these policies are accruing to the initially well off states. While a massive inflow of private capital and FDI in developed

[1] Here it means growing industries grow on further.

states coupled with drastic reduction in public investment[1] are partly responsible for the persistent nature of spatial inequality, high rate of technological progress and economies of scale, which in turn generate cumulative cycle of growth difference constitutes the rest of the factors responsible.

This study is an attempt to investigate as to what extent regional variation in returns to scale and technological progress, technical efficiency and multifactor productivity play important roles to cause industrial concentration.

This chapter gives theoretical understanding of the causes of regional disparity in industrial activities through a comprehensive literature survey. Section-1 deals with the theories of industrial agglomeration; section-2 provides Indian evidences in this aspect.

I.1 Regional Disparity in Industrial Activities:

Regional disparity is the result of agglomeration of economic activities at macro level. The causes of regional disparity have been explained here under the theoretical foundation of 'agglomeration economics'.

The incidences of agglomeration have opened up a widespread research area in development economics and economic geography. The internal dynamics and macro economic outcome of spatial concentration raises significant questions for developing policy. Spatial concentration of industries is often an outcome of the economic rationality of decision-making units in internally but the aggregate impact of these decisions has in more macro economic consequences[2]. The distortion, arising out of spatial concentration of

[1] B.B. Bhattacharya and Sakthivel ,"Regional Growth and Disparity in India: A coparison of Pre and Post- Reform Decades" 2004; E/244/2004; web:http://ieg.nic.in/workpap/htm

[2] Nicholas A. Phelps, "External economies, agglomeration and flexible accumulation". Trans. Inst. Br. Geogr. N.S. 17:035 – 046 (1992) ISSN: 0020 -2754

industries, at the national/international level poses great challenge for developing policy for the purpose of creating a more balanced development.

Agglomeration basically refers to the sectoral and spatial concentration of economic activities, which talk about the industrial activity and other economic and cultural activities revolving around it. For instance, industrial development is followed by an influx of population (because of employment opportunities) and consequent development of markets. The concept of urbanization and metropolitan cities emanates from this agglomerative nature of economic activities. Several theories have been developed to analyze the incidence of agglomeration.

These theories and models seek to investigate the following questions:

i) Why do industries concentrate?/

ii) Is concentration a perpetual process?

I.1A Theories of Agglomeration Economies

Traditional regional economic theories predict the causes of spatial inequality in economic activities in terms of differences of technologies, saving rates, investments and endowments of resources for production. However, these fail to explain today's very uneven distribution of economic activities, often between two very similar geographic regions. Many literatures have attempted to explain this inequality of development across regions. Adam Smith's idea on 'division of Labour' in pin making industry can be said the starting point in agglomeration theory where it is explained that spatial agglomeration rest upon economies of specialization, input- output

links, and user producer exchanges of knowledge[1]. Later on Myrdal's (1957) 'cumulative causation' theory gives an appreciable explanation on spatial inequality. Its main conclusions are that, firstly, industrial development will occur at a spatially uneven pace. Secondly, growth will be higher in those regions experiencing industrial agglomeration. It diverges from standard neo-classical theory in that growth rates of GDP and GDP per capita will be unequal across regions, as there is no full factor price equalization.

Early literatures recognize that there are advantages for firms to agglomerate in a certain location. Marshall (1920) points at three types of externalities: labour pooling[2], non-tradable specialized inputs and knowledge spillovers. He also notes that external economies are more common in manufacturing than in agriculture. Myrdal's (1957) so-called "cumulative causation" and Hirschman's (1958) "backward linkage" and "forward linkage" give a good theoretical support to the polarization of industrial growth. Myrdal's original exposition of cumulative causation is that the 'backwash effects predominate and spread effects are dampened. This tends cumulatively to accentuate international inequalities as well as regional inequalities within the underdeveloped countries.

Geography matters in determining where such processes begin and coastal access is an important geographical factor in this regard. Commercial centers are, of course, usually located in places where there are reasonably good natural conditions for the construction of a port. However, 'historical accident' is seen as the fundamental cause. It may be that the initial investment would have resulted in greater success elsewhere, but somehow it did not occur there. And as long as

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[1] Cited in G. Bottazzi, G. Dosi and G. Fagiolo, "On the Ubiquitous Nature of Agglomeration Economics and Their Diverse Determinants". LEM Working Paper Series, October, 2001; web: http://www.lem.sssup.it

[2] Such an explanation of industrial concentration empirical evidences by Dumais et al (1997). They have shown that industrial spatial polarization persistence is driven mostly by labour pooling.

the externalities are strong enough, this process continues once it has begun. Myrdal explains backwash effects, e.g. when an agglomerating region attracts factors of production from elsewhere, evolving cumulative cycle of growth through migration, capital movements and trade. It is upward in the lucky regions and downward in the unlucky ones. When factor payments are increased to (especially immobile factors) a certain level, the process of agglomeration gets halted. External diseconomies or spread effects act as counteracting forces simultaneously. This benefits the surrounding regions.

The traditional theories of agglomeration have little scope to explain the causes. A new school of thought has evolved which analyze the causes of agglomeration in general equilibrium framework[1]. They help understand how historical accident can shape economic geography, and small changes can produce discontinuous changes in spatial structure.

The theory of "new economic geography" on spatial inequality, initiated by the pioneering works of Fujita (1988), Krugman (1991), Venables (1996), contributed to the development of a general equilibrium approach to study geographic agglomeration, industrial clustering and the evolution of cities. The new economic geography deals with some of the classic questions of regional and urban sciences related to location in a coherent theoretical framework, and explain the endogenous mechanisms driving geographic concentration of economic activity leading to core-periphery patterns.

Krugman (1991) has shown that the geographic concentration of industries itself generates a pecuniary external economies that results in further attraction of new firms or industries. Agglomerative forces are, therefore, self-perpetuating and self-reinforcing. This self-

[1] D. Simonis, " The New Economic Geography:a survey of the literature" December 2002, Federal Planning Bureau; URL:http://www.plan.be

reinforcing process is the outcome of the spatial concentration of economic activity arising from the interplay of various factors: scale economies, transport costs, backward-forward linkages of firms determining the location of economic activity. Producers are inclined to concentrate their production in a single location to derive the maximum benefits from economies of scale. The distance between the manufacturing units and the place where the products will be sold is one of the prime factor responsible for the formation of spatial concentration. One of the important consequences of it is the development of market associated with lessening of the potential demand risk. In order to minimize the transport costs, the producer will have a tendency to open its manufacturing unit proximate to the location where other firms already exist. It is obvious that if a specific economic activity develops particularly in a given region, for some historical reasons, it will attract firms from other regions, thus reinforcing the advantage deriving from the size of its own market. This circular process of cumulative causality leads in the end to the concentration of the industry in a single area. The effects from the concentration of economic activity can be reinforced by the existence of externalities such as technology and knowledge spillovers through the improvement of information flows (informal contacts facilitated by proximity), access to a diversified range of intermediate goods and complementary services to industrial activity and the benefits from the availability of specialized high-skilled labour. The economic literature also makes a distinction between location economies associated with the firms belonging to a same sector and the urbanization economies associated with the firms from all sectors being located in a same place. The interplay of technological, sectoral and geographical proximity comes from the research work on endogenous growth, which considers these externalities as the engine of growth. While the role of pecuniary externalities, emphasised by the new economic geography, is especially relevant to explain agglomeration effects at

the European scale, empirical studies tend to show that the existence of technology and knowledge spillovers, encouraged by specialized high-skilled labour availability, may well prove to be a better explanation of agglomeration at the local level. Thus, this mechanism is very important to understand, for example, the impact of information and communication technology on the spatial configuration of cities. Regional economics and urban economics have already analyzed the potential advantages from geographical concentration of economic activity. Harris (1954) and Pred (1966) studied the emergence of large regional concentration of economic activity, such as the "manufacturing belt" in America's northeast and inner Midwest. Harris (1954) emphasized the role of access to markets in the location of economic activities[1]. He measured the market access of each region using a measure of "market potential" defined as a weighted sum of purchasing power across locations, with the weights for each location depending inversely on its distance. Harris concluded that the heavily industrialized regions of the United States were in general also locations with exceptionally high market potential. He also noted that the concentration of production was self-reinforcing. Pred (1966) was interested in the dynamics of regional growth and in the conditions for a regional economy to take off in a cumulative process of growth[2]. The advantages of concentration resulting from interactions between different sectors and many of the underlying ideas about cumulative causation through forward and backward linkages were also familiar to development economics in the 1950s (Myrdal, 1957; Hirschman, 1958).

[1] Harris, C. D. 1954. "The Market as a Factor in the Localization of Production." *Annals of the Association of American Geographers* 44: 315–48.

[2] Pred, A. R. 1966. *The Spatial Dynamics of U.S. Urban-Industrial Growth, 1800–1914.*

The above literature introduces us to the underlying factors responsible for the incidence of industrial agglomeration. However, this study calls for a detailed analysis of the mechanisms through which these factors operate.

Increasing returns to scale, Knowledge Spillovers & Industrial Agglomeration

The polarization of industrial growth acknowledges the stylised fact that the new firms locate themselves in such a place where other firms already exist. The geographical proximity associated with indivisibility of production structures of firms in an industry generate increasing returns to scale, which induces industrial concentration. Under constant returns to scale a firm can locate anywhere (Carl Hansen, 2002). Any dispersed nature of industrial location hardly accrues the benefit of knowledge spillovers, agglomeration economies.

If this analysis is extended to industry level, it is observed that under increasing returns to scale industries get agglomerated.

Increasing returns occur when one unit increase of a factor input raises the production by more than one unit. Recent growth models (Romar 1992, Barrow Sal-ai Martin,1995) show that increasing returns to at least one factor of production is required to achieve sustained growth in per capita income. Moreover, with fixed stock of land and natural resources, increasing returns need to be large enough to offset diminishing returns from fixed factors of production. The fact that agglomeration induces further agglomeration is attributable to the existence of increasing returns to scale.

A key source of increasing returns is the ongoing creation of knowledge, often from R&D, but also from "learning-by-doing" of workers, managers, researchers, entrepreneurs, and investors. Knowledge is manifest in specialized intermediate goods (and

services), such as specialized machinery and equipment, specialized organisation and production processes, and skills of workers and investors. Workers acquire specialized skills through research, education, training, and learning on the job, and firms undertake R&D to develop specialized intermediate goods resulting in further capitalisation on existing knowledge.

Existing knowledge is used when people create or assimilate new knowledge. In economic jargon, new knowledge is complementary to existing knowledge. This achieves increasing returns if increase in the stock of existing knowledge increases the rate at which new knowledge is created. Up to a certain extent more the knowledge is, higher the marginal productivity of skilled workers and investors. If new knowledge is .largely a substitute for existing knowledge, diminishing returns will be obvious result, which will retard the perpetual growth process.

Typically, no single person has all the knowledge and competencies required to create new knowledge and bring it to market in a commercially successful manner. Teams of people, with skills complementary to other team members and to capital, are usually required in today's world. There are also physical production processes requiring team effort, where workers' skills are important. In general, specialized intermediate goods are complementary in the production of final goods.

Knowledge externalities occur when a person or firm acquires knowledge from another person or firm without financially compensating them. Endogenous growth models often assume knowledge externalities are inter-temporal, such as current generations inheriting knowledge from previous generations, and contemporaneous, such as knowledge created by one person or firm leaking to other people and firms.

"Knowledge externalities occur in all sorts of ways, such as when firms observe or deconstruct new products and services introduced by competitors, when employees move from one firm to another, and through formal and informal interactions between people with productive knowledge capital and people capable of identifying and comprehending the value of that knowledge. Formal and informal interactions occur among investors, researchers, board members, highly skilled workers, and across these categories"...Curl Hansen, 2002.

Agglomeration economies

The proponents of 'new economic geography' (Krugman, Fujita et al.) explain agglomeration economics as spatial concentration of firms. As firms concentrate in a particular region, the concentration or agglomeration itself generates externalities and firms derive benefit from these externalities. The externalities are two types– pecuniary and non pecuniary. Pecuniary externalities are generated from the interactions of the different economic agents (buyers and suppliers, i.e. firms and households). These externalities are basically related with employment, consumption of goods and services, i.e. related with demand and supply side of the economy. When the market is formed due to agglomeration of industries, the proximity between firms and households facilitate the matching process in terms of the skills labour market and the access to a larger variety of goods and services (Hansen, 1992). The proximity between firms generates inter-industry and intra-industry backward and forward linkages such as the access to a large variety of intermediate goods and business services, as well as intra-firms relations between front office and back office.

The non-pecuniary externalities are knowledge spillover or technological externalities. These externalities are generated from non-market interaction due to proximity. Non-pecuniary externalities are

thought to be an important factor in the creation of agglomerations. The non-pecuniary externalities are in such a character that they are difficult to measure.

Such concepts as informational and technological externalities between firms, or in general informational exchanges between agents explain why households and firms want to cluster together. The reason for clustering is the fact that these externalities between firms are assumed to decline rapidly with distance. Knowledge spillovers are channeled through face-to-face communication and casual diffusion of information between firms. These non-market mechanisms matter most for small-scale agglomerations. In the literature (Duranton, 1997; Fujita and Thisse, 1996), another distinction is made between "location economies" associated to firms of a same sector (intra-industry externalities) and "urbanization economies" associated to firms located in a same area (inter-industry externalities). Some authors have demonstrated the positive impact of a diversified sectoral environment on the results in terms of innovation (Audretsch and Feldman, 1999; Duranton and Puga, 2001).

Cumulative causation mechanism

Cumulative causation is logically said to be a divergent process (Kaldor & Young's theory of cumulative causation)[1] in which economic change is regarded as an endogenous phenomenon in the market system (Fujita, 2004). Embracing the idea of evolutionary economics, which strongly criticizes the mainstream equilibrium theory in the present day practical world, Kaldorian view of cumulative causation explains this divergent process in the light of increasing returns to scale, external economies and complementarities (especially in production and consumption). According to Kaldor, increasing returns

[1] Nanako Fujita, "Gunnar Myrdal's Theory of Cumulative Causation Revisited", Economic Research Center Discussion Paper, April 2004, No. 147

to scale prevails in the manufacturing sector, which brings dynamism in the manufacturing growth through 'learning by doing' and technological innovation. The growth in manufacturing sector intern leads to the growth in GDP.

The new economic geography considers that the concentration of economic activity in a location creates a favourable economic environment that supports further concentration. The interaction of demand, increasing returns and transport costs creates a cumulative causation process. In the presence of increasing returns and transport costs, firms tend to agglomerate in a single place and to choose a location with a large local demand. But the presence of more firms in a single place then creates an incentive for other firms to locate in the same place. The location decisions of firms and consumers/workers form a self-reinforcing process. The circular relationship, in which the location of demand determines the location of production, and vice-versa, can be a deeply conservative force.

Circular causation reinforces small differences in the production structure and can differentiate similar markets into large and small. Locations with large population will tend to specialize in the production of goods for which scale economies, product differentiation and transport costs are significant. With a large home market, producers of highly differentiated products can potentially obtain enough local demand to exploit economies of scale. Locations with small home markets will tend to specialize in standard products, or products for which transport cost or scale economies are insignificant. Ottaviano and Puga (1998) distinguish three kinds of cumulative mechanisms through which economic activities can agglomerate: (1) migration-induced demand linkages, (2) input-output cost and demand linkages, (3) endogenous growth, factor accumulation, and intertemporal linkages.

Role of Technological progress in Industrial Concentration

Technological dynamism is one of the important aspects of industrial growth. Before sixties industrial growth in developing countries was in inertia. The reason, clearly manifested in mainstream growth economics, is low rate of capital accumulation and which in turn causes the absence of technological progress. Since capital accumulation is key to technological progress, it is necessary to build healthy atmosphere for investment and that is possible only when agglomeration takes place. From the sheer inquisitiveness one may be interested to investigate why agglomeration gives better investment climate. The answer, spelt out by the industrial whiz kids, is positive externalities generated from the clustering of firms. The formation of this clustering requires coordination among firms, which basically reduces the potential risk. The industrial growth in most of the developing countries are plagued by coordination failure among the firms and which in tern causes partly low level of capital formation (due to high potential risk of investment)[1]. If the economy is falling short of capital but endowed with other essential resources, trade liberalization coupled with the expansion of transnational corporations brings forth the required capital as well as technology. But the interesting fact is that this external capital and technology are generally injected where clustering happens to exist.

[1] Carl Hansen (2002); LECG economics and Finance. In his paper he has cited the idea of coordination failure in regard to knowledge externalities. Industries may not exploit the benefit of large knowledge externalities due to coordination problem.The Azariadis and Drazen (1990) model produced multiple equilibria and coordination problems because of threshold (or critical mass) characteristics of knowledge externalities. Suppose these effects were incorporated into a model of specialisation patterns, like that in Fujita *et al.* Then it is easy to see that overall growth rates could be significantly affected by the allocation of investment. If high-growth industries require substantial critical mass to take-off, then a thin spread of capital across many industries leaves private returns to knowledge capital the same across all sectors (even though social returns are relatively higher for high-growth industries), leaving economies stuck in a low-growth equilibrium.

The role of technological change in production process is the heart of endogenous economic growth theory (for details see Grossman and Helpman,1991, Romar, 1994, Barro and Sala-i-Martin, 1995). As compared to neoclassical growth model, endogenous economic growth theory explains technological change as a result of profit motivated investments in knowledge creation by private economic agents and endogenise it in production function.

The novel formulation of technological knowledge in economic theory in Romer (1990) is the key in establishing this new and rapidly evolving field of economic growth theory. According to this formulation, technological knowledge is a non-rival, partially excludable good. Such formulation of technological knowledge as a key factor in the production function results in a departure from the constant returns to scale, perfectly competitive world of the neoclassical growth theory. In Solow formulation of production function if it assumed that technology is time invariant, capital does not depreciate and labour force does not grow, the continuous accumulation of capital after a certain limit will reduce the marginal productivity of capital.

The condition for a sustained per-capita income growth in the long run is that, resulting from continuous capital accumulation, the marginal product of capital should not decrease below a positive lower bound. Development in the state of technology is an essential force to offset the effect of capital accumulation on per capita income to decline in the neoclassical model of economic growth. Technological progress will increase the marginal product of capital which will lead to a higher per capita income. As a result, in steady state the rate of technical development equals the rate of capital accumulation.

I.1B Empirical Evidences in Indian Context

Most of the above clustering analysis has been done in the perspective of developed countries, but in the context of developing countries causes and pattern of agglomeration are somewhat different. In developed world the high metropolitan bias of agglomeration has been changing gradually over the period. Firms are inclined to locate in sub urban areas rather than in urban areas to take cost advantage. But in developing countries non-metropolitan areas are not so developed to attract industries. Therefore, the degree of urban bias is still high in developing countries. Industries in India, like other developing countries, are relatively concentrated in few historically developed pockets and this agglomeration process is still continuing. Immediately after Independence the Government of India took many bold initiatives in its developmental policies. Borrowing the socialist idea from Russian economy the Government of India gave priority to public sector investment in backward hinterlands in order to reduce socio economic inequality.

But even after five decades of planned development industrial activities in India have not dispersed much across various regions of the country. Considering the three time periods (1961, 1971 and 1981) Jayasree De (1993) has shown that in the initial stages of industrialization, industries tended to agglomerate in the economically and geographically advantageous areas of West Bengal, Maharashtra, Gujarat and Tamil Nadu.

Many literatures of the eighties have shown that the regional disparity in industrial growth has declined slowly. Deepak Gupta (1985) has shown that there has been a declining trend in inter-state industrial disparities by comparing the coefficients of variations of four indicators value of output, value added by manufacture, persons

employed and total productive capital employed across the states from 1962 to 1980-81[1].

D.V.S. Sastry & Ujwala R. Kelkar (1989) have reached the same result. They have pointed out that the decline in inequality was on account of two factors, viz., 'within inequality' as well as 'between regions'[2].

A. Anuradha and AVVSK Rao (1995) have claimed that the inter-state disparity in relative terms, tended to decline during the period 1971-86.

Several studies have tried to analyze the impact of India's economic reforms initiated in 1991 on the productive efficiency of India's manufacturing sector (Veeramani and Goldar 2004, Jayan Jose Thomas 2003, Rajan and Sen 2002, Forbes, 2001, Joshi and Little 1998, Srinivasan 1996).

Much literature on Indian industry basically deals with the issue of how total factor productivity, technological progress and economies of scale in manufacturing change over time and how trade liberalization impacts upon them. These literatures have only shown an all India picture. There are few works written from a geographical standpoint, being limited to descriptive approaches to the spatial distribution of industry in specific states or regions. Non-spatial analysis of industrial productivity and growth are found in the writings of Shukla [1984]; Ahluwalia [1991]; Becker, Williamson and

[1] R.B.I Occasional Papers, Vol.6, No.1, June 1985; pp.54 -68. It is found in his study that Andhra Pradesh, Gujarat, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Orissa, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh have shown more than six times increase in the per capita value added in 1980-81 over 1962 and even the calculated coefficients of variations of four indicators value of output, value added by manufacture, persons employed and total productive capital have fallen since 1962.

[2] "However, the contribution of 'between inequality' to total inequality has been increasing significantly implying thereby that although the disparities within the regions are declining, imbalance do exist between the regions"..... D.V.S. Sastry & Ujwala R. Kelkar (1989), "Regional Disparities in Industrial Development".....R.B.I Occasional Papers, vol. 8, No. 3, pp. 265-268.

Mills [1992]; Das and Barua [1996]; Lall S.V and S. Chakraborty; Goldar and others. J. J. Thomas in his paper has shown regional disparities in India's industrial growth using the theoretical framework of economies of scale, technical progress and cumulative growth differences. He has found that among the Indian states, some, particularly the western states, have achieved rapid output growth and consequently, realized economies of scale; technical progress too has been rapid in these States and thus, cumulative cycle of regional differences arises in India's industrial growth. Goldar and Veeramani in their paper have analyzed the influence of investment climate (IC) on total factor productivity (TFP) in the registered manufacturing sector across the major Indian states. Their study establishes the critical importance of labour market flexibility, access to finance, availability of infrastructure etc for improving industrial productivity and overall growth. It is clear from their paper that the polarization of industrial growth occurs in the states, which have market friendly investment climate. Goldar and Veeramani (2004) have shown the regional disparity of industrial growth by estimating multilateral TFP indices for the whole registered manufacturing sector in all major states for the period of 1980-2000.

From the above literature review, it is found that the idea of agglomeration economics has been applied widely to explain clustering of industries in metropolitans or its shift to suburban areas. The role of economies of scale, technological Knowledge spill over, transport cost and local demand are the essential factors which explain the agglomeration of industries in a particular location. This study attempts to capture the returns to scale, technological progress (regress) and multifactor productivity growth across the states as well as across the industries in a broad framework and examine the stylized fact: to what extent the high rate of growth of the above

variables explain the cumulative causation and hence agglomeration of industries.

1.2 Objectives

I. To measure and analyze the trend of spatial concentration in Indian manufacturing across the 15 major states in pre and post liberalization period.

II. This paper seeks to examine the fact whether or not agglomerative forces are self- reinforcing in case of India.

III. To analyze whether or not economies of scale, multifactor productivity are predominant factor for industrial concentration.

Hypotheses:

I. The spatial concentration in manufacturing is slowly reducing in the post-liberalization period.

II. The concentration in industry is a perpetual phenomenon in rich states.

Economies of scale and technological progress are the important but not the predominant factor for industrial concentration.

I.3 Plan of Study

The chapter-II gives a broad picture of regional pattern of Indian manufacturing. The inter-state (states are taken as units of region) variation in returns to scale, technological progress, technical efficiency and multifactor productivity growth are analyzed in details in chapter-III. The chapter-IV gives conclusion.

I.4 Data & Variables

In order to examine the issues of interest data are drawn from the Annual Survey of Industries (ASI) published by the CSO. The ASI data covers all factories employing 10 or more workers and using power, and those employing 20 or more workers but not using power on any day of the preceding 12 months, which are required to be registered under sections 2m(i) and 2m(ii) of the Factories Act 1948. To show the impact of economic reforms on industrial growth the two phase of time period [pre-liberalization (1980-81 to 1990-91) and post liberalization (1991-92 to 2000-01)] will be considered. From 1980-81 to 1997-98 I have used a 'Data Base on the Industrial Sector in India', EPW Research Foundation, Mumbai, 2002. For the subsequent years the data has been taken from the respective volumes of the ASI itself. Only the registered segment of the India's manufacturing sector is of prime focus in this study. The entire manufacturing sector is analyzed at the NIC-1987: 2 digit level classification. The major 15 industry groups are chosen. The National Industrial Classification has been changed from 1998. The data given in summary results are in NIC-98; 3 and 4 digit level. To make the data (from 1998 onwards) compatible with NIC-87 the CSO -prepared concordance list with slight modification[1] has been followed. The industry groups with concordance are shown in Table-1 (see appendix-II). From 1998-99 to 2000-01 the data of Bihar, Madhya Pradesh and Uttar Pradesh have been clubbled with Jharkhand, Chattrishgarh and Uttaranchal.

The variables chosen here are as follows: number of factories, Book value of fixed capital, number of workers, number of employees, wages to workers (Rs. Lakh), total emoluments (Rs. Lakh), value of output (Rs. Lakh), gross value added (Rs. Lakh), net value added (Rs. Lakh), value of profit (Rs. Lakh), depreciation (Rs. Lakh) and outstanding loans (Rs. Lakh). deflate gross value added , gross output, fixed capital, rent paid, interest paid, profit, wage , total

[1] NIC-34 is clubbed with NIC-35 & 36.

emoluments , gross fixed capital formation. While estimating production function, gross value added, gross outputs are deflated by wholesale price index of each industry category respectively. Fixed capital is deflated by wholesale price index for machine and machine tools. The implicit GDP deflator is used to deflate profit, wage and total emoluments.

I.5 Methodology

In order for distinguishing the states between industrially developed and less developed the method of principal component analysis is adopted. For detailed analysis at the disaggregate level, states' shares of the number of factories, gross value added (GVA), number of employees and fixed capital are calculated. Annual compound growth rates of the above said variables in the 15 major states are calculated for pre (1980-81 to 1990-91) and post liberalization (1991-92 to 2000-01) period.

A recent relevant approach (found in McCann (2001), Devereux et al (1999), and Overman et al (2001) to measure the concentration and specialization of industries has been undertaken.

A simple and commonly used measure of regional industrial concentration for industry i in region r is given by the location quotient:

$$LQ_{ir} = (E_{ir} / E_r) / (E_{in} / E_n)$$

Where E_{ir} = employment of ith industry in region r

E_r = employment in region r,

E_{in} = employment of ith industry in country n

E_n = employment in country n.

The LQ table basically shows the degree of representation of an industry in a particular state and makes comparison with that of the other states. A value of 1.0 indicates that the industry forms the same proportions of total jobs in a particular state as it does in India; while a value greater than 1 means the proportion of employment in that industry in that state is higher than that in the nation.

The measure of Industrial specialization is obtained by using Relative Diversity Index (proposed by Duranton and Puga,2000).

$$RDI_r = 1 / MOD [(E_{ir} / E_r) - (E_{in} / E_n)]$$

The RDI is the inverse of the summed differences between the regional and the national industry shares. As the value of RDI increases, the regional distribution of employment approaches that of the national economy.

To describe the spatial distribution of national industries Hirschman-Herfindahl index is frequently used. This takes the form of

$$HHI_i = \sum^{15}_{i=1} [(E_{ir} / E_n) - (E_r / E_n)]^2$$

If the value of H-H indexes approaches to zero, it implies that the industries are evenly distributed across the region. The industry is highly concentrated if the value of index is close to one.

In this study the role of transportation cost and local demand is not shown empirically, but is explained theoretically.

The returns to scale, technological progress, and technical efficiency are obtained by estimating the ratio form of Cobb-Douglas

stochastic frontier production function[1]. The advantage of using stochastic frontier production function is that it can estimate technical efficiency along with technological progress and returns to scale[2]. Here Battese and Coelli's approach has been adopted to estimate time varying technical efficiency. The Cobb-Douglas stochastic frontier production function is more compatible with the Indian manufacturing data structure[3]. Here ratio form of Cobb-Douglas stochastic frontier production function is employed. The production function is given below.

$$\ln (Y_{it} / L_{it}) = a + \beta \ln (K_{it} / L_{it}) + (\alpha + \beta - 1) \ln L_{it} + \lambda T + U_{it} - V_{it} \quad .....(1)$$

Y refers to gross value added, L to labour (number of employees), K to gross fixed capital, and t refers to time.

t = time period 1980-81 to 2000-01

i = 13 major 2 digit industry

The 'returns to scale' is obtained by estimating the value of $(\alpha + \beta - 1)$. If $\alpha + \beta - 1 > 0$ it implies increasing returns to scale; $\alpha + \beta - 1 = 0$, constant returns to scale and $\alpha + \beta - 1 < 0$, decreasing returns to scale. Technological progress is assumed to be Hicks-Neutral.

$$U_{it} = \{\exp[-\eta(t-T)]\}Ui \quad \text{and} \quad V \sim N(0, \sigma_v^2)$$

Here ln(k) and ln(l) are natural logarithm of capital and labour. U_{it} measures inefficiency. In which the term η is decay parameter to be estimated; U_i is assumed to follow $N(\mu, \sigma_u^2)$ distribution truncated at zero. V_{it} is identically and independently distributed and often referred to as idiosyncratic error (which measures random shocks).

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[1] The reasons for applying stochastic frontier production function of Cobb-Douglas type are discussed in details in section-III.1 in Chapter-III.

[2] Production functions other than than stochastic frontier specification are unable to calculate the technical efficiency.

[3] Arup Mitra(1989)

The technical efficiency (TE) of industry 'i' at 't' point of time is obtained from the following form: $TE_{it} = \exp(-U_{it})$; which equals 1 when the industry attains perfect efficiency and equal to zero for complete inefficiency.

The parameterization of Battese and Corra (1977) replace σ_V^2 and σ_U^2 with $\sigma^2=\sigma_V^2+\sigma_U^2$ and $\gamma=\sigma_U^2/(\sigma_V^2+\sigma_U^2)$. This is done with the calculation of the maximum likelihood estimates in mind. The parameter, γ, must lie between 0 and 1.

The production function has been calculated for 13 major industries and for 15 major states. To find the returns to scale of each state, a panel regression for each state across 13 major industries over 21 years (1980-81 to 2000-01) has been done. Similarly the return to scale for each industry has obtained by estimating panel regression for each industry across the 15 major states over 21 years (1980-81 to 2000-01). These 13 industries are only registered manufacturing industries. In the previous chapter the metal & machineries (34+35+36) and miscellaneous (38) have been taken separately, but here to check the efficiency level of all the machinery sector, the miscellaneous industry has been clubbed with metal & machineries. Due to large number of missing data the beverage tobacco industry (22) is clubbed with food and food products (20-21); textile wears & apparel (26) is merged with textile & jute industry (23+24+25); leather industries (29) is not considered for Assam. For Kerala and Orissa, leather (29) industry has been clubbed with wood (27), paper (28) industry and the three industries have been considered as one unit (27+28+29). In industry wise panel data analysis, for a particular industry, the states, which have large number of missing data, have been deleted from the panel data set.

Here, Stata 8.1 version has been used to estimate the stochastic frontier production function for panel data. In this version of Stata, Battese-Coelli (1992) parameterization of time effects (time-

varying decay model) is followed. Each of the linear restrictions of the production function has been tested by Likelihood ratio test[1].

Multi factor productivity (MFP) growth provides a more comprehensive measure of efficiency in production. It captures the combined effects of changes in technological progress, improvements in organizational structure, management practices, worker management, and worker-management relations as well as the diffusion of technology across firms other than Labour and capital productivity.

The objective of MFP measurement is to isolate the extent to which efficiency and technology influence manufacturing growth. Under the assumption of constant returns to scale and competitive markets for two factor inputs (labour & capital) a translog index of multifactor productivity is estimated. It has the advantage that it does not make rigid assumptions about the elasticity of substitution and it does not assume technological progress to be Hicks-neutral as well.

This is obtained from the following relationship:

$$MFP_{t-1,\,t} = \ln [Y(t)/Y(t-1)] - S_K \ln [K(t)/K(t-1)] - S_L \ln [L(t)/L(t-1)]$$

Where,

Y, K, L are output, capital and labour respectively. S_K and S_L are average income share of capital and labour.

[1] Likelihood ratio test is elaborately discussed in appendix-I

Chapter II

Regional Pattern of Indian Industries

The spatial inequality in industrial growth is a common phenomenon in most of the developing countries and India is no exception where industrial development has been highly lop-sided since fifty years of Independence (passing through ten Five Year Plans). This persistent nature of inequality is partly an unavoidable result of 'historical accident' occurred in postcolonial period. When the tide of 'industrial revolution', occurred in Britain in 19th century, inundated the whole Europe, the colonial country like India had also been affected by it through the initiation of industrialization. But the industrial policies taken by the British coupled with indigenous movement for industrialization were very much shortsighted. The merchant colonial rulers were reluctant to make a strong industrial base all over the country; their objective was to exploit the easily accessible natural resource, as a result of which the industrialization started in few mineral rich regions of the hinter lands and the port towns. The factories were established to reduce transport costs of raw materials and to access the advantage of sea trade. This resulted in historical concentration of industries in those regions. This is supported by the fact that in 1951, more than half of the total paid up capital and total manufacturing output was confined to the two cities alone (Bombay and Ahmadabad). This caused high inter-regional disparity in industrial development and the trend of this wide disparity among the states has become a pre-dominant feature in the regional pattern of Indian economy even after fifty years of independence. After the inception of Five Year Plans, the major goal of

the industrial policy was somewhat towards the fulfillment of attaining high growth, while the objective of spatial diffusion of industrialization got less attention. Due to poor infrastructure and scarcity of skilled labour private agents were reluctant to establish industries in backward hinterlands. Colonial legacy still persists.

This chapter mainly concentrates on the analysis of vertical and horizontal inter-dependencies of growth process in registered manufacturing during 6th, 7th, 8th and 9th Five Years Plans.

In section-II.1A, inter-state disparity of industrial activities has been analyzed with the help of principal component analysis and the growth differences with respect to gross value added, employment, factories, and gross fixed capital formation have been discussed. Section –II.2 deals with the different measures of specialization and concentration of Indian manufacturing industries across the major states and analyzes the trends of concentration in both pre and post liberalization. Section-II.3 gives conclusion.

II.1A Inter-State Disparity in Industrial Activities:

Principal Component Analysis

The growing importance of the regional imbalance of industrial growth had made the researchers to feel the necessity of raking the Indian states according industrial activities during the decade of 70s. The most common method to identify the industrially developed and less developed states was ranking states on the basis of employment and value added[1].

[1] The regions have been divided into two groups----the industrially more developed and industrially less developed. These two groups have been made on the basis of the employment and value added criterion adopted by the Pande Working group and by the Sivaraman Committee. The Pande Working Group has identified the developed state on the basis of employment criterion. They suggested the number of workers engaged in registered factories per lakh population in 1988 as one of the indicators.

This chapter seeks to rank the states according to industrial development using principal component analysis (PCA) where the states are ranked on the basis employees per lakh population, factories per lakh population, gross value added per worker, gross value added per unit of capital, real wage rate and share of registered manufacturing in net state domestic product (NSDP).

The results of principal component analysis for both the time point 1980-81 and 2000-01 are found to have great similarities. Factor analysis of the six indicators in the early eighties gives two factors, which explain 32 per cent and 15 per cent (Table-1.1). The first factor has high positive correlations with variables as employees per lakh population, share of registered manufacturing in net state domestic product (NSDP), factories per lakh population, and gross output per unit of capital. The first factor, thus, represents the 'concentration of industrial activities'[1]. The second factor, on the other hand, is positively and highly correlated with labour productivity and wage rate. Thus, it represents structural ratios of industries. In 2000-01, the result of factor analysis shows that the first factor explains 31% while the second factor explains 16% (Table-1.2). Here also the first factor is highly and positively correlated with factories per lakh population, employees per lakh population, share of registered manufacturing in net state domestic product (NSDP) and gross output

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In that year, factory employment per lakh of the population for all India was 934. The states, which were equal to that or above the level, were considered to be industrially developed states. According to this criterion Gujarat, Kerala, Maharashtra, Tamil Nadu and West Bengal were called developed states. Others were below the critical level.

The Sivaraman Committee categorized states on the basis of the per capita value added in manufacturing in 1975-76. In that year, the all India figure was Rs. 159.7. States with that or higher values were called developed. Gujarat, Maharashtra, Tamil Nadu, West Bengal and Haryana, Karnataka and Punjab satisfied the criterion. Others did not.

[1] Mona Khare and H.S. Yadav, "Regional Pattern of Industrial Development in India", IJRS Vol. XXXIII,No.2, 2001

per unit of capital and the second factor has high and positive correlation with rest of the factor. It can be conclude from the factor analysis that the agglomerative feature of industrial activities doesn't have change in the liberalization period.

With the help of factor scores (shown in Table-1 in Appendix-II) calculated from factor analysis the major fifteen sates can be ranked according to concentration of industrial activities.

Table:-1.1 Results of Principal Component Analysis (1980-81)

1980-81			Rotated Factor Loadings	
Factor	Eigenvalue	Variable	Factor-1	Factor-2
1	3.21452	Real wage rate	-0.18076	0.8856
2	1.53408	GVA per unit of labour	0.16983	0.80478
3	0.76428	GVA per unit of capital	0.83586	-0.27502
4	0.36747	No. of factories per lakh population	0.8416	-0.0653
5	0.08738	No. of employees per lakh population	0.96244	-0.03849
6	0.03227	Share of reg. manufacturing in NSDP	0.89572	0.1954

Table:-1.2 Results of Principal Component Analysis (2000-01)

2000-01			Rotated Factor Loadings	
Factor	Eigenvalue	Variable	Factor-1	Factor-2
1	3.18078	Real wage rate	-0.40263	0.71594
2	1.66826	GVA per unit of labour	0.16584	0.90012
3	0.60047	GVA per unit of capital	0.67928	-0.29658
4	0.42217	No. of factories per lakh population	0.96811	-0.03197
5	0.10654	No. of employees per lakh population	0.96268	-0.06101
6	0.02178	Share of reg. manufacturing in NSDP	0.81578	0.50302

The rankings of 15 major states in 1980-81 and 2000-01 have been projected in Table-1.3. In 1980-81, the top 5 states are Maharashtra, Gujarat, Tamil Nadu, Punjab and West Bengal. The total share of gross state domestic product of registered

manufacturing sector of these top five states in national aggregate is 58.87 %. In 2000-01 (Table-2 in Appendix-II), the ranking has changed. Tamil Nadu, Punjab, Haryana, Gujarat and Maharashtra are the top 5 states. West Bengal has fallen to the eleventh position. The share of registered manufacturing of West Bengal in national aggregate has fallen from 9.13% to 6.19%. The rapid decline in industrial performance in West Bengal is because of closing down of a large number of industries and poor performances of large-scale public sectors[1]. Another important reason is that electricity industry (NIC-40) is not included in 3-digit classification of registered manufacturing since 1998-99 onwards[2]. This industry has major share of invested capital (35.02% in 1997-98) in West Bengal and its contribution to total gross value added of manufacturing is 39.80 %.

Table-1.3: Ranking of 15 Major States by Principal Component Analysis

State	1980-81	2000-01
Mahrashtra	1	5
Gujarat	2	4
Tamil Nadu	3	1
Punjub	4	2
West Bengal	5	11
Haryana	6	3
Karnataka	7	6
Andhra Pradesh	8	7
Kerala	9	8
Assam	10	12
Uttar Pradesh	11	13
Rajasthan	12	10
Madhya Pradesh	13	9
Orissa	14	14
Bihar	15	15

[1] During the 80s growth of number of factories in almost all industries experienced negative growth rate. In the post 90s, only food products (20-21), beverage tobacco (29), textile wear & apparel (26), leather (29), petrochemical (31) and other miscellaneous industry (38) have improved so much.

[2] To make compatible with dataset from 1998-99 to 2000-01 this industry is not considered in this study

Tamil Nadu has improved a lot. Among the industrially backward states Madhya Pradesh, Rajasthan and Kerala have lifted up slightly. Uttar Pradesh, Assam and Bihar there is no sign for improvement.

The secondary sector plays a significant role with the progress of economy. The contribution of registered manufacturing in net state domestic product is taken into account to explain the importance of secondary sector.

Table-1.4:- Share of Registered Manufacturing in NSDP

STATE	1980-81	2000-01
Maharashtra	19.13	12.44
Gujarat	15.11	13.15
Tamil Nadu	14.95	12.88
West Bengal	12.16	6.50
Haryana	10.05	12.41
Karnataka	9.06	6.41
Kerala	7.59	6.18
Madhya Pradesh	6.86	10.03
Punjab	5.91	10.11
Andhra Pradesh	5.85	6.80
Rajasthan	4.83	6.58
Orissa	4.74	6.18
Uttar Pradesh	4.34	6.19
Assam	4.16	6.18
Bihar	3.45	6.88

Table-1.4 indicates that Maharashtra, Gujarat, Tamil Nadu, West Bengal and Haryana were the top five states in 1980-81 according to contribution of registered manufacturing in NSDP(shown in Figure-1.1). This contribution was significantly lower in Bihar, Assam, Uttar Pradesh, Orissa, Rajasthan, Andhra Pradesh and Punjab. In 2000-01 the share of registered manufacturing in NSDP of top five industrially advanced states except Haryana had fallen down, while the all the industrially less developed states except Karnataka and Kerala this share improved a lot (shown in Figure-1.2).

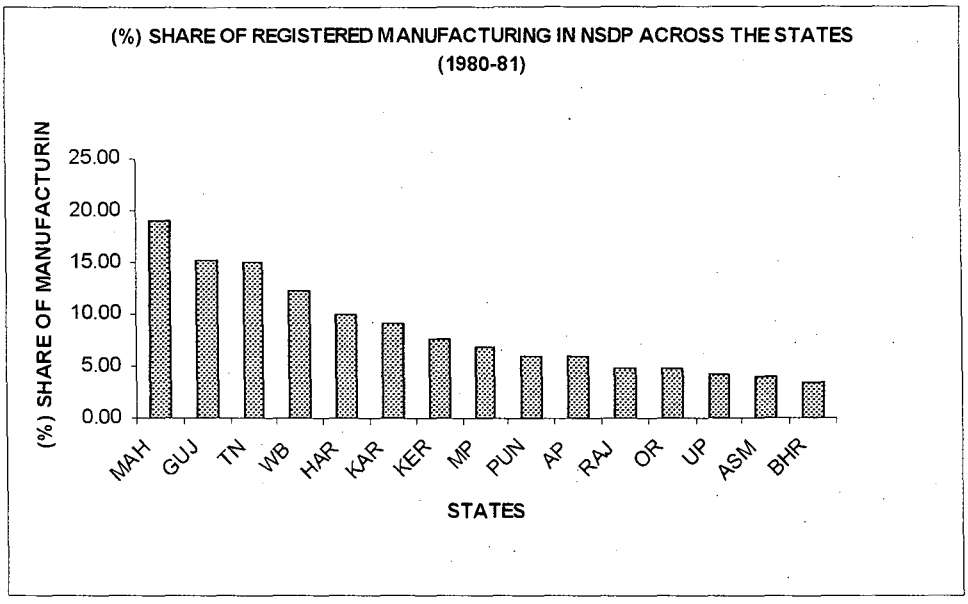

Figure 1.1

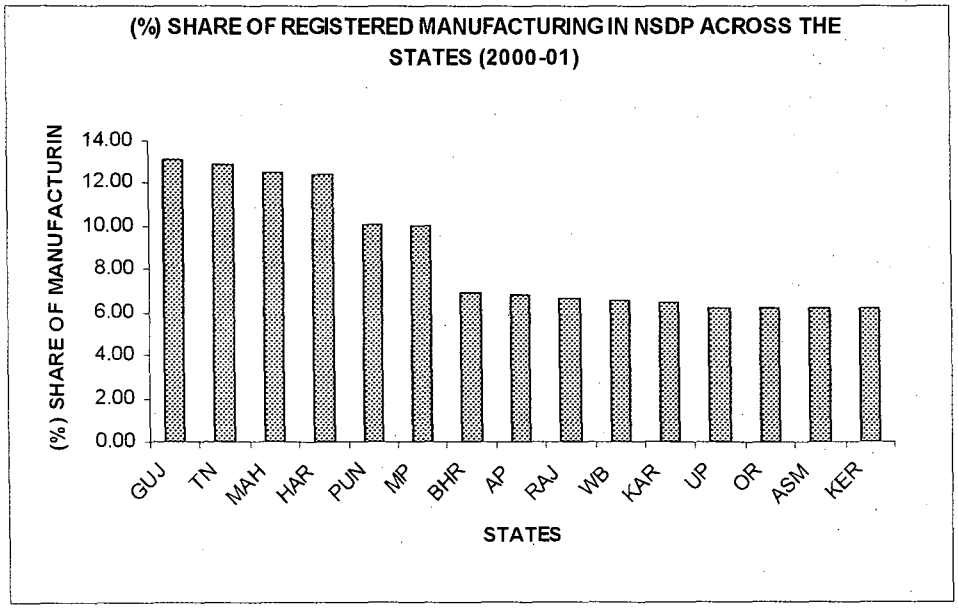

Figure-1.2

The declining share of manufacturing in developed states during the era of liberalization may be due to the rapid growth of service sector, while the less developed states with increasing share of manufacturing are in 'take-off stage'[1].

Both the principal component analysis and the analysis of share of registered manufacturing conclude that the initially less developed states like Madhya Pradesh and Rajasthan has got the impetus in industrialization in the post 90s.

II.1B Inter-State Variation in Manufacturing's Share:

A comparative analysis of states' share of the number of factories, fixed capital, employment, gross value added in the national level helps one to get a clear picture of regional disparity in industrial activities. Table-1.5 reveals that in 1980-81 Maharashtra had highest percentage share (16.63%) of the number of factories to the national aggregate among the 15 major states, followed by Gujarat (12.96%), Andhra Pradesh (11.98%), Tamil Nadu (10.9%), Uttar Pradesh (7.93 %) and West Bengal (7.25 %). Where as Orissa and Assam had very small shares (1.79% and 1.84 % respectively) to the national aggregate and rest of the other states' shares were between 2% to 6%. This situation has been quite stable over the period. In 1990-91 Andhra Pradesh had the highest percentage share (14.94%) and in 2000-01, Tamil Nadu was in the first position. In 2000-01 Assam had the least share (1.20%). An interesting result is found in the case of fixed capital. In 1980-81 Bihar had the highest share (15.59 %) of fixed capital in comparison to other states. But in 1990-91 and in 2000-01 this share has declined rapidly to 7.59% and 3.99 % respectively. Table-1.5 also indicates that the states like Gujarat, Maharashtra, Tamil Nadu and Andhra Pradesh, which are historically industrially developed, have attracted more capital. In Maharashtra the share of

[1] Rostow's stage theory

fixed capital was 14.94% in 1981-82. That increased to 16.94 % and 17.15% in 1991-92 and 2000-01 respectively. Assam had again the least share (1.56% in 1981-82) and this share declined to 1.09% in 2000-01.Kerala followed the same trend (declined from 3.11% in 1981-82 to 1.58% in 2000-01). The share of fixed capital in Gujarat has increased significantly over the period. It was 9.01% in 1981-82 and 18.29% in 2000-01. Karnataka and Uttar Pradesh showed increasing trend. The share of Orissa increased from 2.61% in 1981-82 to 5.31% in 1991-92 but rapidly declined to 3.01% in 2000-01. In case of Haryana, Punjab, Rajasthan and West Bengal this change is very modest.

Table:-1.5 Share of Factory, Fixed Capital, Employment and Gross Value Added in Indian Manufacturing

STATE	Factory (%)	Fixed Capital (%)	Employment (%)	GVA (%)
Andhra Pradesh				
1981-82	11.98	7.84	9.89	7.3
1991-92	14.94	11.87	11.28	6.04
2000-01	11.07	6.86	11.69	6.64
Assam				
1981-82	1.84	1.56	1.64	1.75
1991-92	1.52	1.22	1.72	1.44
2000-01	1.2	1.09	1.5	0.74
Bihar				
1981-82	4.95	15.59	4.97	7.94
1991-92	3.4	7.59	4.56	6.66
2000-01	2.54	3.99	3.15	3.19
Gujarat				
1981-82	12.96	9.01	9.52	9.24
1991-92	10.38	9.84	9.05	9.2
2000-01	11.28	18.29	9.73	13.47
Haryana				
1981-82	2.65	2.55	2.61	3.26
1991-92	2.9	2.92	3.23	3.85
2000-01	3.64	3.07	3.95	3.51
Karnataka				
1981-82	5.67	4.34	4.76	4.07
1991-92	5.47	4.39	5.51	6.45
2000-01	5.61	6.86	6.21	6.22
Kerala				
1981-82	3.09	3.11	3.97	3.38
1991-92	3.46	1.99	3.61	2.97

2000-01	4.06	1.58	4.18	2.22
Madhya Pradesh				
1981-82	3.46	8.02	4.09	5.77
1991-92	3.89	5.5	4.49	5.23
2000-01	3.54	5.69	4.43	6.62
Maharashtra				
1981-82	16.63	14.94	17.99	23.21
1991-92	14.26	16.94	15.49	20.6
2000-01	14.96	17.15	15.26	21.88
Orissa				
1981-82	1.79	2.61	1.56	1.51
1991-92	1.46	5.31	1.83	2.46
2000-01	1.39	3.01	1.71	1.9
Punjab				
1981-82	5.93	3.13	3.17	3.14
1991-92	5.6	3.14	3.98	4.07
2000-01	5.89	2.29	4.74	3.18
Rajasthan				
1981-82	2.97	3.07	2.26	2.61
1991-92	3.45	3.89	2.85	3.13
2000-01	4.14	3.89	3.04	4.22
Tamil Nadu				
1981-82	10.9	9.8	10.88	12.01
1991-92	14.5	8.56	12.98	11.76
2000-01	16.88	10.15	15.04	12.52
Uttar Pradesh				
1981-82	7.93	7.61	9.76	6.1
1991-92	9.47	9.44	9.49	9.8
2000-01	8.69	9.76	7.77	7.65
West Bengal				
1981-82	7.25	6.83	12.93	8.72
1991-92	5.3	7.4	9.92	6.34
2000-01	5.1	6.34	7.6	6.05

The reason behind the highest percentage of share of fixed capital in Bihar was that in early 80s a sudden spurt in investment in public sector and heavy industries (iron& steel) occurred to strengthen the industrial base of the economy. But over the period this share declined due to decrease in the public sector investment. The industrial policies in late 80s onward encouraged more private investment rather than public investment and especially in the post liberalization period the public sector investment has fallen rapidly.

This is also true for other less developed states where public sectors are more concentrated than private.

In case of employment share the states like Maharashtra (15.26% in 2000-01), Tamil Nadu (15.04% in 2000-01) and Andhra Pradesh (11.69% in 2000-01) have the major shares to the national aggregate. Assam has the smallest share (1.50 % in 2000-01). This share has been increased in Andhra Pradesh, Gujarat, Haryana, Karnataka, Kerala, Punjab, Rajasthan and Tamil Nadu. The highest fall in employment share is recorded in West Bengal from 12.93% (1980-81) to 7.6% (2000-01).

The same picture has been observed in case of share of gross value added of each state in national aggregate. The highest share is again found in Maharashtra (21.88%), followed by Gujarat (13.47%) and Tamil Nadu (12.52%). This share has increased from 180-81 to 2000-01 it has increased only in Gujarat, Madhya Pradesh, Rajasthan, Tamil Nadu and Uttar Pradesh.

In order to show the relation between fixed capital and employment across the states the rank correlation has been calculated between the share of fixed capital and share of employment for the periods of 1981-82, 1991-92 and 2000-01 respectively. The estimated rank correlation coefficient is found to have significantly high and increasing trend over time (Table-1.6). This high rank correlation simply explains that the states with higher share of fixed capital are associated with higher level of employment. Similarly, the rank correlations between the shares of gross value added and the share of employment (shown in Table-1.6) has been calculated to show the relation between them across the states. The result indicates that there is a high degree of correlation between share of value added and that of employment, but it has declined over the years. Though the high rank correlation implies the states which have higher share

of employment in the national aggregate produce high level of value added, resulting high spatial inequality, but its declining tendency indicates that the other states are also trying to increase the scope of industrialization.

Table 1.6: Rank Correlations

YEAR	Rank correlation share of fixed capital and share of employment	Rank correlation share of GVA and share of employment
1980-81	0.796	0.946
1990-91	0.846	0.896
2000-01	0.847	0.882

#Rank correlation coefficients are significant at 5% level.

From the above analysis it ca be said that although, Maharashtra, Gujarat and Tamil Nadu are still occupying the major shares of factories, fixed capital, employment and gross value added, the disparity among the states are getting reduced slowly due to the improvement of shares of above said variables in newly growing states like Andhra Pradesh, Madhya Pradesh, Rajasthan.

II.1C Inter-State Disparity in Manufacturing Growth

The annual compound growth of the number of factories, employment, fixed capital, gross value added, real wage rate, Labour productivity have been calculated for the time period of 1980-81 to 1990-91 and 1991-92 to 2000-01 respectively. During the eighties growth rates of employment (Table-1.7a) in registered manufacturing sector across the states had shown a pale picture. The growth rates of employment observed in the industrially developed states like Gujarat (-0.9 %) and Maharashtra (-1.09 %) had turned negative. Punjab, Haryana and Tamil Nadu had positive but very low rate of growth of employment. Among the major 15 states West Bengal had the lowest

growth rate (-3.35 %). In that grave situation Rajasthan (2.63 %), Assam, Uttar Pradesh, Madhya Pradesh and Orissa enjoyed positive growth rate of employment. The interesting feature of this period was

Table 1.7a: Growth of Employment

States	1980-85	1985-90	1992-97	1997-2001	1981-91	1991-01
Andhra Pradesh	0.19	4.89	3.36	-2.91	0.10	-0.97
Assam	-2.23	1.56	3.44	-4.95	-0.30	-3.12
Bihar	-1.96	1.47	-2.23	-3.20	-0.90	1.92
Gujarat	0.52	1.00	4.94	-3.33	2.04	3.80
Haryana	4.76	0.62	7.62	-0.30	0.80	3.32
Karnataka	0.31	3.63	7.87	-7.56	-1.09	1.33
Kerala	-3.98	2.24	1.67	-1.31	1.83	0.06
Madhya Pradesh	3.90	3.92	3.26	-5.08	-1.09	1.08
Maharashtra	-2.16	0.59	4.24	-7.44	1.15	-0.14
Orissa	6.14	1.87	3.12	-4.00	4.44	1.56
Punjab	3.74	5.70	3.66	2.89	2.63	1.68
Rajasthan	2.00	3.21	6.32	-1.93	1.81	2.02
Tamil Naru	2.39	2.17	4.73	-2.01	0.23	-1.47
Uttar Pradesh	-1.30	4.37	1.28	-5.96	-3.35	-1.68
West Bengal	-1.34	-1.75	1.48	-10.19	0.12	1.00
All India	-0.13	2.10	3.71	-4.32	1.43	0.82

that the growth rate of gross value added (Table-1.7b) was significantly high. Both the developed and less developed states enjoyed high growth of gross value added. "The 1980s is often called as the decade of 'jobless growth' in Indian manufacturing because the revival in output growth during this period was not accompanied by adequate generation of employment" (J.J. Thomas, 1998). Several studies have been done to capture the cause of this incidence. After the introduction of job security regulations in the late 1970s, the employers were enforced to adopt capital-intensive production techniques (Fallon and Lucas 1993 cited in Goldar 2000) This view is supported by the high growth rate of capital intensity measured by capital labour ratio during this period, shown in Table-1.7c. If the growth rates are analyzed from the sixth Five Year Plans onwards, it gives a good empirical support to the causes of high growth in gross

value added, fixed capital (Table-1.7d), capital intensity and lower growth in employment. Table-1.7a shows that during the 6th Five Year Plan the growth rate of employment is very low even negative in many developed states, while states like Orissa, Madhya Pradesh and

Table 1.7b Growth of Gross Value Added

States	1980-85	1985-90	1992-97	1997-2001	1981-91	1991-01
Andhra Pradesh	14.64	0.21	13.31	-7.33	1.94	0.12
Assam	6.41	4.41	-0.20	-6.26	6.81	4.50
Bihar	10.61	**11.19**	7.82	-21.28	7.45	10.19
Gujarat	10.16	7.51	14.44	8.41	7.97	7.58
Haryana	4.78	5.20	13.92	2.70	8.89	8.69
Karnataka	11.21	16.62	15.31	-1.59	3.83	5.21
Kerala	4.16	**13.32**	8.66	1.63	8.18	9.40
Madhya Pradesh	3.71	**17.90**	13.61	-2.62	7.12	6.96
Maharashtra	7.68	7.28	9.92	-0.003	12.42	4.54
Orissa	3.15	**24.23**	3.36	11.22	10.33	5.86
Punjab	10.37	15.50	12.10	-0.43	9.36	11.33
Rajasthan	10.99	**12.21**	16.26	12.12	6.26	6.51
Tamil Naru	10.68	7.22	12.50	5.98	11.54	4.90
Uttar Pradesh	10.69	**15.57**	13.63	-3.93	0.45	6.41
West Bengal	0.94	-2.50	7.61	2.34	7.60	7.78
All India	8.83	9.49	12.26	1.08	4.00	8.15

Rajasthan are in better position. But in case of gross value added and fixed capital both developed as well as less developed states has shown respectable performance. One of the important reasons is the industrial policy of 1980 adopted by the then Congress Government[1]. During the 6th and 7th Five Year Plans the percentage shares of gross domestic capital formation both in public sector and private sector increased from 3.5% (1st Plan) to 11.1 (6th Plan) and from 7.2 % (1st Plan) to 12.1 %(7th Plan) respectively shown in Table-1.7e. All these

[1] The main objective of the 1980 industrial policy was to regularize the excess capacity installed over and above the licensed capacity. Government also proposed to allow the privilege of automatic expansion of capacity to all industries. This automatic increase was granted to units wanting to achieve economies of scale and a 49 per cent rise in capacity due to modernization was allowed. The threshold asset limit for companies under MRTP Act was raised from Rs. 20 crores to Rs. 100 crores. The Government also decided to launch a drive to revive the efficiency of the public sector.

industrially favourable policies brought a sea change in industrial activities over these Five Year Plan periods.

Table 1.7c: Growth rate of Capital Intensity

States	1980-85	1985-90	1992-97	1997-2001	1981-91	1991-01
Andhra Pradesh	9.98	-6.13	-6.44	4.91	7.94	2.95
Assam	-4.74	12.49	2.74	24.40	3.38	4.95
Bihar	1.74	-2.86	8.74	0.71	-1.48	6.95
Gujarat	11.83	2.75	17.40	8.63	10.94	16.76
Haryana	0.37	3.30	3.75	11.13	6.23	7.49
Karnataka	7.81	13.67	12.71	11.08	7.71	18.06
Kerala	9.83	-0.95	8.80	8.44	3.73	7.54
Madhya Pradesh	8.97	2.13	6.46	8.21	5.60	9.93
Maharashtra	15.81	12.34	13.40	9.12	11.51	10.51
Orissa	5.42	22.98	5.81	21.47	14.31	3.24
Punjab	3.70	5.67	7.93	1.39	3.03	5.97
Rajasthan	8.80	3.87	14.10	8.57	7.75	11.71
Tamil Naru	11.42	1.07	14.38	10.22	5.77	10.64
Uttar Pradesh	18.72	12.10	19.93	8.44	10.97	16.87
West Bengal	7.15	4.50	5.20	24.73	8.59	8.72
All India	8.92	4.66	12.67	10.18	7.19	12.27

Table 1.7d: Growth of Fixed Capital

States	1980-85	1985-90	1992-97	1997-2001	1981-91	1991-01
Andhra Pradesh	10.18	-1.54	-3.30	1.86	3.49	3.94
Assam	-6.87	14.24	6.27	18.24	-1.78	3.61
Bihar	-0.26	-1.44	6.32	-2.51	9.95	19.00
Gujarat	12.41	3.78	23.20	5.01	8.40	11.66
Haryana	5.15	3.94	11.66	10.80	8.57	21.97
Karnataka	8.14	17.79	21.57	2.69	2.60	8.97
Kerala	5.46	1.27	10.62	7.02	7.54	10.00
Madhya Pradesh	13.22	6.14	9.93	2.72	10.29	11.70
Maharashtra	13.30	13.00	18.21	1.00	15.62	3.10
Orissa	11.90	25.27	9.11	16.60	7.61	7.62
Punjab	7.58	11.69	11.88	4.33	10.58	13.59
Rajasthan	10.98	7.21	21.32	6.47	7.68	12.87
Tamil Naru	14.09	3.26	19.80	8.01	11.22	15.15
Uttar Pradesh	17.18	17.00	21.46	1.99	4.95	6.89
West Bengal	5.72	2.67	6.75	12.02	7.33	13.39
All India	8.78	6.85	16.85	5.42	9.49	3.79

Table 1.7e: Share of Public and Private Sector in Gross Domestic Capital Formation

Plan Periods	public sector	private sector	Total
First Plan : 1951-56	3.5	7.2	10.7
Second Plan:1956-61	6.6	8.8	15.4
Third Plan: 1961-66	8.4	8.3	16.7
Fourth Plan: 1969-74	7.2	10.9	18.1
Fifth Plan : 1974-79	9.5	11.7	21.2
Sixth Plan: 1980-85	11.1	10.5	21.6
Seventh Plan: 1985-90	10.7	12.1	22.8
Eighth Plan(1992-97)	9.2	15.4	24.6
1997-98	1.1	24.1	25.2
2000-01	6.8	17.2	24

Source: CMIE, Basic statistics relating to the Indian Economy, Vol. I, All India, August, 1994 and CSO, National Accounts Statistics (2002).

In the 1990s industrial picture was favourable in respect of employment generation. The registered manufacturing sector in India witnessed a significantly high growth rate of employment compared to 1980s. In the 1990s especially in 8th plan the growth rate of real wage rate (Table-1.7f) declined rapidly. This might be one of the important reasons for higher employment growth. This is also supported by Goldar (2000). In his study he has pointed out two major reasons: slowdown in growth of real wages and the relatively faster growth of small and medium-sized factories, which are more labour intensive than large, sized factories[1]. Nagaraj (2000) contested Goldar's, views and argued that faster employment generation in the 1990s was due to the investment boom in that decade. In Table-1.7a it is revealed that all the 15 major states have enjoyed positive growth rate of employment except Bihar, West Bengal, Kerala and Uttar Pradesh. These states witnessed high growth of real wage during this period. The growth rates of employment in Haryana, Karnataka and Rajasthan are noticeable. To analyze this overwhelming performance

[1] cited in J.J. Thomas(1998)

of registered manufacturing the new industrial policy adopted in 1991 is important to be discussed.

Table 1.7f: Growth of Real Wage Rate

States	1980-85	1985-90	1992-97	1997-2001	1981-91	1991-01
Andhra Pradesh	6.72	-7.31	4.96	1.91	4.84	3.27
Assam	-4.99	3.49	3.19	-4.18	1.54	4.22
Bihar	6.86	5.21	13.64	-5.89	-6.07	1.79
Gujarat	7.21	2.58	0.15	2.14	4.71	6.23
Haryana	-0.46	4.04	-0.95	-1.79	4.96	3.10
Karnataka	13.00	9.07	1.89	4.53	4.57	0.24
Kerala	4.39	2.07	6.74	0.97	6.29	1.78
Madhya Pradesh	5.81	3.40	9.50	5.65	2.69	2.46
Maharashtra	10.95	4.92	2.92	-0.68	3.38	7.58
Orissa	3.15	-1.12	8.88	2.76	6.73	1.60
Punjab	6.63	5.52	1.43	0.23	1.69	4.84
Rajasthan	3.06	2.81	5.07	-0.96	4.69	1.46
Tamil Naru	5.07	1.13	5.29	-3.47	3.64	3.30
Uttar Pradesh	14.53	3.91	4.77	-0.85	1.98	1.89
West Bengal	3.89	1.41	6.26	9.67	6.53	3.34
All India	7.80	3.05	4.23	0.96	4.12	7.44

The major thrust areas of the New Industrial Policy[1] were :(a) to unshackle the Indian Industrial economy from the cobwebs of unnecessary bureaucratic control, (b) to introduce liberalization with a view to integrate the Indian economy with the world economy, (c) to remove restrictions on direct foreign investment as also to free the domestic entrepreneur from the restrictions of MRTP Act, and, (d) the

[1] The "New Industrial Policy" was discussed elaborately in "Handbook of Industrial Policy and Statistics",1997-98

policy aimed to shed the load of the public enterprises which have shown a very low rate of return or were incurring losses over the years. This New Industrial Policy was expected to fetch an industry friendly atmosphere for large as well medium enterprises. The industrially advanced states were expected to get benefit more.

Both the 7th and 8th plans witnessed higher growth rate GVA coupled with lower growth rate of share of emoluments in gross value added in developed states like Haryana, Punjab, Gujarat and Maharashtra. This implies that developed states enjoyed technological progress.

The above analysis mainly deals with growth performance of the 15 major states at the aggregate level. To get a concrete picture of industrial performance across the states,it is required to see the industry-wise growth performance of each state. During the decade of 80s Assam and West Bengal showed very poor performance. In Assam the growth rates of GVA (shown in Table-1.7g[1]) in almost all industries except rubber & petrochemical (31), basic metal & alloys (33) and metal & machineries (34+35+36) are found to be negative. Rubber and petrochemical being a major industry in Assam showed impressive growth rate of 36.59% while another major industry wood (27) experienced -42.72% growth in GVA. In the post liberalization phase only food products (20-21), basic chemical (30) and machineries (34+35+36) achieved positive growth rate. In West Bengal the major industries like jute & cotton textile (23+24+25), paper & printings (28), non-metallic (32), basic metal & alloys (33) and transport (37) industries had negative growth of GVA during the 80 and total growth of the state was 0.09 %. In the post 90s the growth rate has improved significantly. Except rubber & petrochemical (31), transport and miscellaneous (38), all other industries have enjoyed high positive

[1] See table -1.7g in Annexure

growth rate. During the last two decades Rajasthan improved significantly and experienced highest growth in GVA (9.70%) of manufacturing. Except textile industry[1], all other industries have enjoyed very high growth rate. Textile wear& apparel (26), wood (27), basic chemical (30), non-metallic (32) and miscellaneous have shown excellent growth performance in both pre and post liberalization (especially in post 90s).

With the growth of gross value added, how many new establishments and employment grow is important to be discussed. During the last two decades, the growth rate of the number of factories (Table-1.7h) is highest in Rajasthan (3.87%) followed by Tamil Nadu (3.70%), Kerala (3%), Gujarat (2.96%) and Haryana (2.69%). Assam, Bihar. Orissa and West Bengal have shown very poor performance in terms of both growth of factories and employment. Inspite of being industrially advanced states Gujarat and Maharashtra have experienced poor growth performance in employment.

Table 1.7h: Growth of Factories

States	1980-85	1985-90	1992-97	1997-2001	1981-91	1991-01
Andhra Pradesh	-1.97	6.22	2.79	-9.86	3.75	-2.82
Assam	1.09	-3.69	0.09	-5.09	-0.49	-0.55
Bihar	-2.30	-7.75	-3.87	-1.93	-2.79	-2.68
Gujarat	-3.66	1.48	4.90	-0.08	-0.42	2.96
Haryana	2.67	0.49	4.72	4.96	2.04	3.48
Karnataka	-0.48	0.97	4.20	-1.06	0.81	1.94
Kerala	-0.33	2.51	5.59	0.16	0.88	3.24
Madhya Pradesh	0.53	-1.53	2.83	0.95	1.04	0.54
Maharashtra	-1.85	0.66	3.59	-3.79	-0.17	1.71
Orissa	-4.69	-0.58	2.77	1.91	-0.83	0.15
Punjab	-2.17	2.66	2.41	3.17	1.26	1.47
Rajasthan	-0.89	1.99	4.85	1.06	2.10	3.00
Tamil Naru	5.82	2.50	2.14	0.79	3.04	2.22
Uttar Pradesh	1.58	7.42	-0.30	-0.60	3.33	0.69
West Bengal	-5.78	-0.52	-0.15	1.01	-1.98	0.98
All India	-0.73	1.96	2.73	-1.00	1.13	1.33

[1] During 90s textile industry in Rajasthan experienced negative growth rate.

The above analysis can be concluded by interpreting the coefficient of variations (CV) of above said variables (Table-1.8). The coefficient of variation has been calculated to see how the disparity in registered manufacturing growth changes over the time. The Table-1.8 indicates that CV of growth of all the above said variables other than gross value added declined in 2000-01. This phenomenon clearly testifies the neo-classical growth theory of convergence (Solow, 1956)

Table:- 1.8 Coefficient of Variation of Different Variables

	coefficient of variation	
Growth rate	1980-81 to 1990-91	1991-92 to 2000-01
Factories	247.78	179.67
Fixed capital	54.20	50.19
Employment	457.20	357.96
Gross value added	11.85	14.02
Output	53.43	37.36
Labour productivity	47.55	33.40
Real wage rate	90.01	61.79

where it is precisely told that poorer region tends to grow faster than their richer counterparts, so that the poorer region possibly catch up the same steady state growth path of per capita income. The key assumption that entails the convergence result in neoclassical models is diminishing returns to reproducible capital. The relatively less developed economy will have lower stocks of physical capital, and hence higher marginal rates of return on it. Therefore, for any given rate of investment, it will have faster growth in the transition phase[1].

II.2A Specialization and Concentration of Industries in India

In the earlier section the spatial concentration has been discussed at both aggregate as well as disaggregate level, but it is unclear there which industries are more concentrated and where this concentration process occurs. Here, results of the most frequently

[1] The phenomenon is known as conditional β -convergence in Solow model.

used measures of concentration, relative diversity index (RDI) and Hirschman-Herfindahl index (HHI), location quotient (LQ) are given[1].

Relative diversity index (RDI) measures the degree of regional specialization of industries. It is the inverse of the summed difference between regional and national industry shares. As the value of RDI increases the regional industry share approaches to the national average. The share of employment is the most widely used indicator of industry share.

Spatial Hirschman-Herfindahl Index measures the regional spread of an industry. If the value of H-H index approaches to zero, it implies that the industries are evenly distributed across the region. The industry is highly concentrated if the value of index is close to one.

The location quotient indicates the degree of representation of an industry in a particular state and makes comparison with that of the other states. A value of 1.0 indicates that the industry forms the same proportions of total jobs in a particular state as it does in India; while a value greater than 1 means the proportion of employment in that industry in that state is higher than that in the nation. The results of these three measures are given in details below.

This study attempts to investigate whether more diversification or less specialization of industries causes a spur of industrial growth or not in the Indian context. The values of RDI for 15 major states in three different time periods (1980-81, 1990-91 and 2000-01) are given in Table-2.1. The RDI values in 1980-81 have shown that Tamil Nadu, Karnataka, Maharashtra, Punjab and Madhya Pradesh are above the national average (mean RDI= 2.29) and Haryana, Rajasthan, Uttar Pradesh and Gujarat are close to the national average. These states

[1] Formulas of all the measures of concentration have been discussed in details in methodology section of chapter-I

are highly diversified in and are specialized with different industries. Whereas states like Assam, Orissa and Bihar are far below from the country's mean value of RDI. Andhra Pradesh and Kerala are also industrially less diversified states.

In the early 90s out of 15 major states seven states had higher RDI values than the national average. These states were Maharashtra, Tamil Nadu, Uttar Pradesh, Karnataka, Haryana, Madhya Pradesh and Punjab. Gujarat, West Bengal and Rajasthan were slightly below the national average. The position of Assam, Bihar, Orissa and Kerala were quite similar to early 80s. A similar outcome was noticed in 2000-01. Maharashtra, Punjab, Madhya Pradesh, Uttar Pradesh and Karnataka were the most diversified states where as, Assam, Bihar, Orissa and Kerala were states with less diversified industries.

In Table-2.1a, it is clear that the diversification has been increased. The coefficient of variation has reduced from 47.80 percent to 38.19 percent in 1990-91 and 38.81 percent in 2000-01. The states like Uttar Pradesh,

Table 2.1a: Relative Diversity Index Values for 15 major India States

STATE	1980-81	RANK	STATE	1990-91	RANK	STATE	2000-01	RANK
TN	5.14	1	MAH	4.11	1	MAH	3.61	1
KAR	3.41	2	TN	2.91	2	PUN	2.77	2
MAH	3.22	3	UP	2.90	3	MP	2.67	3
PUN	3.11	4	KAR	2.80	4	UP	2.52	4
MP	2.81	5	HAR	2.58	5	TN	2.19	5
HAR	2.15	6	MP	2.51	6	KAR	2.03	6
RAJ	2.09	7	PUN	2.37	7	HAR	1.80	7
WB	2.01	8	GUJ	2.11	8	GUJ	1.79	8
UP	1.97	9	WB	2.09	9	RAJ	1.73	9
GUJ	1.78	10	RAJ	1.76	10	WB	1.58	10
AP	1.63	11	AP	1.71	11	AP	1.44	11
KER	1.58	12	KER	1.61	12	KER	1.32	12
BHR	1.41	13	OR	1.31	13	OR	1.30	13
OR	1.10	14	BHR	1.23	14	BHR	1.01	14
ASM	0.89	15	ASM	0.79	15	ASM	0.86	15
AVERAGE	2.29		AVERAGE	2.19		AVERAGE	1.91	
Coeff. of Variation	47.80		Coeff. of Variation	38.19		Coeff. of Variation	38.81	

Note: AP = Andhra Pradesh, ASM = Assam, BHR = Bihar, GUJ = Gujarat, HAR = Haryana, KAR = Karnataka, KER = Karala, MP = Madhya Pradesh, MAH = Maharashtra, OR = Orissa, PUN = Punjab, RAJ = Rajasthan, TN = Tamil Nadu, UP = Uttar Pradesh, WB = West Bengal.

Haryana, which were below the national average in 1980-81, ame above the mean level in 1990-91. Among the states, which were elow the country's average, Gujarat, West Bengal, Andhra Pradesh, erala and Orissa had been getting closer to the national average from 990-91 onwards. Assam and Bihar remained in the same position. mong the states that belong to the upper strata (i.e., values of RDI re above the national average) Maharashtra has improved upon ignificantly. Diversifications in Tamil Nadu and Karnataka have been lowly getting reduced. In 2000-01 RDI in Haryana has become lower han mean level. These states are getting regionally specialized in articular set of industries. In the above analysis it is revealed that he states, which are industrially advanced, are more diversified in ndustrial activities rather than less industrially states. But in few leveloping states like Uttar Pradesh and Madhya Pradesh the process f diversification in industries grows rapidly.

Table 2.1b: Distance between National Average and Each value of RDI

State/Year	1980-81	1990-91	2000-01
Tamil Nadu	-2.85	-0.72	-0.28
Karnataka	-1.12	-0.61	-0.12
Maharashtra	-0.93	-1.92	-1.7
Punjab	-0.82	-0.18	-0.86
Madhya Pradesh	-0.52	-0.32	-0.76
Haryana	0.14	-0.39	0.11
Rajasthan	0.2	0.43	0.18
West Bengal	0.28	0.1	0.33
Uttar Pradesh	0.32	-0.71	-0.61
Gujarat	0.51	0.08	0.12
Andhra Pradesh	0.66	0.48	0.47
Kerala	0.71	0.58	0.59
Bihar	0.88	0.96	0.9
Orissa	1.19	0.88	0.61
Assam	1.4	1.4	1.05
Average	2.29	2.19	1.91

In section- II.1b it is shown that Haryana, Karnataka, Tamil Nadu, Maharashtra, Punjab, Gujarat, Rajasthan and Kerala had positive and relatively higher growth of employment than rest of the

states during the decade of 90s and among these states Maharashtra, Tamil Nadu, Punjab, Haryana and Karnataka are highly industrially diversified. The increase in diversity raises the demand for employment by inducing the local competition among the firms. This entails the stylized fact – diversity and local competitions foster the growth of industrial employment[1].

On the other hand states, which are highly specialized in very small number of industries, (Assam, Bihar and Orissa) show lower growth of industrial employment[2]. These states are specialized in more traditional manufacturing rather than export oriented high return capital good and consumer good industries[3]. It is true that states with greater specialization of a small set of industries are not able to create a large market as well as local demand. Conversely, the states with greater diversity create large inter-industry market and local demand that basically help to attract new firms. Thus diversity in industrial growth generates a cyclical growth of industrial activities and is continuing to be stable over the period. This persistent nature of industrial diversification is manifest in the southwest region (Tamil Nadu, Karnataka and Maharashtra) and northern India (UP, Punjab and Haryana).

The occurrence of historical accident is one of the leading factors of industrial diversification mix. In India, the states, which are historically developed (since pre-independence), have attracted various industries and have promoted industrial polarization. This nature of diversity in industries in industrially developed states is a good testimony of long run persistence of the so-called 'colonial legacy'.

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[1] Glasser, Kallal..... duranton and puga

[2] Black & Henderson(1998)

[3] Assam is specialized in very few industries like Tea, Jute and petroleum products. Bihar and Orissa are specialized metal and basic metal industries.

But it is simultaneously true that the regional specialization of industries is slowly declining over the period, especially in the post-liberalization era.

In the above analysis this study has explored the regional concentration of registered manufacturing by focusing the relative degrees of industrial specialization. This part of the analysis emphasizes on the spatial distribution of national registered manufacturing and their locational representation.

The degree of spatial concentration and locational representation of a particular industry can be shown by calculating the Hirschman-Herfindahl Index (HHI) and the rank of Location Quotient (LQ) with respect to employment and gross valued added for 2-digit organized manufacturing industries across the major 15 states in India for different time period. Table-2.2a shows the HHI of the 15 major industries for the time periods (1980-81, 1990-91 and 2000-01).

Table 2.2a: Hirschmann-Herfindahl Index(across the industries) in respect of Employment

	1980-81		1990-91		2000-01	
INDUSTRY	HHI	RANK	HHI	RANK	HHI	RANK
Beverage tobacco(22)	0.27	1	0.26	1	0.32	1
Leather(29)	0.15	2	0.17	2	0.14	2
Wood & wood products (27)	0.07	3	0.08	3	0.03	6
Basic metal&alloy(33)	0.04	4	0.06	4	0.06	4
Miscellaneous(scientific equipments, watch) (38)	0.03	5	0.02	9	0.04	5
Textilewear&apparel(26)	0.02	6	0.06	5	0.09	3
Non-metalic(32)	0.02	7	0.02	8	0.02	10
Transport(37)	0.02	8	0.02	7	0.02	9
rubber,petrochemical (31)	0.02	9	0.01	12	0.01	12
Food& food products (20-21)	0.02	10	0.01	11	0.02	11
Textile(23+24+25)	0.02	11	0.01	10	0.02	7
Basic chemical(30)	0.01	12	0.02	6	0.02	8
metal& machine(34+35+36)	0.01	13	0.01	14	0.01	13
OTHERS	0.005	14	0.01	13	0.01	14
Paper& printings (28)	0.004	15	0.004	15	0.003	15

The Table -2.2a shows that beverage & tobacco industry is geographically more concentrated., followed by leather(29), wood and basic metal & alloys and other machineries (scientific equipments, cinematography etc) up to 1990-91. In 2000-01 the concentration of Textile wear& apparel (26) has increased and the concentration of wood industry has declined. The regional spread of non metallic (32), transport (37), rubber& petrochemical (31) and food (20-21) has increased in the post reform period. Metal, machinery (34+35+36), others (utilities) and paper& printing (28) are the most widely spread industries across the country. With respect gross value added, the HHI shows that leather industry is the most concentrated industry in the country, followed by basic metal& alloys, textile wear & apparel in 2000-01. Since 1980-81 to 2000-01 production concentration for wood (27), beverage& tobacco and scientific equipments & other machineries (38) has declined. Both the Table-2.2a & 2.2b reveals the same results for concentration ,i.e. leather, textile wear& apparel, basic metal & alloys and beverage tobacco are geographically more concentrated in India, but their rankings among them are differ in two tables. With respect to employment beverage tobacco industry is ranked first (HHI = 0.32), while leather industry is in 2nd position (HHI = 0.14), but with respect to gross value added the former comes in 4th position (HHI = 0.08) and the latter one holds 1st rank (HHI = 0.14). This high employment concentration coupled with low gross value added concentration simply implies that productivity of beverage tobacco industry has increased. The same conclusion can be drawn for scientific equipments & other machineries (38) and food (20-21) industries.

From the above two measures of concentration can be determined which of the states are industrially diverse and which of the industries in the country are geographically more concentrated. Now to extend this analysis, it is required to know which industries

are getting concentrated in which states. Location quotient gives representation of an industry in a particular state. The value of it shows how much one industry's share is greater than national average. The location quotients for all major 15 industries are shown in Table-2.3a & 2.3b.

According to the ranked employment HHI index, beverage tobacco (22) industry is the most concentrated industry and this is mainly concentrated in Andhra Pradesh. The value of location quotient of this industry is 5.88(2000-01). This indicates that the proportion in employment in this industry is 5th times larger than other industries in AP and India's employment in that industry.

Table:-2.2b Hirschman-Herfindahl Index (across the industries) with respect to GVA

	1980-81		1990-91		2000-01	
INDUSTRY	HHI	RANK	HHI	RANK	HHI	RANK
Beverage tobacco(22)	0.22	1	0.18	1	0.14	1
Leather(29)	0.12	2	0.09	3	0.05	9
Wood & wood products (27)	0.09	3	0.06	4	0.08	4
Basic metal&alloy(33)	0.06	4	0.09	2	0.09	3
Miscellaneous(scientific equipments, watch) (38)	0.06	5	0.02	12	0.02	14
Textilewear&apparel(26)	0.04	6	0.02	11	0.04	11
Non-metalic(32)	0.04	7	0.04	6	0.05	8
Transport(37)	0.03	8	0.03	7	0.1	2
rubber,petrochemical (31)	0.03	9	0.03	8	0.06	6
Food& food products (20-21)	0.03	10	0.04	5	0.05	10
Textile(23+24+25)	0.02	11	0.01	15	0.07	5
Basic chemical(30)	0.02	12	0.02	9	0.05	7
metal& machine(34+35+36)	0.02	13	0.02	10	0.03	13
OTHERS	0.01	14	0.01	14	0.01	15
Paper& printings (28)	0.01	15	0.01	13	0.03	12

The ranked gross value added location quotient of this industry is found to be 2.88 and compared to other states and other industries within the state the share of gross value added of this industry is highest. In Andhra Pradesh, the location quotient of this industry has

declined over the period. In the 80s and early 90s Assam had major share in wood (27) and Food (20-21) industry in 2000-01 food (20-21) is the most concentrated industry followed by rubber and petrochemical (31). The ranked gross value added location quotient concludes the same result but the values of it have declined more than that of ranked employment location quotient. From Table-2.1 leather industry is second highest concentrated industry next to beverage & tobacco in India. The HH index (in respect of employment) of this industry is 0.14. But In respect of gross value added and investment the HH indicates leather industry is ranked first as shown in Table -2.1 & 2.2. The regional spread of this industry is very small. Ranked employment location quotients of this industry are found to be in 3.17 and 2.47 in Tamil Nadu and Uttar Pradesh respectively. In these two states leather industry is major and highly concentrated industry compared to other industries. The ranked gross value added location quotient shows that this industry is also concentrated in West Bengal.

It is found in table-2.2a that the textile wear& apparel is next to leather industry regarding concentration. Location quotient table (Table-2.3a) tells that this industry is mainly concentrated in Karnataka (lq = 3.04), Tamil Nadu (lq = 2.08) and Uttar Pradesh (lq = 2.08). In Karnataka this industry is major industry. In Tamil Nadu, Haryana, Punjab and Uttar Pradesh this industry is second major industry. Table -2.2a shows that basic metal & alloys, scientific equipments & cinematography, wood, textile basic chemical, transport, non-metallic, food industries have high regional spread and rubber & petroleum products, metal & machinery, others and paper& printing industries are almost equally distributed among the 15 major states. Basic metal & alloys (33) industry occupies a major share in four mineral rich states of Bihar, Orissa, Madhya Pradesh and West Bengal. The values of location quotient are 5.36 and 5.26, 2.98 and

2.24 respectively. The shares of employment of this industry in these states are 18.6 %, 8.24 %, 11.59% and 15.22% respectively. The ranked GVA location quotients (shown in Table-2.3b) for Bihar and Orissa are above 6 but for West Bengal it is very low. The share of GVA of Bihar is highest and it has increased both for Bihar and Orissa. The relatively higher values of LQ with respect to gross value added in comparison to the values of LQ with respect to employment imply this industry to be highly productive.

Apart from geographical factors, the priority of public sector investment in heavy industry is one of the important reasons behind the concentration of these industries in these states.

In the two Location Quotient tables (Table-2.3a & 2.3b) it has been found that the capital and high-technology intensive industries are concentrated in industrially advanced states. Transport industry (37) is concentrated mainly in Punjab, Haryana; metal & machinery (34+35+36) are in Haryana and Maharashtra. Scientific equipment and other soft industry (38) are concentrated in Maharashtra.

The values of location quotients for less diversified states are relatively high in comparison to industrially diversified states. This supports the fact that industrially less developed sates are highly specialized in few industries. Another important fact is that these industries are mainly primary and mineral rich intermediate goods oriented.

It has been observed in location quotient tables that Assam is specialized in food and petroleum industries where as Bihar and Orissa are specialized in basic metal & alloys industries. Since Assam is oil rich state and huge public sector investment in petroleum industry has taken place, this industry gets concentrated in this state.

Similarly Bihar and Orissa are rich in iron ore. The major steel industries of the country are situated in these two states.

The results of the above three measures of concentration are integrated to each other and provide conclusive evidences which are very much interdependent. The states, which are less diversified, are highly specialized in two or three industries and the values of location quotient of these industries are high enough in comparison to the states which are industrially more diversified.

The important fact which has come out from the above analysis of concentration is that diversification gradually spread across the states in the post liberalization period.

Table:-2.3a Ranked Employment Location Quotient

Industry	1980-81	Industry	1991-92	Industry	2000-01
Andhra Pradesh	**LQ**	**Andhra Pradesh**	**LQ**	**Andhra Pradesh**	**LQ**
Beverage, Tobacco	6.44	Beverage, Tobacco	5.69	Beverage, Tobacco	5.84
Others	1.33	Food & Food products	1.20	Non-metallic	1.23
Food & Food products	1.32	Others	0.90	Food & Food products	1.21
Paper &Printings	0.85	Paper & Printings	0.89	Paper & Printings	0.91
Basic Chemical	0.71	Non-metallic	0.86	Metal, Machine tools	0.76
Non-metallic	0.69	Basic Metal & Alloys	0.76	Basic Chemical	0.67
Assam	**1980-81**	**Assam**	**1991-92**	**Assam**	**2000-01**
Wood & Wood products	9.39	Wood & Wood products	13.78	Food & Food products	4.59
Food & Food products	4.11	Food & Food products	4.30	Rubber& Petrochemicals	1.88
Others	1.04	Rubber& Petrochemicals	1.92	Non-metallic	1.41
Paper & Printings	0.79	Non-metallic	1.10	Paper & Printings	1.18
Rubber& Petrochemicals	0.55	Paper & Printings	0.85	Others	0.79
Basic Chemical	0.50	Others	0.81	Wood & Wood products	0.50
Bihar	**1980-81**	**Bihar**	**1991-92**	**Bihar**	**2000-01**
Basic Metal & Alloys	3.74	Basic Metal & Alloys	4.19	Basic Metal & Alloys	5.36
Rubber & Petrochemicals	2.80	Non-metallic	2.72	Non-metallic	3.32
Non-metallic	2.52	Rubber & Petrochemicals	2.23	Rubber & Petrochemicals	2.33
Transport	1.37	Transport	1.78	Others	1.47
Food & Food products	1.01	Wood & Wood products	0.91	Wood & Wood products	1.37
Others	0.98	Basic Chemical	0.77	Transport	1.37
Gujarat	**1980-81**	**Gujarat**	**1991-92**	**Gujarat**	**2000-01**
Textile	1.90	Basic Chemical	1.77	Basic Chemical	2.40
Non-metallic	1.51	Textile	1.51	Miscellaneous	1.80
Basic Chemical	1.33	Non-metallic	1.41	Textile	1.42

Miscellaneous	1.01	Miscellaneous	1.12	Non-metallic	1.38
Metal, Machine tools	0.91	Metal, Machine tools	1.11	Metal, Machine tools	1.17
Others	0.80	Rubber& Petrochemicals	1.06	Rubber& Petrochemicals	0.98
Haryana	**1980-81**	**Haryana**	**1991-92**	**Haryana**	**2000-01**
Metal, Machine tools	2.12	Transport	1.81	Transport	3.40
Others	1.95	Metal, Machine tools	1.78	Metal, Machine tools	1.68
Rubber& Petrochemicals	1.68	Non-metallic	1.48	Textile wear& apparel	1.36
Miscellaneous	1.39	Miscellaneous	1.15	Non-metallic	1.21
Paper & Printings	1.39	Rubber& Petrochemicals	1.13	Leather & Leather products	1.20
Transport	1.26	Paper & Printings	1.12	Miscellaneous	1.11
Karnataka	**1980-81**	**Karnataka**	**1991-92**	**Karnataka**	**2000-01**
Wood & Wood products	2.31	Textile wear& apparel	2.96	Textile wear& apparel	3.04
Miscellaneous	1.60	Miscellaneous	2.36	Wood & Wood products	1.53
Non-metallic	1.42	Metal, Machine tools	1.71	Metal, Machine tools	1.44
Metal, Machine tools	1.41	Paper & Printings	1.50	Others	1.32
Paper & Printings	1.40	Others	1.28	Miscellaneous	1.27
Food & Food products	1.36	Non-metallic	1.13	Paper & Printings	1.26
Kerala	**1980-81**	**Kerala**	**1991-92**	**Kerala**	**2000-01**
Wood & Wood products	5.15	Wood & Wood products	4.44	Wood & Wood products	4.05
Food & Food products	2.60	Food & Food products	2.51	Food & Food products	3.23
Textile wear& apparel	1.61	Beverage, Tobacco	1.90	Rubber& Petrochemicals	1.70
Beverage, Tobacco	1.45	Miscellaneous	1.46	Paper & Printings	1.23
Rubber& Petrochemicals	1.26	Rubber& Petrochemicals	1.36	Non-metallic	1.08
Non-metallic	1.23	Non-metallic	1.21	Others	0.86
Madhya Pradesh	**1980-81**	**Madhya Pradesh**	**1991-92**	**Madhya Pradesh**	**2000-01**
Basic Metal & Alloys	2.05	Non-metallic	2.10	Basic Metal & Alloys	2.98
Non-metallic	1.63	Basic Metal & Alloys	1.35	Non-metallic	1.66
Paper & Printings	1.28	Beverage, Tobacco	1.18	Beverage, Tobacco	1.36
Textile	1.14	Paper & Printings	1.13	Rubber& Petrochemicals	1.13
Wood & Wood products	1.08	Wood & Wood products	1.07	Others	1.07
Beverage, Tobacco	1.06	Textile	1.05	Metal, Machine tools	0.95
Maharashtra	**1980-81**	**Maharashtra**	**1991-92**	**Maharashtra**	**2000-01**
Miscellaneous	1.74	Miscellaneous	1.99	Miscellaneous	2.00
Metal, Machine tools	1.37	Others	1.33	Metal, Machine tools	1.53
Textile wear& apparel	1.35	Rubber& Petrochemicals	1.31	Rubber& Petrochemicals	1.40
Basic Chemical	1.35	Metal ,Machine tools	1.30	Wood & Wood products	1.38
Rubber& Petrochemicals	1.31	Basic Chemical	1.29	Transport	1.26
Transport	1.11	Transport	1.09	Paper & Printings	1.25
Orissa	**1980-81**	**Orissa**	**1991-92**	**Orissa**	**2000-01**
Basic Metal & Alloys	3.91	Basic Metal & Alloys	4.07	Basic Metal & Alloys	5.26
Non-metallic	3.29	Wood & Wood products	2.67	Wood & Wood products	2.46
Paper & Printings	3.21	Non-metallic	2.38	Paper & Printings	1.86
Wood & Wood products	2.93	Paper & Printings	2.26	Non-metallic	1.84
Others	0.97	Basic Chemical	0.83	Rubber& Petrochemicals	1.32
Food & Food products	0.67	Textile	0.72	Others	1.06

Punjab	1980-81	Punjab	1991-92	Punjab	2000-01
Transport	1.57	Transport	2.50	Transport	2.34
Basic Metal & Alloys	1.54	Textile wear& apparel	1.49	Food & Food products	1.55
Miscellaneous	1.50	Rubber& Petrochemicals	1.41	Rubber& Petrochemicals	1.28
Textile wear& apparel	1.44	Food & Food products	1.25	Metal, Machine tools	1.05
Metal, Machine tools	1.32	Textile	1.18	Textile	0.99
Food & Food products	1.22	Basic Metal& Alloys	1.11	Basic Metal& Alloys	0.94
Rajasthan	**1980-81**	**Rajasthan**	**1991-92**	**Rajasthan**	**2000-01**
Non-metallic	2.21	Others	2.55	Non-metallic	2.98
Others	1.61	Non-metallic	2.18	Miscllaneous	2.36
Transport	1.58	Textile	1.75	Textile	1.90
Textile	1.35	Miscellaneous	1.23	Others	1.38
Textile wear& apparel	1.20	Rubber& Petrochemicals	1.01	Wood & Wood products	1.01
Miscellaneous	1.08	Basic Metal & Alloys	0.97	Basic Metal & Alloys	0.99
Tamil Nadu	**1980-81**	**Tamil Nadu**	**1991-92**	**Tamil Nadu**	**2000-01**
Leather & Leather products	3.06	Leather & Leather products	3.17	Leather & Leather products	2.64
Textile wear& apparel	1.56	Textile wear& apparel	2.03	Textile wear& apparel	2.08
Basic Chemical	1.36	Basic Chemical	1.45	Textile	1.28
Transport	1.29	Transport	1.26	Basic Chemical	1.20
Food & Food products	1.14	Textile	1.15	Others	1.15
Others	1.11	Paper & Printings	1.13	Transport	1.06
Uttar Pradesh	**1980-81**	**Uttar Pradesh**	**1991-92**	**Uttar Pradesh**	**2000-01**
Leather & Leather products	3.06	Leather & Leather products	3.17	Leather & Leather products	2.64
Textile wear& apparel	1.56	Textile wear& apparel	2.03	Textile wear& apparel	2.08
Basic Chemical	1.36	Basic Chemical	1.45	Textile	1.28
Transport	1.29	Transport	1.26	Basic Chemical	1.20
Food & Food products	1.14	Textile	1.15	Others	1.15
Others	1.11	Paper & Printings	1.13	Transport	1.06
West Bengal	**1980-81**	**West Bengal**	**1991-92**	**West Bengal**	**2000-01**
Leather & Leather products	1.71	Basic Metal & Alloys	1.97	Textile	2.34
Transport	1.65	Transport	1.62	Basic Metal & Alloys	2.24
Basic Metal & Alloys	1.61	Textile	1.59	Others	1.68
Textile	1.43	Wood & Wood products	1.02	Wood & Wood products	1.15
Miscellaneous	1.18	Miscellaneous	0.99	Transport	1.04
Rubber& Petrochemicals	1.16	Metal, Machine tools	0.96	Leather & Leather products	0.84

Note: LQ = Location Quotient

Table:-2.3b Ranked Gross Value Added Location Quotient.

Industry	1980-81	Industry	1991-92	Industry	2000-01
Andhra Pradesh	**LQ**	**Andhra Pradesh**	**LQ**	**Andhra Pradesh**	**LQ**
Metal, Machine tools	20.77	Metal, Machine tools	17.35	Metal, Machine tools	17.01
Food & Food products	12.83	Non-metallic	15.20	Basic Chemical	16.83
Basic Chemical	12.82	Food & Food products	15.11	Food & Food products	12.42
Textile	11.35	Basic Chemical	12.88	Non-metallic	11.69
Beverage, Tobacco	10.23	Beverage, Tobacco	11.61	Beverage, Tobacco	11.10
Paper & Printings	7.19	Paper & Printings	5.95	Basic Metal & Alloys	10.52

Assam	1980-81	Assam	1991-92	Assam	2000-01
Food & Food products	64.07	Food & Food products	45.89	Food & Food products	40.30
Wood & Wood products	9.50	Rubber& Petrochemicals	33.25	Rubber& Petrochemicals	36.53
Rubber& Petrochemicals	8.40	Paper & Printings	5.88	Paper &Printings	10.05
Others	3.88	Wood & Wood products	5.56	Metal, Machine tools	2.85
Paper & Printings	3.31	Non-metallic	2.80	Basic Chemical	2.59
Textile	2.85	Others	1.74	Others	2.23

Bihar	1980-81	Bihar	1991-92	Bihar	2000-01
Basic Metal & Alloys	40.31	Basic Metal & Alloys	49.17	Basic Metal & Alloys	70.38
Transport	21.87	Transport	12.15	Rubber& Petrochemicals	5.98
Rubber& Petrochemicals	10.69	Rubber& Petrochemicals	10.24	Beverage, Tobacco	4.01
Metal, Machine tools	5.77	Basic Chemical	9.25	Metal, Machine tools	4.01
Non-metallic	5.48	Non-metallic	5.68	Food & Food products	3.93
Food & Food products	4.14	Beverage, Tobacco	5.40	Transport	2.96

Gujarat	1980-81	Gujarat	1991-92	Gujarat	2000-01
Textile	34.90	Basic Chemical	37.46	Basic Chemical	51.57
Basic Chemical	25.40	Metal, Machine tools	16.85	Textile	10.34
Metal, Machine tools	11.79	Textile	13.62	Metal, Machine tools	9.24
Rubber& Petrochemicals	7.45	Food & Food products	7.02	Basic Metal & Alloys	6.53
Food & Food products	6.22	Basic Metal & Alloys	6.98	Rubber& Petrochemicals	6.16
Non-metallic	3.60	Non-metallic	6.19	Non-metallic	5.13

Haryana	LQ	Haryana	LQ	Haryana	LQ
Metal, Machine tools	35.81	Metal, Machine tools	29.28	Transport	29.19
Basic Metal & Alloys	11.80	Transport	20.74	Metal, Machine tools	25.81
Transport	8.51	Food & Food products	8.41	Food & Food products	9.97
Textile	7.93	Basic Metal & Alloys	6.69	Textile wear& apparel	7.66
Rubber& Petrochemicals	7.58	Basic Chemical	6.47	Basic Metal & Alloys	6.68
Paper & Printings	7.09	Non-metallic	6.46	Basic Chemical	3.72

Karnataka	1980-81	Karnataka	1991-92	Karnataka	2000-01
Metal, Machine tools	29.77	Metal, Machine tools	35.03	Metal, Machine tools	20.40
Basic Metal &Alloys	10.83	Non-metallic	8.14	Food & Food products	11.15
Basic Chemical	9.95	Food & Food products	7.74	Beverage, Tobacco	10.97
Textile	9.46	Transport	7.49	Basic Chemical	10.58
Transport	7.50	Basic Chemical	6.85	Transport	7.82
Food & Food products	6.97	Basic Metal & Alloys	6.36	Textile wear& apparel	7.67

Kerala	1980-81	Kerala	1991-92	Kerala	2000-01
Basic Chemical	23.77	Rubber& Petrochemicals	21.58	Rubber& Petrochemicals	20.77
Rubber& Petrochemicals	12.35	Basic Chemical	17.81	Basic Chemical	20.54
Metal, Machine tools	11.40	Food & Food products	15.06	Food & Food products	18.14
Food & Food products	10.82	Metal, Machine tools	10.60	Metal, Machine tools	7.51
Textile	9.78	Paper &Printings	7.70	Paper &Printings	6.66
Paper &Printings	6.37	Textile	6.02	Textile	5.99

Madhya Pradesh	1980-81	Madhya Pradesh	1991-92	Madhya Pradesh	2000-01

Basic Metal & Alloys	44.04	Non-metallic	27.19	Basic Metal & Alloys	25.25
Textile	15.21	Metal, Machine tools	18.19	Non-metallic	15.55
Metal, Machine tools	13.46	Basic Chemical	12.33	Basic Chemical	13.43
Non-metallic	7.95	Textile	11.77	Textile	9.95
Basic Chemical	6.55	Basic Metal & Alloys	11.65	Metal, Machine tools	8.59
Paper & Printings	4.68	Food & Food products	9.56	Others	6.75
Maharashtra	**1980-81**	**Maharashtra**	**1991-92**	**Maharashtra**	**2000-01**
Basic Chemical	24.09	Metal, Machine tools	24.24	Basic Chemical	23.65
Metal, Machine tools	23.63	Basic Chemical	20.00	Metal, Machine tools	20.53
Textile	17.16	Transport	11.42	Rubber& Petrochemicals	15.22
Transport	9.41	Textile	10.58	Food & Food products	9.82
Basic Metal & Alloys	7.30	Rubber& Petrochemicals	8.89	Transport	7.76
Rubber& Petrochemicals	4.26	Food & Food products	8.19	Textile	6.34
Orissa	**1980-81**	**Orissa**	**1991-92**	**Orissa**	**2000-01**
Basic Metal & Alloys	56.74	Basic Metal & Alloys	59.45	Basic Metal & Alloys	65.73
Non-metallic	10.25	Non-metallic	11.54	Non-metallic	8.59
Paper & Printings	10.05	Basic Chemical	7.53	Paper & Printings	5.96
Metal, Machine tools	6.24	Paper & Printings	6.34	Basic Chemical	4.70
Basic Chemical	5.47	Metal, Machine tools	4.60	Rubber & Petrochemicals	4.60
Textile	4.42	Textile	2.92	Food & Food products	4.22
Punjab	**1980-81**	**Punjab**	**1991-92**	**Punjab**	**2000-01**
Textile	16.51	Textile	20.61	Food & Food products	25.00
Metal, Machine tools	16.41	Metal, Machine tools	14.28	Metal Machine tools	15.54
Food & Food products	15.97	Food & Food products	12.96	Textile	15.03
Basic Chemical	15.91	Transport	12.38	Basic Chemical	13.78
Basic Metal & Alloys	15.07	Basic Chemical	11.90	Transport	8.78
Transport	10.19	Basic Metal & Alloys	9.64	Textile wear& apparel	7.01
Rajasthan	**1980-81**	**Rajasthan**	**1991-92**	**Rajasthan**	**2000-01**
Textile	32.49	Textile	25.64	Basic Chemical	28.09
Metal, Machine tools	19.14	Non-metallic	21.22	Non-metallic	18.57
Basic Metal & Alloys	16.65	Metal, Machine tools	12.76	Textile	13.70
Non-metallic	14.53	Basic Metal & Alloys	9.10	Metal, Machine tools	9.78
Basic Chemical	7.72	Basic Chemical	7.70	Basic Metal & Alloys	8.59
Transport	5.72	Food & Food products	5.29	Rubber& Petrochemicals	5.91
Tamil Nadu	**1980-81**	**Tamil Nadu**	**1991-92**	**Tamil Nadu**	**2000-01**
Textile	23.02	Metal, Machine tools	17.09	Transport	14.34
Metal, Machine tools	17.48	Textile	16.88	Textile	13.71
Basic Chemical	13.75	Basic Chemical	11.86	Metal, Machine tools	13.58
Transport	11.55	Food & Food products	9.67	Basic Chemical	13.02
Food & Food products	8.34	Transport	8.71	Textile wear& apparel	9.34
Rubber& Petrochemicals	4.98	Rubber& Petrochemicals	7.97	Paper & Printings	7.67
Uttar Pradesh	**1980-81**	**Uttar Pradesh**	**1991-92**	**Uttar Pradesh**	**2000-01**
Metal, Machine tools	19.96	Metal, Machine tools	23.74	Food & Food products	17.20
Food & Food products	19.31	Basic Chemical	20.33	Metal, Machine tools	16.08

Textile	13.92	Food & Food products	11.72	Basic Chemical	15.96
Basic Chemical	10.49	Rubber& Petrochemicals	8.34	Basic Metal & Alloys	10.61
Transport	8.42	Basic Metal & Alloys	8.09	Beverage, Tobacco	8.61
Basic Metal & Alloys	8.30	Beverage, Tobacco	5.72	Transport	8.25
West Bengal	**1980-81**	**West Bengal**	**1991-92**	**West Bengal**	**2000-01**
Textile	25.22	Metal, Machine tools	20.29	Textile	19.76
Metal, Machine tools	16.95	Basic Metal & Alloys	19.34	Basic Metal & Alloys	18.28
Basic Metal & Alloys	16.38	Textile	16.69	Metal, Machine tools	14.55
Transport	11.87	Transport	10.70	Basic Chemical	13.23
Rubber& Petrochemicals	7.72	Basic Chemical	10.54	Beverage, Tobacco	7.52
Basic Chemical	6.84	Rubber& Petrochemicals	5.30	Paper & Printings	6.60

II.2.B Spatial Concentration in Pre and Post Liberalization Period

In several empirical studies it has been claimed that the unevenness in regional growth in India is getting widened both in pre and post reform period. Ample evidences on this fact have been collected from the studies done by Ahluwalia (2000 and 2002), Nagaraj,(1998); Rao, Shand and Kaliranjan, (1999) and B.B. Bhattacharya and Sakthivel(2004). They have shown that with the high growth of GDP the regional disparity in per capita income has widened, especially during the decade of 90s. Polarization effect is strong in rich states. After the initiation of neo-liberal phase the public investment is susceptible to drastic reduction and private investment is getting concentrated in relatively well-off states. This section is mainly concerned with the issue of spatial concentration of registered manufacturing and linking with the growth of it. In a large number of studies on interregional imbalance of industrial growth (Deepak Gupta; A. Anuradha, AVVSK Rao 1995; D.V.S. Sastry & Ujwala R. Kelkar), it has been found that the regional concentration of industrial activities got reduced during 70s and 80s. This paper has attempted to analyze the trend of spatial concentration in manufacturing in two different time phases: pre-liberalization period (1980-81 to 1990-91) and post-liberalization period (1991-92 to 2000-01). The Hirschman-Herfidahl index calculated for all major 15 industries with respect to

both employment and gross value added (shown in Table-2.3c) shows that the regional spread of industrial activities was improved during the decade of 80s. The two H-H indexes graphed in Figure-2.1 and 2.2, reveal that the concentration had been declining slowly, gradually from 1980-81 to 1990-91 and then it became stable during the 90s. The fall in concentration is attributed to government's inclination towards more outward looking industrial policy from inward looking import-substituting policy. During this period the less developed states have improved much. This was reflected in growth rates of employment and gross value added (GVA). The gross value added registered manufacturing in Bihar, Kerala, Madhya Pradesh, Rajasthan and Orissa grew at overwhelming rates between 11% to 25%, while the growth rates in more industrially advanced states like Maharashtra, Gujarat, Tamil Nadu and Andhra Pradesh were relatively low between 5% to 7% (Table-1.7b). Although, the growth rate of employment showed very unimpressive picture for all states few less developed states like Kerala, Orissa and Rajasthan were in relatively better position[1]. During the 90s the degree of concentration also shows declining trend in respect of employment. On the contrary the H-H Index with respect to gross value added shows that the concentration did not change from 1980-81 to 2000-01 inspite of the achievement of the high growth rate of GVA by both developed and less developed states. This happened due to the fact that there had been a paradigm shift of India's economic policy away from state regulation to market orientation to make the economy compatible with globalization and liberalization environment. As the industrial policy has come out from its stringent regulatory framework, the growth rate in registered manufacturing got accelerated. This high growth rate was indeed reflected in initially developed states rather than relatively less well of states. The surge in private sector investment and FDI took

[1] Especially in 7th Five year plans (1985-90) the employment growth was recorded relatively high in all less industrially advanced states(Table-1.7C)

place in these states because of better industrial climate. Among the less industrially developed states the growth rates of employment and gross value added in Rajasthan, Uttar Pradesh and Kerala have been improved upon so much.

Table 2.3c: Spatial Hirschman-Herfindahl Index for Indian Manufacturing

Year	Employment	Gross Value Added
1980-81	10.22	11.19
1981-82	10.00	10.92
1982-83	9.92	10.62
1983-84	9.85	10.95
1984-85	9.75	11.18
1985-86	9.60	11.59
1986-87	9.66	11.28
1987-88	9.43	10.47
1988-89	9.47	10.85
1989-90	9.37	10.84
1990-91	9.40	11.19
1991-92	9.31	9.91
1992-93	9.33	11.36
1993-94	9.44	11.95
1994-95	9.36	11.18
1995-96	9.52	11.81
1996-97	9.39	11.15
1997-98	9.59	10.54
1998-99	9.81	11.14
1999-00	9.40	11.08
2000-01	9.47	10.98

The growth rate in registered manufacturing got accelerated. This high growth rate was indeed reflected in initially developed states rather than relatively less well of states. The surge in private sector investment and FDI took place in these states because of better industrial climate. Among the less industrially developed states the growth rates of employment and gross value added in Rajasthan, Uttar Pradesh and Kerala have been improved upon so much.

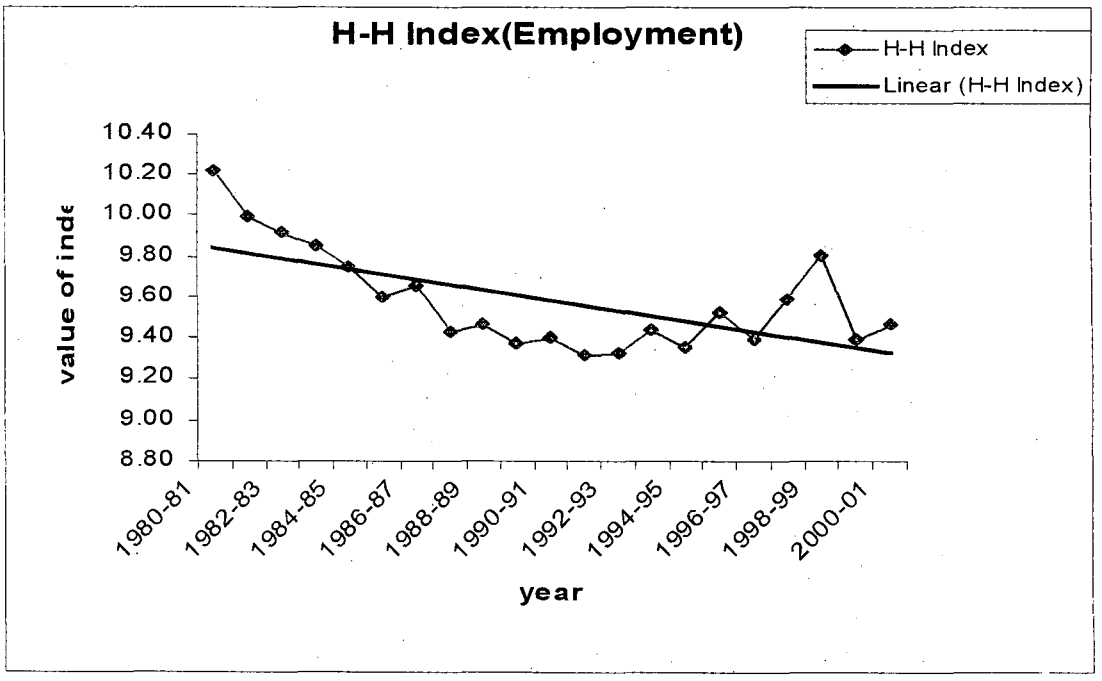

Figure 2.1

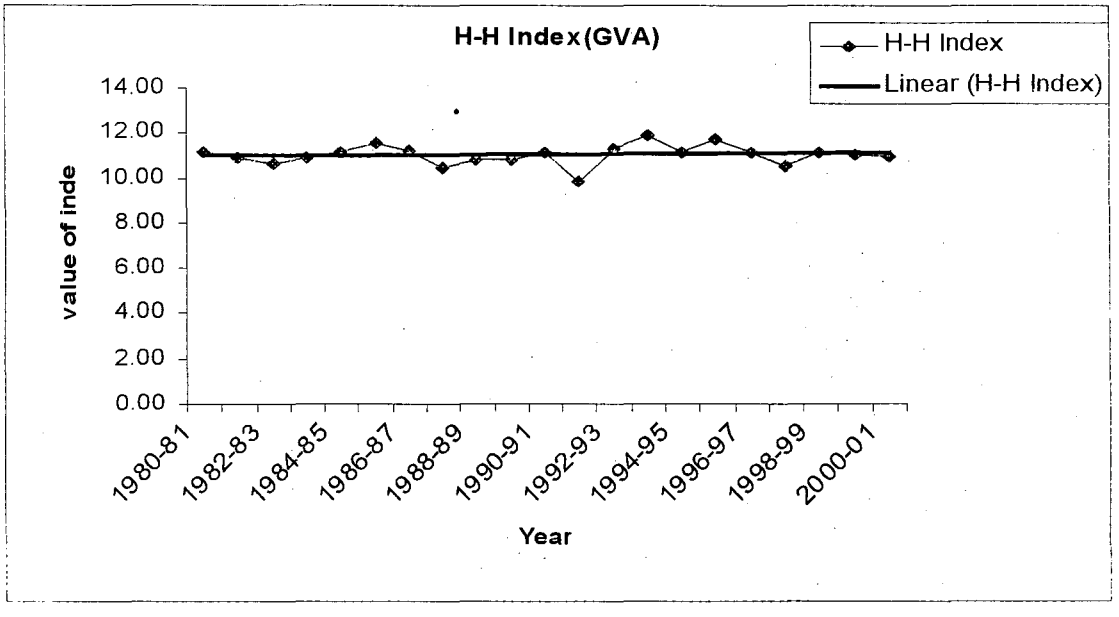

Figure 2.2

II.3 Conclusion

The space neutrality of industrial development is negligible in Indian manufacturing. The major share of value added, employment and other indicators that represent industrial activities are still occupied by the initially developed states Maharashtra, Gujarat, Tamil Nadu. The growth performance of registered manufacturing is somewhat favourable to spatial diffusion. The less developed states like Madhya Pradesh and Rajasthan have recorded significantly high growth rate. Kerala has improved upon slightly in the post 90s. The rapid growth performance of these states in the post liberalization may question the perpetuity of 'historical accident'.

Eastern region (West Bengal, Assam, Bihar and Orissa) is deteriorating over the period. But the overall picture of industrial growth shows that the gap between industrially developed and less developed states is declining. This is also observed in relative diversity of industries across the states. The states which are industrially advanced are the more industrially diverse. The diverse states experience high growth of value added and employment. In the post liberalization period industrial diversity has dispersed more.

In regard to sectoral analysis (i.e. industry wise) the regional spread of industries shows negligible change. Very few industries are spatially concentrated and during the 80s this concentration declined minutely, but in the decade of 90s it remains unchanged.

The industry wise growth performance across the states has acknowledged the fact that the industry which is more concentrated and specialized achieves high growth rates of factories, valued added and employment compared to its less concentrated & specialized counterpart.

The analysis of the trend of spatial concentration gives a contradictory result. The concentration of manufacturing with respect to employment has shown declining trend, while with respect to value added it is still prominent in Indian registered manufacturing. This may be due to the variation of returns to scale, efficiency and productivity which are discussed in details in the next chapter.

Chapter III

An Inter-State Analysis of Returns to Scale, Technological Progress and Cumulative Causation in Manufacturing Industries in India: Productivity & Efficiency

The detailed analysis in the preceding chapter reflects that, even after fifty years of Independence, despite achieving high growth rate in manufacturing sector, the regional imbalances in this sector has not yet narrowed down as expected. The study shows that the western region, chiefly Maharashtra & Gujarat, experienced higher degree of industrial development with respect to various indicators[1]. It has also been observed that these states together accounted for approximately 35% of India's manufacturing gross value added and 14% of India's total manufacturing employment in 2000-01. Along with these two states Tamil Nadu, Karnataka and Andhra Pradesh have turned up with significant share of gross value added and employment in national aggregate. The industrial development of Northern India is also reflected in the rapid growth of industrial activities in Haryana and Punjab. On the other hand one of important industrial belt in Eastern region West Bengal has been loosing its prominence gradually since eighties.

Till now the study of regional distribution of industrial growth has reached at such a juncture wherefrom the most possible and certain question that needs to be further investigated is the

[1] Indicators considered are number of factories, fixed capital, number of employees, gross value added, real wage rate etc.

underlining rationale for the polarization of industrial growth. This section tries to analyze the causes of this polarization in these particular regions under the theoretical foundation of 'new economic geography', which assess the causes of concentration in terms of interrelation of three parameters: increasing returns to scale, transport cost and demand for manufacturing (Krugman 1993a, 1993b & 1996 and Krugman, Fujita and Venables, 1999).

Increasing returns to scale is an important prerequisite for spatial concentration of industries. However, economies of scale are not properly derived if transport cost is high. Close proximity to factors of production with better physical infrastructure reduces transport costs. When suitable levels of transport costs and increasing returns are attained, manufacturing producers start concentrating in those areas where initial demand for their products are relatively high. The externalities generated from both demand and supply sides ("backward and forward linkages" in Hirschman, 1958) create reinforcing forces, which further attract industries. The process of this self-reinforcing of spatial concentration is called "cumulative causation" (Myrdal, 1957).

The underlying theory of endogenous growth models (Arrow, Romar, et.al) based on technological knowledge spillover and increasing returns to scale can be used to analyze the cause of cumulative growth cycle. The endogenous growth theories explain that dynamism in economic growth can be achieved by improving technological progress, knowledge spillover, i.e., increasing returns to scale is *sine-qua-non* for fostering economic growth. The technological progress and increasing returns to scale increase the growth of output which in turn raise the growth of productivity of factors used in production, resulting cumulative causation in manufacturing sector.

The role of transport cost and local demand for manufacturing has been discussed theoretically in this study. How far regional variation of returns to scale, technological progress, technical efficiency and multifactor productivity attributes cumulative growth differences across the states has been investigated empirically in this study.

The estimation of returns to scale, technological progress, technical efficiency and multifactor productivity are described in section-1. Section-2 explains the regional variation of cumulative growth cycle.

III.1 Measurement of Returns to Scale, Technological Progress and Technical Efficiency and Multifactor Productivity Index: A Stochastic Frontier Production Function Approach

The term returns to scale establishes the relation between a proportional increase in inputs and corresponding proportional changes in output.

In production function approach, the economies of scale or increasing returns to scale is calculated by calculating the sum of partial elasticity of output with respect to capital and labour. If the sum is grater than one, the industry is enjoying increasing returns to scale; equal to one, then constant returns to scale and less than one implies decreasing returns to scale.

In the traditional neoclassical theory, the contribution of technological progress in output growth is defined as the residual after accounting the contribution of labour and capital (cited in J.J. Thomas, 2003).

According to production frontier model when technological progress (or regress) occurs, the production frontier shifts outward or

inward. The maximum feasible and efficient output is obtained along the frontier. But in reality not all firms produce along the frontier. Production points are generally found below the frontier. This discrepancy occurs due to inefficiency in production process. The greater the distance between frontier and the production point, the larger the inefficiency in production system. Alternatively, technical efficiency occurs as this distance decreases.

Here, economies of scale or increasing returns to scale, technological progress and technical efficiency are calculated by estimating stochastic frontier production function (both in Cobb-Douglas and Translog specification).

Aigner, Lovell and Schmidt (1977) initially developed stochastic frontier specifications of production functions. The advantage of using this model is that it considers the importance of random disturbance term and also measures the inefficiency of the firms, while in 'deterministic model' the discrepancy between frontier and production point is only attributable to the production inefficiency; the effect of random exogenous shock is completely ignored.

Stochastic frontier model has been widely used in individual or firm level (concerned more microeconomic topics) to examine the efficiency. For example, Battese and Coelli (1992) employed the stochastic frontier model to examine the time varying efficiency levels of paddy farmers in India. Piesse and Thirtle (2000) estimated efficiency gains in Hungarian agricultural and manufacturing firms during the transition away from communism using translog stochastic frontier production function[1]. The application of it in firm level has been discussed theoretically in Kumbhakar and Lovell (2000).

[1] Jenifer Piesse and Colin Thirtle(2000), "A Stochastic Frontier Approach to Firm Level Efficiency, Technological Change, and Productivity during the Early Transition in Hungary", Journal of Comparative Economics. Vol.28, issue 3, pages-473-501

However, recent studies have also applied stochastic frontier estimation to compare efficiency differences across countries or across regions within a country. Wu (2000) has applied this model to examine Chinese regions so as to distinguish efficiency gains from technological progress and determine whether Chinese growth is sustainable. Gumbau-Albert (1998) measures inefficiency across Spanish regions and Gumbau-Albert (2000) considers to what extent efficiency gains can explain convergence within Spain after 1964. Osiewalski et al (1998) claim that output growth in Poland was due to gains in efficiency as reform pushed production towards the frontier. Adkins et al (2002) estimate technical efficiency across a wide sample of countries and examine its relationship with measures of institutions and political freedoms.

Perhaps stochastic frontier model is more compatible with specifying production functions for firms as opposed to aggregate production functions for entire regions.

Although not using stochastic frontier estimation, regional variation of productivity can be estimated by following the idea of Solow's decomposition of output growth into increases in inputs and productivity growth from economy wide production function.

This procedure has been replicated for many other countries, time periods, and sets of inputs, which Barro and Sala-I-Martin (1995, chapter 10) summarizes. Hall and Jones (1999) break down output differences across countries to differences in input quantities and differences in productivity and then try to explain why worker productivity differs across the world. Such studies are important because breaking down economic growth into capital accumulation and productivity can be quite relevant for how we interpret output growth. Neoclassical growth models such as the Solow Model predict

that output per capita growth driven solely by the accumulation of inputs is not sustainable due to diminishing returns. For growth to occur in the long run, inputs must continue to become more productive. Decomposing output growth into its constituent parts helps us to not only understand why growth occurs but derive future implications regarding whether this growth is sustainable. However, an important disadvantage of using the Solow (1957) approach is that it does not distinguish between technological progress and efficiency gains as to why productivity is changing. Distinctions between the two can be quite important. Efficiency gains are not sustainable without technological progress since they cannot occur once the frontier is reached. Therefore, a benefit of applying stochastic frontier estimation to macroeconomic data is that it can help us better understand why productivity changes over time.

It seems better to apply this methodology across Indian states. The stochastic frontier methodology assumes that the same frontier applies to all observations since the distance from this frontier determines inefficiency. If efficiency levels do not differ across states, then these varied characteristics are not strong enough to cause inefficiency to vary across regions. On the other hand, varying efficiency levels would imply that these regional differences are not trivial and that even in a domain having a common national economic policy and similar institutions, regional differences in efficiency can still occur.

Empirical Estimation of Stochastic frontier production function: Panel Data Analysis

This study tries to estimate time varying technical efficiency, technological progress by adopting Battese and Coelli's approach. The Cobb-Douglas production function is more compatible with Indian

manufacturing data structure[1]. Here ratio form of Cobb-Douglas production function is employed. The production function is given below.

$$\ln (Y_{it} / L_{it}) = a + \beta \ln (K_{it} / L_{it}) + (\alpha + \beta - 1) \ln L_{it} + \lambda T + U_{it} - V_{it} \quad .....(1)$$

Y refers to gross value added, L to labour (number of employees), K to gross fixed capital, and t refers to time.

t = time period 1980-81 to 2000-01
i = 13 major 2 digit industry

The same production function is also employed for each industry across the states (i.e i= 15 major states).

Here, the returns to scale is obtained by estimating the value of $(\alpha + \beta - 1)$. If $\alpha + \beta - 1 > 0$ increasing returns to scale; $\alpha + \beta - 1 = 0$, constant returns to scale; $\alpha + \beta - 1 < 0$, decreasing returns to scale. Technological progress is assumed to be Hicks-Neutral.

$U_{it} = \{\exp[-\eta(t-T)]\}Ui$ and $V_{it} \sim N(0, \gamma^2)$

Here lnk and lnl are natural logarithm of capital and labour. U_{it} measures inefficiency. In which the term η is decay parameter to be estimated; U_i is assumed to follow $N(\mu, \sigma_u^2)$ distribution truncated at zero. V_{it} is identically and independently distributed and often referred to as idiosyncratic error (which measures random shocks). The technical efficiency (TE) of industry i at t point of time is obtained from the following form: $TE_{it} = \exp(-Uit)$; which equals 1 when the industry attains perfect efficiency and equal to zero for complete inefficiency.

The production function has been calculated for 13 major industries and for 15 major states. To find the returns to scale of each

[1] Arup Mitra,1989

state, a panel regression for each state across 13 major industries over 21 years (1980-81 to 2000-01) has been done. Similarly the return to scale for each industry has obtained by estimating panel regression for each industry across the 15 major states over 21 years (1980-81 to 2000-01). These 13 industries are only registered manufacturing industries. In the previous chapter the metal & machineries (34+35+36) and miscellaneous (38) have been taken separately, but here to check the efficiency level of all the machinery sector the miscellaneous industry has been clubbed with metal & machineries. Due to large number of missing data the beverage tobacco industry (22) is clubbed with food and food products (20-21); textile wears & apparel (26) is merged with textile & jute industry (23+24+25); leather industry (29) is not considered for Assam. For Kerala and Orissa, leather (29) industry has been clubbed with wood (27), paper (28) industry and the three industries have been considered as one unit (27+28+29). In industry wise panel data analysis, for a particular industry, the states which have large number of missing data haven deleted from the panel data set.

Here, to estimate the stochastic frontier production function for panel data, Stata 8.1 version has been used. In this version of Stata, Battese-Coelli (1992) parameterization of time effects (time-varying decay model) is followed. Each of the linear restrictions of the production function has been tested by Likelihood Ratio Test. All the regression results are shown in Annexure.

III.2A Returns to Scale and Technological Progress: variations across states

Productivity differs across the regions due to 'economies of scale' and technological progress (J. J. Thomson 2003). To compare the variation of 'returns to scale' across the 15 major states, Cobb-Douglas (CD) of each state has been estimated using pooled time

series and cross-section data, pertaining to the 13 major industries of each state. The reference period chosen for analysis is from 1980-81 to 2000-01.

The Table-1 shows that except Haryana, West Bengal, Gujarat and Madhya Pradesh, all the major states have constant returns to scale[1]. The 'returns to scale' is estimated by the sum of factor elasticity of output. Table-1 also reveals that both the capital and Labour elasticity of output are low (i.e., both α = capital elasticity of output; β = Labour elasticity of output are less than 1) in all the 15 states. Comparing to capital elasticity of output, labour elasticity of output is relatively high. The lower values of α explain that change in technological progress is very low implying per unit increase in fixed capital does not have much effect on output increase. Having relatively high Labour elasticity of output (β = 0.83) Gujarat and Madhya Pradesh are accruing the benefit of increasing returns to scale. Among the 15 major states only Bihar, Haryana, Kerala and West Bengal have very low elasticity of output with respect to Labour; the rest of the other states have relatively high β values. These three states are suffering from decreasing returns to scale.

The percentage changes in technological progress of the 15 states are also given in Table-1. Maharashtra, Tamil Nadu and Rajasthan have shown relatively faster rate of changes in technological progress among the 15 major states. The percentage changes in technological progress obtained for Assam (2.40%) and Kerala (-0.13%) are statistically insignificant.

[1] But J. J Thomas in his paper estimated the Cobb-Douglas production functions and he found potential economies of scale in Maharashtra, Gujarat, Tamil Nadu, Punjab, Rajasthan and Madhya Pradesh and constant returns to scale in rest of the states from 1979-80 to 1997-98.

Table 3.1: Estimation of Returns to Scale& Technological Progress (Cobb-Douglas Production Function)

States	Elasticity of output with respect to capital	Elasticity of output with respect to labor	Returns to scale	Technological Progress (%)
Andhra Pradesh	0.17	0.75*	CRS	0.60
Assam	0.29	0.70*	CRS	2.40*
Bihar	0.38	0.43	DRS	0.31
Gujarat	0.30	0.83	IRS	0.32
Haryana	0.42	0.48*	DRS	0.40
Karnataka	0.23	0.73*	CRS#	0.44
Kerala	0.21	0.43	DRS	-0.13*
Madhya Pradesh	0.36	0.83	IRS	0.34
Maharashtra	0.28	0.78*	CRS#	1.52
Orissa	0.39	0.66*	CRS#	0.53
Punjab	0.21	0.79*	CRS#	0.21*
Rajasthan	0.35	0.66*	CRS#	0.65
Tamil Nadu	0.36	0.70*	CRS#	0.92
Uttar Pradesh	0.31	0.59*	CRS#	0.48
West Bengal	0.32	0.56	DRS	0.34

* this value is not significant at 5% level.

the returns to scale shown in the table does not reject the null hypothesis for constant returns to scale by Likelihood ratio test.

Policy makers have tried to impact upon the technological progress from 80s. During the early 80s when government had shown quite liberal attitude in policy making, the technological progress in all the 15 major states especially in Bihar, Maharashtra, Karnataka and Andhra Pradesh was quite satisfactory. This happened because of high growth of capital accumulation in the abovementioned states in 6th Five-year plan (Table-1.7B).

However, regional imbalance in growth of manufacturing output and capital accumulation undertaken through various policies of government over the years has to be analyzed in terms of efficiency and multifactor productivity growth. This is because; long run sustainability in output growth is dependent on both factor accumulation and efficiency[1]. To analyze in details this phenomenon it is, therefore, need to calculate technical efficiency and growth of multi factor productivity across the industries for all major 15 states.

III.2B Regional Variation of Multifactor Productivity Growth

Multi factor productivity (MFP) growth represents efficiency in production in more complete manner. It measures the combined effects of changes in technological progress, improvements in organizational structure, management practices, worker management, workers management relations as well as the diffusion of technology across firms other than Labour and capital productivity. It is obtained by subtracting the combined growth rate of two factor inputs (labour & capital) from the growth rate of output.

The results are given in Table-3.2.[2] The results show that the estimated translog index of MFP for each state declines rapidly after

[1] Young (1992) in one study on factor accumulation and technical change comments that economic growth is largely driven by factor accumulation. On the contrary Krugman argued that an economy cannot continue increasing factor inputs indefinitely to raise output without increase in efficiency.
[2] See Annexure

liberalization period. According to T. Besley and R. Burgess (2002) pro-worker amendments to the Industrial Disputes Act are associated with lowered investment, employment and productivity and output in registered manufacturing. Granting excessive bargaining power to organized Labour blunted investment climates. The fall in growth rate of MFP in West Bengal may be due to this pro worker Labour regulation because this state adopted maximum number of pro worker amendments[1].

In the post liberalization period the average growth rate of MFP is found to be negative in Assam, while in the other states such as Karnataka, Orissa, Punjab, Tamil Nadu and West Bengal it is significantly low. Goldar and Veeramani (2004) in their study on investment climate and total factor productivity have shown that poor investment climate is an important factor for low total factor productivity. It is clearly manifested in their paper that the Labour market flexibility, access to finance, availability of infrastructure are crucial for improving industrial productivity and overall growth.

It is clear from the above analysis that the states which are industrially developed since long past have higher multi factor productivity than those of the poorly developed states. Important conclusive evidence explored from this analysis founds that states like West Bengal and Bihar where a significant amount of public sector investment had taken place have been loosing their ground since 80s.

III.2C Returns to Scale and Technological Progress: variations across Industries

How far economies of scale and technological change account for industrial concentration is empirically judged in this study. The

[1] Timothy Basely and Robin Burgess,(2002) : CEPR Discussion Paper No. 3260

industries, which are highly concentrated, have increasing returns to scale in production and faster growth in technological progress (New Economic Geography postulations). In this section the analysis is done on the basis of variation of return to scale and technological progress across the industries according to the ranked gross value added Hirschman-Herfindahl Index[1]. The calculated spatial Hirschman-Herfindahl index as a measure of industrial concentration shows that leather (29), textile wear &apparel (26) and basic metal & alloys are more concentrated industries in Indian manufacturing. The leather is dominant in Tamil Nadu, Uttar Pradesh and West Bengal partly. The results obtained from Cobb-Douglas stochastic frontier production function reveals that these industries have constant returns to scale (Table-3.3). Technological progress is also found to be relatively low for these industries.

Beverage & tobacco (22) is one of the concentrated industries experiences decreasing returns to scale with relatively lower technological progress. Metal, machinery & miscellaneous (34+35+36+38) and transport industries (37) enjoy increasing returns to scale, while technological progress is found very low. The rest of the industries are found to have constant returns to scale.

The above analysis clearly indicates that most of the registered manufacturing in India shows constant returns to scale and experiences with very low technological progress. The interplay of concentration and economies of scale is not as significant for many states and industries in India as postulated in 'new economic geography'.

[1] see Table-2.2b in chapter-II, page-

Table-3.3 Economies of Scale and Technological Progress across Industries

INDUSTRY	Elasticity of output w.r.t capital	Elasticity of output w.r.t labor	Returns to Scale	Technological Progress (%)
Food products(20-21)	0.50	0.45	CRS	17.46
Beverage & tobacco(22)	0.31	0.49	DRS	0.32
Textile(23+24+25)	0.42	0.63	CRS	0.24
Textile wear & apparel(26)	0.49	0.58*	CRS#	0.002*
Wood(27)	0.37	0.70*	CRS#	-29.43
Paper, printing(28)	0.11	0.94*	CRS#	-0.31*
Leather(29)	0.17	0.85*	CRS#	0.04
Basic chemical(30)	0.27	0.59*	CRS#	0.81
rubber, petrochemical(31)	0.34	0.77*	CRS#	0.33
Non-metallic(32)	0.23	0.72*	CRS#	0.49
Basic metal & alloys(33)	0.31	0.68*	CRS#	0.35
Metal, machine & miscellaneous(34+35+36+38)	0.40	0.70	IRS	0.18
Transport (37)	0.34	0.80	IRS	0.12

* The values are not significant. at 5% level

the returns to scale shown in the table does not reject the null hypothesis for constant returns to scale by Likelihood ratio test.

III.2D Variation in Technical Efficiency across the States and Industries

Technical efficiency is the efficiency with which factors of production are combined to generate output. Technical efficiency combined with technological progress makes the manufacturing sector to attain sustainable growth. In the previous section it is observed that the technological progress for major 15 states turns out to be perceptibly low. The average technical efficiency level across the

industry and the states in registered manufacturing is found to be quite impressive.

Table 3.4: Maximum Efficiency : Industry, Top Three States

Industry	**1980-81 to 2000-01**
INDUSTRY	**States**
Food & Food Products(20-21)	PUN, MAH, ASM
Beverage, Tobacco(22)	UP, KAR, BHR
Textile(Cotton, Jute, etc)(23+24+25)	MP, KAR, RAJ
Textile Wear & Apparel(26)	PUN, HAR, MAH
Wood & Wooden Products(27)	HAR, MAH, AP
Paper, Printings(28)	KER, MAH, HAR
Leather & Leather Products(29)	MP, HAR, MAH
Basic Chemicals(30)	MAH, GUJ, KER
Rubber & Petro-chemicals(31)	ASM, MAH, GUJ
Non-metallics(32)	TN, MP, MAH
Basic metals & Alloys(33)	MP, BHR, KER
Metal, Machineries & other miscellaneous(34+35+36+38)	MP, MAH, RAJ
Transport(37)	MAH, HAR, BHR

Beverage tobacco (22), paper& printing (28), leather (29), basic chemical (30) and rubber& petrochemical (31) industries are suffering from low technical efficiency for maximum number of states. Table-3.5[1] shows that Punjab, Maharashtra and Assam attain maximum level of efficiency in food (20-21) industry and the average efficiency level is above 0.9. The beverage tobacco (22) which is the second highest concentrated industry with respect to ranked gross value added Hirschman-Herfindahl Index, is found to have high technical efficiency in Uttar Pradesh, Karnataka and Bihar and the level of efficiency is around 0.85. But according to the ranked gross value added location quotient (see Table-2.3b; chapter-2) beverage tobacco (22) industry is mainly concentrated in Andhra Pradesh, but efficiency level of this industry in Andhra Pradesh is very low (TE = 0.36). Textile industry (23+24+25) is one of the major and growing industries in

[1] See Annexure

India and it shows high level of efficiency in all the 15 major states and the average efficiency level is 0.80. The maximum level of efficiency of this industry is found in Madhya Pradesh, Karnataka and Rajasthan. Textile wear & apparel industry is also an efficient industry across the states. Punjab, Haryana and Maharashtra are the top three states according to efficiency level. Basic metal& alloys (32) and Nonmetallic (33) industries are efficient in mineral rich states Tamil Nadu, Madhya Pradesh, Maharashtra, Bihar and Kerala. Metal& machineries including miscellaneous industries (34+35+36+38) and Transport industry have shown maximum level of efficiency throughout India. For machineries (34+35+36+37) among the 15 states Madhya Pradesh, Maharashtra and Rajasthan and for the later Maharashtra, Haryana and Bihar have attained maximum level of efficiency.

From the above analysis it is observed that the two most concentrated industry beverage tobacco (22) and leather (29) industries are not highly efficient in the region where they are particularly concentrated. This may be due to the fact that the beverage & tobacco industries have decreasing returns to scale and technological progress in this industry is low (0.32). The technological progress in leather industry (29) is very low (0.04%). The regional spread of textile wear & apparel (26) and basic chemical (30) are also very low and maximum level of efficiency is gained in those states where these industries are concentrated. This supports the stylised fact that specialization helps to attain high level of efficiency.

It is also observed in Table-3.5 that except metal& machineries (34+35+36+38) and transport (37) technical efficiency in all other industries has declined during the post 90s.

III.2E Variation of Technological Progress and Multifactor Productivity growth across the Industries

Among the 15 major industries only food products (20-21) industries have high technological progress (17.46%). All other industries are suffering from low technological progress. Even wood (27) and paper & printings (28) industries turn out to have negative technical change, i.e., regressive technological change.

A steep fall in multifactor productivity growth is observed almost in all industries during the post 90s . In Table-3.2, it is found that Assam has experienced negative multifactor productivity growth. This accounts for abnormal fall in MFP growth of four major industries (food products, rubber& petrochemical, non-metallic and wood). In Assam during the decade of 80s the three major and concentrated industries- rubber& petrochemical, food and wood experienced significantly high rates growth of MFP (13.20%, 13.88%, and 14.68% respectively). But during the 90s these growth rates turned to be negative. It is earlier told in section-3.2.2 that Karnataka, Orissa, Punjab, Tamil Nadu and West Bengal also had poor growth in MFP. In Karnataka leather, basic chemical, nonmetallic, rubber& petrochemicals industries have witnessed negative growth rate of MFP. Beverage& tobacco industries are found to have negative growth of MFP in Orissa and Punjab; Textile in Orissa and Rajasthan; Wood in Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Kerala, Madhya Pradesh, Orissa, Rajasthan, Tamil Nadu and West Bengal; Paper & printings showed negative growth in Haryana, Madhya Pradesh, Orissa, Punjab and Uttar Pradesh. Punjab experienced negative growth rate in beverage tobacco, wood, paper& printing, basic metal & alloys and transport (major and most concentrated industry in Punjab) industries. In Tamil Nadu, wood,

leather and basic chemical industries are found to have negative growth. Leather and Basic chemical occupy a significant share in manufacturing sector in Tamil Nadu. In West Bengal, negative MFP growth is observed in food products, wood, non-metallic and transport industries.

The above data analysis clearly reveals that wood, basic chemical, rubber& petrochemical, transport, beverage tobacco industries have experienced poor growth performance in multifactor productivity, though these industries have high level of technical efficiency.

From the location quotient (Table-2.3b) it is found that the beverage& tobacco (22) industries are concentrated in Andhra Pradesh. The MFP of this industry in this state is also very low relative to the other industry. An important reason may be due to low investment ratio[1] (shown in Table-3.6).[2] In comparison to other industries the investment ratio in the beverage & tobacco (22) industries is quite low and during the 90s it has declined rapidly, while textile industry (23-25), textile wear (26) and paper & paper products, basic chemicals (30) which are not concentrated in Andhra Pradesh have very high multifactor productivity both in pre and post liberalization period. In Gujarat the most concentrated industry is basic chemical (30), followed by textile (23-25) and non-metallic mineral products (32). The share of employment in chemical industry (shown in Annexure) in Gujarat is 25% of total employment and 24 .4 % of total employment in this particular industry at the national level. In respect of gross value added the share is 33.4 per cent. This industry still shows constant returns to scale .The multifactor productivity index for this industry is at average level during 80s but it has declined rapidly in the post 90s. The next concentrated industry

[1] Investment ratio = gross fixed capital formation as a percentage share of total output)
[2] See Annexure

in Gujarat is textile (23-25). Here this industry is also unable to derive the benefit of economies of scale. Textile industry in all India level shows constant returns to scale. The average investment ratios of these two industries in Gujarat are significantly high in both pre and post liberalization but the profit share (shown in Annexure-VI) in gross output in textile (23-25) was very low during 80s and even negative in post liberalization period. This might be due to industrial disputes occurring in Gujarat. The maximum number of strikes, lockout and man days lost took place in textile; chemical, engineering and coal mining industries and West Bengal, Gujarat, Tamil Nadu and Andhra Pradesh are worst affected.[1]Despite the fall in technological progress, the textile and chemical industries have shown commendable performance in respect of growth of gross value added during the 90s[2].

In Maharashtra metal machinery & machine tools (34-36) and other machineries (38) are highly concentrated. Rubber and petro-chemical industry is also relatively clustered in Maharashtra. In all India level the machinery and machine tools are showing increasing returns to scale but in Maharashtra this industry it has constant returns to scale.

MFP growth in these particular industries is relatively high in comparison to other industries. In the decade of 90s the MFP growth has shown declining trend.

It is found form the above analyses that multifactor productivity growth is recorded high in most of the industries and in all the states. During the 90s it has fallen drastically. Over the period from 1980-81 to 2000-01 both the technological progress and multifactor

[1] Ministry of Labour/ annual report 2003-04; chapter-03.
[2] shown in Table-1.7D in chapter-II page

productivity growth have been noticed relatively high in developed states. But few developed states have come up in this regard.

III.3 Cumulative Causation and Industrial Concentration

Cumulative cycle of growth differences across the regions can be shown with help of rank correlations between (i) the rates of growth of value added and labour productivity, (ii) the rates of growth of labour productivity and wage share, (iii) the rates of growth of value added and fixed capital stock.

Table 4: Rank Correlations

	1980-81to 1990-91	1991-92 to 2000-01
Growth rate of GVA and Labour Productivity	0.618**	0.574**
Growth rate Labour Productivity and share of Total Emoluments	0.06	-0.193
Growth rate of Fixed Capital and GVA	0.644*	0.606**

- Significant at 1% level. ** Significant at 5% level.

The growth rates of GVA[1] and labour productivity (shown in Table-5) of the developed states are found to be relatively lower than that of industrially backward states since 80s. This increasing trend of growth rates in less developed states is reflected in rank correlations.

Table:-5 Growth of Labor Productivity

States	1980-85	1985-90	1992-97	1997-2001	1981-91	1991-01
Andhra Pradesh	8.14	-3.85	5.85	6.17	-1.19	4.80
Assam	-2.14	5.09	3.00	1.95	5.07	5.78
Bihar	9.95	5.04	3.40	-7.35	7.54	9.13
Gujarat	6.62	7.10	5.98	7.63	7.09	3.96
Haryana	0.15	7.05	1.20	8.06	8.08	6.29
Karnataka	6.65	15.29	5.66	7.89	3.11	7.14
Kerala	-1.70	7.18	7.38	10.08	8.41	9.12
Madhya Pradesh	3.64	11.32	7.06	11.33	8.21	6.81
Maharashtra	8.60	7.84	5.28	9.18	7.29	2.75
Orissa	-2.03	12.11	0.76	10.21	5.32	3.71
Punjab	3.27	8.94	1.89	1.33	6.95	8.81
Rajasthan	2.47	9.26	8.38	7.39	3.09	6.32

[1] See Table-1.7b chapter-II

Tamil Naru	3.07	3.11	8.26	8.40	11.54	7.44
Uttar Pradesh	16.95	10.43	8.08	6.78	5.61	10.59
West Bengal	2.28	4.20	6.41	19.70	7.38	7.52
All India	6.86	7.46	6.38	8.55	3.82	7.44

The rank correlation coefficient is found to be positive but not very high. Again, the rank correlation has declined during post 90s. The similar result is obtained in cases of growth rates of fixed capital and GVA. The rank correlation here also has declined in the post liberalization period. This simply implies that the backward states are in the initial phase of growth path and since the resource utilization is far below from the full capacity utilization, the growth rates are found to be positive and relatively higher than those of the developed states. The declining growth rates of developed states coupled with faster growth rates of less developed states are reducing the cumulative cycle of growth differences. Myrdal's view of cumulative causation, which considers both backwash and spread effects, fits well in this case. Though spread effect is very little and the backwash effect is dampening it, the spread effect has been initiated in Indian manufacturing across the states. The reason for this faster growth can also be explained by the rank correlation between growth rate of labor productivity and the share of total emoluments in GVA. As productivity improves, it is obvious that the income share of labour will decline. In the post liberalization period this share has declined in developed states as well as in less developed states.

III.4 Conclusion

From the above analysis it can reasonably be concluded that the spatial inequality of Indian manufacturing is partly the result of variation of returns to scale, technological progress and multifactor productivity growth. Technological progress and multifactor productivity growth are found relatively high in developed states. In the earlier studies it has found that the developed states in India had

increasing returns to scale and industrially backward states had constant returns to scale, but during the 80s the backward states have fallen in high growth path and naturally they also start to enjoy economies of scale (for instance Madhya Pradesh is enjoying increasing returns to scale). Technical efficiency is found to be high for developing states like Rajasthan, Madhya Pradesh). The impact of liberalization on technical efficiency across the states and industries are not impressive in most of the cases it has declined. The technological progress is found relatively lower. The multifactor productivity growth shows a declining trend. The lower technological progress may be the cause of lower multifactor productivity growth.

Cumulative growth difference across the states exists but it has declined due to faster growth of multifactor productivity in less industrially developed states. How far it depends on the regional variation of economies of scale and is questionable in Indian registered manufacturing.

Chapter IV

Conclusion

This study is an attempt to analyze the regional imbalance of industrial growth and productivity in India by examining the role of economies of scale, technological progress, technical efficiency and cumulative causation. The broad descriptive analysis of Indian registered manufacturing sector has clearly revealed that Maharashtra, Gujarat and Tamil Nadu are still occupying the country's major share of value added; while the state like West Bengal is loosing its prominence. Assam, Orissa, Kerala and Bihar are unable to come out from the vicious circle of low level of industrial growth. Uttar Pradesh and Madhya Pradesh, Karnataka, and Rajasthan have improved their share in national aggregate significantly. Regarding employment share Maharashtra is in the top position and Uttar Pradesh, Tamil Nadu Andhra Pradesh and Madhya Pradesh are in quite better position. A drastic fall in employment share has occurred in West Bengal during the decade of 90s. This improvement in share in both gross value added and employment in these states reasonably conclude that these states have fallen in the path of rapid industrialization and impact of liberalization is in favour of this. The comparative growth analysis has also supported this view. The 80s was the decade of jobless growth and the industrially developed states Maharashtra, Gujarat experienced negative growth rate along with Bihar, Kerala and West Bengal. During the decade of 90s all states have enjoyed positive employment growth rate other than Orissa, Assam, Uttar Pradesh, West Bengal and Bihar. Along with Maharashtra and Gujarat Kerala has improved in employment growth during the era of liberalization. Punjab, Rajasthan, Haryana, Tamil

Nadu and Madhya Pradesh are in better position both in pre and post liberalization. This faster growth of both gross value added and employment in Rajasthan, Madhya Pradesh, Haryana coupled with falling performance in West Bengal, Assam, Bihar, Orissa clearly entails the fact that the cumulative growth cycle has been started.

Indian Manufacturing is still spatially concentrated in the both pre and post liberalization period. The states like Maharashtra, Tamil Nadu, Karnataka, Punjab and Madhya Pradesh are attracting more and more capital, raising production, generating employment and thus, creating a strong industrial base which again attracts other industries. These states have become more diversified (industry mix) in industrial growth. Relative diversity indices of all major 15 states have revealed this fact. The industrially less developed states like, Assam, Orissa and Bihar are more specialized in few number of industries. The diversified industrial growth is found to be an indicator of industrial development of a state. The process of diversification across the states in industrial growth has been increased in the decade of 90s.

Geographical concentration of a particular manufacturing and industrially diversified states are complementary to each other in India. Leather & leather products (29) and beverages & tobacco products (22) and basic chemical & chemical products (30) are the most concentrated industries in India. The values of location quotient have shown that these industries are specialized and concentrated industrially diversified states like Tamil Nadu, Uttar Pradesh, Andhra Pradesh, Punjab, Gujarat, and Maharashtra.

During both the decade of 80s and 90s the concentration of Indian manufacturing with respect to employment has shown declining trend, it has remained unchanged in both the periods.

This study has also tried to link between spatial concentration of manufacturing and returns to scale, technological progress, technical efficiency, and multifactor productivity. Very few states have reaped the benefit of scale economics. Among the 15 major states except Bihar (DRS), Gujarat (IRS), Haryana (DRS), Madhya Pradesh (IRS) and West Bengal (DRS) have constant returns to scale. The existence of 'increasing returns to scale' and its resultant effect of rapid growth in manufacturing (Kaldor's view of cumulative causation) are prominent in Gujarat and Madhya Pradesh. The poor industrial performance in Bihar, West Bengal and Kerala is due to the fact that these states are suffering from 'decreasing returns to scale'. Variation of returns to scale in Indian registered manufacturing across the states is, therefore, an important factor for explaining spatial inequality.

A mix result has been explored in regard to technological progress, technical efficiency. Textile wear & apparel and Basic chemical & chemical products which are also relatively highly concentrated industries attain relatively high level of technological progress and technical efficiency. While, beverage & tobacco product which is one of the major concentrated industries in India (especially in Andhra Pradesh where it is geographically concentrated), attains relatively low level of technological progress and technical efficiency. Again textile (23+24+25), metal, machine tools& miscellaneous (34+35+36+38) and transport industries have high level of efficiency but are not geographically concentrated. Concentration is, therefore, not necessarily a predominant factor for attaining efficiency.

The spatial inequality in Indian industries is also reflected in multifactor productivity growth. Multifactor productivity growth, which measures the combined effects of changes in technological progress, improvements in organizational structure, management

practices, worker management, workers management relations as well as the diffusion of technology across firms other than Labour and capital productivity, is recorded relatively high in initially developed states, but few less developed states have also experienced high growth of multifactor productivity. The rapid growth of multifactor productivity for all states took place in the decade of 80s, but it has shown a declining trend in the era of post liberalization for all states. The multi factor productivity growth might be the cause of high growth of valued added in the decade of 80s and it can be inferred that this growth of MFP are responsible for reduction in spatial inequality during this period. But in the post-liberalization period due to relatively lower growth of multifactor productivity in less industrially developed states spatial concentration of registered manufacturing with respect to value added has remained unchanged.

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Annexure 1

Likelihood Ratio Test (LR)

This test is based on the distance between the log-likelihood function evaluated at the ML and the RML estimators. Thus, it is defined as:

$$LR = 2[\ell(\tilde{\theta}) - \ell(\tilde{\theta}_R)] \quad \text{..... (1)}$$

which, under the null hypothesis .The equation is asymptotically distributed as a χ^2_q This result is obtained through a Taylor expansion of second order of the restricted log-likelihood around the ML estimator vector. Taking equation1 it can be thought that if the restriction h (θ) = 0 is true when it is included, the log-likelihood should not reduce its value by a significant amount and thus, both $\ell(\tilde{\theta})$ and $\ell(\tilde{\theta}_R)$ should be similar. Given that the inequality $\ell(\tilde{\theta}) \geq \ell(\tilde{\theta}_R)$ always holds (because a maximum subject to restrictions is never larger than an unrestricted maximum), significant discrepancies between both estimated log-likelihoods can be thought of as evidence against H0, since the RML estimator moves far away from the unrestricted ML. Another way of understanding what underlies this test focuses on the asymptotic properties of the ML estimators under correct specification. Given several regularity conditions, the ML estimators are consistent, asymptotically efficient and their asymptotic distribution is normal. Moreover, it is shown that the RML estimators are consistent when the restrictions are true (correct a priori information). According to these results, we can say that, if H0 is true, then both ML and RML estimators are consistent. Thus, small values of Eq.1 provide evidence in favour of the null hypothesis.

Annexure 2

List of Two Digit Industry Groups

20 Manufacture of Food Products (Includes Industry Group 21 – of Other Food Products)

21 Manufacture of Other Food Products (Includes Industry Group 20 - Food Products)

22 Manufacture of Beverages, Tobacco and Related Products

23 Manufacture of Cotton Textiles

24 Manufacture of Wool, Silk and Man-made Fibre Textiles

25 Manufacture of Jute and Other Vegetable Fibre Textiles (except)

26 Manufacture of Textile Products (including wearing apparel)

27 Manufacture of Wood and Wood Products: Furniture and Fixtures

28 Manufacture of Paper and Paper Products and Printing, Publishing Allied Industries

29 Manufacture of Leather and Leather Products, Fur & Leather

30 Manufacture of Basic Chemicals and Chemical Products (Except Products of Petroleum and Coal)

31 Manufacture of Rubber, Plastic, Petroleum and Coal Products; Processing of Nuclear Fuels

32 Manufacture of Non-Metalic Mineral Products

33 Basic Metal and Alloys Industries

34 Manufacture of Metal Products and parts, except machinery and Equipment

35 Manufacture of Machinery and Equipment other than Transport Equipment (and Excluding Manufacture of Scientific Equipment, Photographic / Cinematografic Equipment and Watches & Clocks)

36 Manufacture of Machinery and Equipment other than Transport Equipment (and excl. Manufacture of Scientific Equipment, Photographic / Cinematografic Equipment and Watches and Clocks)

37 Manufacture of Transport Equipment and Parts

38 Other Manufacturing Industries (incl. Manufacture of Scientific Equipment, Photographic / Cinematografic Equipment and Watches & Clocks)

Others

39 Repair of Capital Goods

41 Gas and Steam Generation and Distribution Through Pipes

42 Water Works and Supply

43 Non-conventional Energy Generation and Distribution

74 Storage and Warehousing Services

97 Repair Services

Annexure 3

Table-1: The Concordance Table

This is the NIC 98 classification	NOTES : List of Two Digit Industry Groups(according to 1987classification)	
	20	Manufacture of Food Products (Includes Industry Group 21 – Manufacture of Other Food Products)
151+152+153+154	21	Manufacture of Other Food Products (Includes Industry Group 20 – Manufacture of Food Products)
155+16	22	Manufacture of Beverages, Tobacco and Related Products
	23	Manufacture of Cotton Textiles
	24	Manufacture of Wool, Silk and Man-made Fibre Textiles
171	25	Manufacture of Jute and Other Vegetable Fibre Textiles (except Cotton)
172 + 173 + 181	26	Manufacture of Textile Products (including wearing apparel)
20 + 361	27	Manufacture of Wood and Wood Products: Furniture and Fixtures
21 + 22	28	Manufacture of Paper and Paper Products and Printing, Publishing & Allied Industries
182 + 19	29	Manufacture of Leather and Leather Products, Fur & Leather Substitutes
24	30	Manufacture of Basic Chemicals and Chemical Products (Except Products of Petroleum and Coal)
23 + 25	31	Manufacture of Rubber, Plastic, Petroleum and Coal Products; Processing of Nuclear Fuels
26	32	Manufacture of Non-Metallic Mineral Products
27 + 371	33	Basic Metal and Alloys Industries
2811 + 2812 + 289	34	Manufacture of Metal Products and parts, except Machinery and Equipment
	35	Manufacture of Machinery and Equipment other than Transport Equipment (and Excluding Manufacture of Scientific Equipment, Photographic / Cinematographic Equipment and Watches & Clocks)
2813 + 29 + 30 + 31 + 32	36	Manufacture of Machinery and Equipment other than Transport Equipment (and excl. Manufacture of Scientific Equipment, Photographic / Cinematographic Equipment and Watches and Clocks)
34 + 35	37	Manufacture of Transport Equipment and Parts
33 + 369	38	Other Manufacturing Industries (incl. Manufacture of Scientific Equipment, Photographic / Cinematographic Equipment and Watches & Clocks)

Annexure 4

Maximum Likelihood Estimation of Cobb-Douglas Stochastic Frontier Production Function (State wise)

Andhra Pradesh

Variable	Parameter	Coefficient	Standard error
Constant	a	0.7221967*	0.4982932
ln k	β	0.1676115	0.0457331
ln l	(α +β -1)	-0.0851206*	0.0475049
T	λ	0.0600958	0.0084258
μ		0.8267795*	0.5216256
η		-0.0181449	0.0066928
lnσ^2		-0.2049605*	0.6660155
ln (γ/1-γ)		1.757489	0.789402
σ^2		0.8146795	0.5425892
γ		0.8528949	0.0990425
σ_U^2		0.694836	0.5428704
σ_V^2		0.1198435	0.0105409
Log likelihood		-123.16198	

Assam

Variable	Parameter	Coefficient	Standard error
Constant	a	9.756537*	13.68164
ln k	β	0.2854285	0.051712
ln l	(α +β -1)	-0.0175492*	0.0638339
time	λ	0.2401926*	0.1736309
μ		14.9761*	0.2678816
η		-0.0177486*	0.0099273
lnσ^2		-0.3132635*	0.3664304
ln (γ/ 1-γ)		0.7862044*	0.5445767
σ^2		0.7310573	0.2678816
γ		0.6870158	0.1170977
σ_U^2		0.7310573	0.267271
σ_V^2		0.2288094	0.0241564
Log likelihood		-144.68297	

Bihar

Variable	Parameter	Coefficient	Standard error
Constant	a	2.101606	.7721524
ln k	β	.3809066	.0524444
ln l	$(\alpha + \beta - 1)$	-.1894302	.0721141
time	λ	.0317436	.0116588
μ		1.022835	.5312136
η		-.0157871*	.0099948
$\ln\sigma^2$		-.0231926*	.54865
$\ln(\gamma/1-\gamma)$		1.048535 *	.7519188
σ^2		.9770743	.5360718
γ		.7404935	.1444909
σ_U^2		.7235171	.5368154
σ_V^2		.2535572	.0224006
Log likelihood		-222.0402	

Gujarat

Variable	**Parameter**	**Coefficient**	**Standard error**
Constant	a	-.7959056*	.6624769
ln k	β	.2958961	.0552344
ln l	$(\alpha + \beta - 1)$	.125015	.0641143
time	λ	.0329849	.014658
μ		1.051206	.4007672
η		-.00091*	.0111293
$\ln\sigma^2$		-1.279557	.2980482
$\ln(\gamma/1-\gamma)$		.1998988*	.5524253
σ^2		.2781606	.0829053
γ		.549809	.1367358
σ_U^2		.1529352	.082726
σ_V^2		.1252254	.0110367
Log likelihood		-124.80281	

Haryana

Variable	Parameter	Coefficient	Standard error
Constant	a	.8716632	.2868634
ln k	β	.4151863	.0422464
ln l	$(\alpha + \beta - 1)$	-.0998355	.0279477
time	λ	.0402459	.0095036
μ		.8051317	.3034759
η		-.0602934	.0155654
$\ln\sigma^2$		-1.229131	.3936695
ln $(\gamma/1-\gamma)$		.6399281*	.6099684
σ^2		.2925466	.1151667
γ		.6547372	.1378873
σ_U^2		.1915411	.1150957
σ_V^2		.1010054	.0088904
Log likelihood		-91.542855	

Karnataka

Variable	Parameter	Coefficient	Standard error
Constant	a	588398*	.4826918
ln k	β	.226901	.0494596
ln l	$(\alpha + \beta - 1)$	-.0464724*	.0465686
time	λ	.0448528	.0112087
μ		.6138527	.2427476
η		.003471*	.011786
$\ln\sigma^2$		-1.187358	.4182505
ln $(\gamma/1-\gamma)$		.332581*	.7269179
σ^2		.305026	.1275773
γ		.5823872	.1767954
σ_U^2		.1776433	.1275459
σ_V^2		.1273828	.0111919
Log likelihood		-126.7432	

Kerala

Variable	Parameter	Coefficient	Standard error
Constant	a	3.382352	.7213069
ln k	β	.210137	.04698
ln l	$(\alpha + \beta - 1)$	-.3564356	.0751445
Time	λ	.0613258	.0088095
μ		1.179587	.4181919
η		1.179587	.4181919
$\ln\sigma^2$		-.2335446*	.5524542
$\ln(\gamma/1-\gamma)$		1.747736	.6579443
σ^2		.7917223	.4373903
γ		.8516671	.0831183
σ_U^2		6742838	.4375644
σ_V^2		.1174385	.0107589
Log likelihood		-110.49526	

Madhya Pradesh

Variable	Parameter	Coefficient	Standard error
Constant	a	-1.643466	.441153
ln k	β	.3617271	.0405089
ln l	$(\alpha + \beta - 1)$	.1963425	.0554713
time	λ	.0349743	.0142164
μ		.8514741*	.4558584
η		-.017366*	.0170106
$\ln\sigma^2$		-1.246425	.250335
$\ln(\gamma/1-\gamma)$		-.2455602*	.5711625
σ^2		.2875308	.071979
γ		.4389166	.1406595
σ_U^2		.126202	.0709328
σ_V^2		.1613288	.0142043
Log likelihood		-154.59223	

Maharashtra

Variable	Parameter	Coefficient	Standard error
Constant	a	1.329907*	1.584538
ln k	β	.282278	.074254
ln l	$(\alpha + \beta - 1)$	.0648853*	.0439526
time	λ	.1528922	.0475893
μ		4.855726	2.53888
η		-.0342367	.0095308
$\ln\sigma^2$		-1.03648	.3371545
$\ln(\gamma/1-\gamma)$		1.11522	.4609816
σ^2		.3547011	.1195891
γ		.753101	.0857149
σ_U^2		.2671257	.1197142
σ_V^2		.0875753	.0077428
Log likelihood			-78.277093

Orissa

Variable	Parameter	Coefficient	Standard error
Constant	a	-.8347206	.3554029
ln k	β	.3242206	.0489697
ln l	$(\alpha + \beta - 1)$	.0424302*	.0384192
time	λ	.0533329	.0198526
μ		.168114*	.6428315
η		-.0794253	.0179201
$\ln\sigma^2$		-.3345519*	.4787784
$\ln(\gamma/1-\gamma)$		.6352427*	.7387148
σ^2		.7156587	.3426419
γ		.6536773	.1672327
σ_U^2		.4678098	.3421168
σ_V^2		.2478489	.0236914
Log likelihood		-179.80626	

Punjab

Variable	Parameter	Coefficient	Standard error
22.62085*	a		30.87587
ln k	β	.2139744	.0444302
ln l	$(\alpha + \beta - 1)$	.0052603*	.0579119
time	λ	-.2095394*	.1922857
μ		18.15837*	26.78387
η		.0121065*	.0080288
$\ln\sigma^2$		-1.513094	.2877931
$\ln(\gamma/1-\gamma)$		.4175332 *	.4874945
σ^2		.2202275	.0633799
γ		.6028928	.1167126
σ_U^2		.1327736	.0632101
σ_V^2		.0874539	.0076991
Log likelihood		-79.071752	

Rajasthan

Variable	Parameter	Coefficient	Standard error
Constant	a	-.2952386*	.549556
ln k	β	.3472095	.047203
ln l	$(\alpha + \beta - 1)$	.002336*	.0526927
time	λ	.0655911	.0172457
μ		.7949004*	.495419
η		-.0499131	.0231337
$\ln\sigma^2$		-1.084416	.2835633
$\ln(\gamma/1-\gamma)$		-.3506334*	.6855738
σ^2		.3380991	.0958725
γ		.4132288	.1662316
σ_U^2		.1397123	.0946979
σ_V^2		.1983868	.0174234
Log likelihood		-179.08866	

Tamil Nadu

Variable	Parameter	Coefficient	Standard error
Constant	a	-.2582456*	.6416859
ln k	β	.3625472	.0516085
ln l	$(\alpha + \beta - 1)$	.0656223*	.044126
time	λ	.0920988	.0259275
μ		2.475023	1.10786
η		-.0445948	.0109921
$\ln\sigma^2$		-1.413843	.3349676
$\ln(\gamma/1-\gamma)$		1.234001	.4438272
σ^2		.2432068	.0814664
γ		.774518	.0775099
σ_U^2		.188368	.0814615
σ_V^2		.0548387	.0048352
Log likelihood		-14.184524	

Uttar Pradesh

Variable	Parameter	Coefficient	Standard error
Constant	a	.9776186*	.5512694
ln k	β	.3053555	.0457781
ln l	$(\alpha + \beta - 1)$	-.100006*	.0557898
time	λ	.0479494	.0082244
μ		.5480405*	.4347078
η		-.0087734*	.0084429
$\ln\sigma^2$		-.698357*	.6461775
$\ln(\gamma/1-\gamma)$		1.358253*	.8194593
σ^2		.4974019	.3214099
γ		.7954756	.1333213
σ_U^2		.4974019	.3214099
σ_V^2		.1017308	.0089224
Log likelihood		-98.938994	

West Bengal

Variable	Parameter	Coefficient	Standard error
Constant	a	1.247836	.5635596
ln k	β	.3248045	.0475965
ln l	$(\alpha + \beta - 1)$	-.1172914	.0463494
time	λ	.0347985	.0112612
μ		.9617139	.3717141
η		-.0348043	.0127036
$\ln\sigma^2$		-1.295378	.298284
$\ln(\gamma/1-\gamma)$		.2784802*	.5319919
σ^2		.2737945	.0816685
γ		.5691736	.1304524
σ_U^2		.1558366	.0813327
σ_V^2		.1179579	.0103794
Log likelihood		-113.3393	

In all the tables * denotes that the coefficient is not significant at 5% level.

Annexure 5

Maximum Likelihood Estimation of Cobb-Douglas Stochastic Frontier Production Function (Industry wise)

Food & Food Products(20-21)

Variable	Parameter	Coefficient	Standard error
Constant	a	362.1773	92.59446
ln k	β	.5042445	.0560971
ln l	$(\alpha + \beta - 1)$	-.0464008*	.0641748
time	λ	1.745714	.2729555
μ		398.8273	97.87152
η		-.004534	.0005653
$\ln\sigma^2$		-2.160268	.1526653
$\ln(\gamma/1-\gamma)$		-1.010129*	.5780367
σ^2		.1152942	.0176014
γ		.2669547	.1131159
σ_U^2		.0307783	.0172251
σ_V^2		.0845159	.0070355
Log likelihood		-73.403932	

Beverage & Tobacco(22)

Variable	Parameter	Coefficient	Standard error
Constant	a	2.17875	.5223906
ln k	β	.306578	.0492449
ln l	$(\alpha + \beta - 1)$	-.2031189	.0591162
time	λ	.0320669	.0108935
μ		.885489	.3201293
η		-.0220132	.0092143
$\ln\sigma^2$		-.7228945 *	.4264647
$\ln(\gamma/1-\gamma)$		.8594987*	.0122106
σ^2		.4853454	.2069827
γ		.7025559	.1285003
σ_U^2		.3409823	.2069384
σ_V^2		.1443631	.0122106
Log likelihood		-155.36441	

Textile [Cotton, Jute & Woolen] (23+24+25)

Variable	Parameter	Coefficient	Standard error
Constant	a	-1.219157	.3498737
ln k	β	.4224292	.0417101
ln l	$(\alpha + \beta - 1)$	.0559513	.0323617
time	λ	.0262722	.0055102
μ		-.0007711*	.9066261
η		-.0584285	.0128464
$\ln\sigma^2$		-1.105938*	1.151178
$\ln(\gamma/1-\gamma)$		1.693065*	1.370141
σ^2		.3309005	.3809253
γ		.8446268	.1798068
σ_U^2		.2794874	.3811122
σ_V^2		.0514131	.0042099
Log likelihood		.41695011	

Wood & Wood Products (27)

Variable	Parameter	Coefficient	Standard error
Constant	a	754.5605*	4.347546
ln k	β	.3733964	.0392123
ln l	$(\alpha + \beta - 1)$	.069736	.0367178
time	λ	-2.943333	.1545266
μ		694.2665	3.204442
η		.0040542	.0002227
$\ln\sigma^2$		-1.785399	.1078051
$\ln(\gamma/1-\gamma)$		-1.454313	.4865146
σ^2		.1677302	.0180822
γ		.1893387	.0746749
σ_U^2		.0317578	.0150456
σ_V^2		.1359724	.0111543
Log likelihood		-146.54005	

Paper & Printings(28)

Variable	Parameter	Coefficient	Standard error
Constant	a	1.450839*	2.767941
ln k	β	.1095382	.0389618
ln l	(α +β -1)	.0465288*	.0575819
time	λ	-.0311018*	.0621461
μ		.9338301*	1.691873
η		.0497697*	.0342973
$\ln\sigma^2$		-1.735823	.0934053
$\ln(\gamma/1-\gamma)$		-2.850713	.9555827
σ^2		.176255	.0164632
γ		.0546445	.0493639
σ_U^2		.0096314	.0091611
σ_V^2		.1666237	.0137709
Log likelihood		-176.66409	

Leather & Leather Products(29)

Variable	Parameter	Coefficient	Standard error
Constant	a	-.3721461*	.4095356
ln k	β	.1694531	.0782067
ln l	(α +β -1)	.0177308*	.0592962
time	λ	.0324246	.0161016
μ		.438727*	.3089512
η		.0085068*	.0240527
$\ln\sigma^2$		-1.104353	.2717037
$\ln(\gamma/1-\gamma)$		-.8928783*	.9184545
σ^2		.3314252	.0900495
γ		.2905162	.1893087
σ_U^2		.0962844	.0877413
σ_V^2		.2351408	.022411
Log likelihood		-172.3554	

Basic Chemical & Chemical Products(30)

Variable	Parameter	Coefficient	Standard error
Constant	a	1.738249	.8911134
ln k	β	.2728363	.0490836
ln l	$(\alpha + \beta - 1)$	-.1418024*	.0783312
time	λ	.081035	.0128673
μ		1.349241	.7136866
η		-.0392296	.0076489
$\ln\sigma^2$		.0993882*	.5493324
$\ln(\gamma/1-\gamma)$		1.83142	.642618
σ^2		1.104495	.6067348
γ		.8619308	.0764755
σ_U^2		.9519982	.6066245
σ_V^2		.1524968	.0125366
Log likelihood		-179.50907	

Rubber & Petrochemicals(31)

Variable	Parameter	Coefficient	Standard error
Constant	a	-.071969*	1.098457
ln k	β	.3448552	.0527143
ln l	$(\alpha + \beta - 1)$	.1189236*	.0666039
time	λ	.0331673	.0074608
μ		1.271918*	1.015322
η		-.3268901*	.1824590
$\ln\sigma^2$		-.8933802	.1561594
$\ln(\gamma/1-\gamma)$		-.6187193*	.4366606
σ^2		.40927	.0639114
γ		.3500728	.0993498
σ_U^2		.1432743	.0609782
σ_V^2		.2659957	.0217765
Log likelihood		-257.19044	

Non-metallic(32)

Variable	Parameter	Coefficient	Standard error
Constant	a	.2418781*	.7239179
ln k	β	.2299772	.0443597
ln l	$(\alpha + \beta - 1)$	-.0518508*	.0712122
time	λ	.0490303	.0074109
μ		.5639517	.4159818
η		-.0197356	.0076944
$\ln\sigma^2$		-.7669328*	.6482953
$\ln(\gamma/1-\gamma)$		1.497564*	.8018038
σ^2		.4644354	.3010913
γ		.8172109	.1197712
σ_U^2		.3795417	.3013232
σ_V^2		.0848937	.0069727
Log likelihood		-85.360871	

Basic Metal & Alloys(33)

Variable	Parameter	Coefficient	Standard error
Constant	a	.0532727*	.4974284
ln k	β	.3123068	.0444232
ln l	$(\alpha + \beta - 1)$	-.0060381*	.0467317
time	λ	.0348126	.007959
μ		.3266769*	.44528
η		-.02675	- .0139233
$\ln\sigma^2$		-.9723682*	.5169338
$\ln(\gamma/1-\gamma)$		.2329852*	.9289362
σ^2		.3781864	.1954973
γ		.5579842	.2291108
σ_U^2		.211022	.1951299
σ_V^2		.1671643	.0136447
Log likelihood		-181.93216	

Metal, Machinery & Miscllaneous(34-38)

Variable	Parameter	Coefficient	Standard error
Constant	a	-.9564843	.2903369
ln k	β	.399067	.0405764
ln l	(α +β -1)	.1038539	.0278405
time	λ	.0181399	.0037345
μ		-.2184903	1.012146
η		.0170127	.0128376
$\ln\sigma^2$		-2.293077	1.382173
ln (γ/1-γ)		.680861	2.078088
σ^2		.1009553	.1395378
γ		.6639308	.4636768
σ_U^2		.0670273	.1393996
σ_V^2		.033928	.0027751
Log likelihood		68.130848	

Transport(37)

Variable	Parameter	Coefficient	Standard error
Constant	a	-1.26894	.3413409
ln k	β	.3365096	.0526075
ln l	(α +β -1)	.131737	.0319377
time	λ	.0210385	.0120911
μ		-.0641329	.7989717
η		.0204185	.0265162
$\ln\sigma^2$		-1.068165	.5932612
ln (γ/1-γ)		-.5442923	1.617381
σ^2		.3436385	.2038674
γ		.3671897	.375817
σ_U^2		.1261805	.2035534
σ_V^2		.217458	.017774
Log likelihood		-220.51962	

Annexure-6

Table 1.7g Growth of Gross Value added

State/Year	20-21	22	23+24+25	26	27	28	29	30	31	32	33	34+35+36	37	38	Other	Total
Andhra Pradesh																
1980-81 to 2000-01	5.53	6.50	2.05	16.27	6.51	1.66	...	0.46	17.41	6.26	4.59	2.72	-3.57	12.77	-0.28	3.72
1991-92 to 2000-01	7.45	5.88	0.59	29.85	14.13	6.31	...	9.95	5.22	5.28	17.15	7.94	13.07	2.09	-7.50	8.15
1980-81 to 2000-01	7.36	6.26	2.40	18.92	1.34	4.56	...	10.46	8.71	8.10	12.38	3.39	3.56	4.78	1.00	6.84
Assam																
1980-81 to 2000-01	-0.46	...	-2.54	...	-6.97	...	...	-17.94	36.59	-0.11	12.53	0.97	-13.47	...	-5.57	3.23
1991-92 to 2000-01	2.06	...	-6.61	...	-42.72	...	...	8.92	-0.47	-1.07	-8.37	3.41	-24.50	...	-6.23	0.12
1980-81 to 2000-01	1.08	...	-0.05	...	-12.51	...	...	-5.00	12.16	5.88	4.29	0.08	-6.80	...	5.46	2.98
Bihar																
1980-81 to 2000-01	3.77	11.55	-2.70	...	15.81	-8.23	0.24	...	12.57	6.06	9.60	5.31	1.66	...	-2.37	7.30
1991-92 to 2000-01	5.19	-3.19	-7.43	...	1.60	-8.85	-3.06	...	-2.45	-1.56	8.49	0.26	-7.08	...	25.17	4.50
1980-81 to 2000-01	3.67	12.43	-2.81	...	5.78	-3.37	-1.93	...	2.23	-0.56	7.33	0.10	-1.61	...	6.29	4.90
Gujarat																
1980-81 to 2000-01	8.13	5.25	-0.96	16.44	3.38	6.13	4.98	12.66	...	9.62	7.29	10.07	4.94	11.15	...	7.71
1991-92 to 2000-01	7.86	21.21	6.53	6.13	13.05	9.04	13.37	15.41	...	8.41	9.55	5.59	3.07	14.11	...	10.19
1980-81 to 2000-01	7.12	7.83	1.57	9.80	5.78	7.89	10.74	12.55	...	10.34	13.02	7.73	8.29	12.21	...	9.27
Haryana																
1980-81 to 2000-01	15.74	11.49	2.95	5.10	8.35	6.37	4.74	2.26	4.92	5.66	4.56	3.81	21.31	13.63	9.44	7.43
1991-92 to 2000-01	7.83	4.69	-7.51	29.86	3.86	-6.13	25.91	0.84	5.75	-3.51	7.05	8.56	9.56	5.07	-9.58	7.58
1980-81 to 2000-01	10.03	8.24	2.23	20.83	9.47	1.62	19.80	3.58	1.73	3.50	5.13	6.12	15.55	13.06	2.69	8.00
Karnataka																
1980-81 to 2000-01	11.95	13.41	2.10	16.91	2.17	11.66	36.35	3.31	13.20	12.74	7.01	10.20	3.65	5.86	7.13	8.15
1991-92 to 2000-01	13.84	21.66	3.69	18.55	26.71	2.16	-1.65	11.86	20.95	3.15	7.69	3.34	9.20	5.17	10.19	8.69
1980-81 to 2000-01	10.27	12.90	6.20	25.71	2.31	8.10	19.41	8.29	13.48	7.52	10.68	8.80	8.37	5.15	8.64	9.43
Kerala																
1980-81 to 2000-01	5.11	8.85	-0.29	-5.62	-10.19	9.12	...	0.22	14.55	2.17	8.89	4.14	-12.18	-0.47	0.29	4.32
1991-92 to 2000-01	9.22	-5.26	6.48	16.65	6.23	2.43	...	6.12	5.42	0.42	6.51	2.86	4.71	-7.59	-2.95	5.21
1980-81 to 2000-01	7.64	4.19	4.72	-6.75	-1.49	6.69	...	3.83	5.75	4.25	5.95	4.07	3.67	1.41	5.07	4.86
Madhya Pradesh																
1980-81 to 2000-01	16.28	16.35	1.82	...	4.10	5.50	21.40	9.12	...	13.21	2.51	10.37	11.41	12.67	20.79	7.18
1991-92 to 2000-01	1.63	2.86	10.04	...	1.14	-5.03	8.10	8.98	...	7.50	13.11	0.84	9.14	18.07	36.53	9.40
1980-81 to 2000-01	13.29	9.39	8.24	...	0.27	1.62	11.49	13.12	...	8.77	6.48	5.94	13.16	19.75	25.12	8.81

Maharashtra																
1980-81 to 2000-01	13.26	7.57	1.31	11.07	1.07	4.17	22.65	6.35	15.23	10.90	5.66	6.01	5.85	8.99	10.64	6.66
1991-92 to 2000-01	10.48	12.65	0.38	4.46	38.24	5.67	-6.05	8.23	10.23	3.05	7.38	5.21	6.22	18.34	-6.26	6.96
1980-81 to 2000-01	9.99	7.85	1.42	12.58	11.18	6.03	8.71	8.96	10.27	5.64	5.35	6.56	6.81	13.19	7.07	7.42
Orissa																
1980-81 to 2000-01	0.73	9.23	10.84	...	2.85	3.99	...	...	...	5.52	16.46	8.47	...	...	...	12.62
1991-92 to 2000-01	5.16	19.05	-17.28	...	-0.93	-1.84	...	...	...	5.12	5.84	-3.48	...	...	...	4.54
1980-81 to 2000-01	8.38	6.78	-3.27	...	4.85	2.09	...	...	...	6.10	9.85	4.18	...	...	...	7.86
Punjab																
1980-81 to 2000-01	12.46	11.27	12.54	14.89	5.11	31.25	19.16	4.37	15.22	...	6.73	8.50	9.63	4.80	11.76	10.21
1991-92 to 2000-01	9.04	2.02	1.73	11.35	22.96	0.26	18.73	7.76	12.49	...	-2.36	6.25	2.48	9.94	13.24	5.86
1980-81 to 2000-01	9.54	11.59	7.25	10.98	9.97	13.65	16.07	6.10	10.05	...	4.55	9.48	8.27	9.60	11.05	8.53
Rajasthan																
1980-81 to 2000-01	4.89	...	4.97	9.64	12.90	9.48	...	10.95	...	14.91	2.74	6.32	5.36	17.99	10.07	8.50
1991-92 to 2000-01	5.09	...	-0.05	22.40	32.99	10.98	...	27.19	...	13.82	10.77	6.05	1.04	28.80	2.93	11.33
1980-81 to 2000-01	10.58	...	6.78	19.32	20.72	10.01	...	13.49	...	11.33	1.62	6.99	3.51	21.53	7.93	9.70
Tamil Nadu																
1980-81 to 2000-01	8.37	7.75	6.00	20.01	-1.24	5.81	9.39	3.07	15.86	5.56	2.56	4.46	2.94	11.34	5.61	5.99
1991-92 to 2000-01	5.42	16.58	3.38	17.84	14.97	6.30	-2.02	10.78	1.69	4.36	7.81	3.19	9.93	9.83	8.04	6.51
1980-81 to 2000-01	6.42	10.00	6.18	21.71	2.27	6.68	8.18	6.24	8.40	6.82	5.28	5.20	6.08	14.18	8.02	6.94
Uttar Pradesh																
1980-81 to 2000-01	10.90	16.52	2.80	5.09	20.81	13.82	14.13	11.97	...	11.21	9.92	13.53	14.25	24.83	5.68	11.37
1991-92 to 2000-01	6.51	7.71	-2.73	16.71	18.37	6.38	2.18	4.53	...	2.99	10.45	-1.75	13.63	11.85	4.13	4.90
1980-81 to 2000-01	7.31	12.30	1.16	13.60	14.22	9.41	11.28	12.19	...	5.08	9.16	7.33	14.73	15.92	10.98	9.13
West Bengal																
1980-81 to 2000-01	8.38	18.16	-1.55	1.46	3.47	-3.04	-5.90	0.30	8.69	-2.65	-7.61	0.98	-1.72	2.85	3.93	0.09
1991-92 to 2000-01	5.86	25.54	10.04	8.59	7.87	14.49	15.62	7.81	-3.88	9.17	4.86	5.38	-4.16	-0.92	5.98	6.41
1980-81 to 2000-01	6.86	15.31	4.49	5.82	5.40	6.14	5.65	7.50	3.36	5.44	4.74	4.53	-0.85	2.69	10.48	4.86

Annexure 7

Growth of Employment

State/Year	20-21	22	23+24+25	26	27	28	29	30	31	32	33	34-36	37	38	Other	Total
Andhra Pradesh																
1980-81 to 2000-01	-2.83	1.75	-0.23	12.24	-1.54	1.59	14.98	0.39	15.08	6.25	4.30	2.03	-0.37	1.11	-0.23	0.95
1991-92 to 2000-01	2.36	1.58	-9.32	27.98	7.00	-1.31	-7.28	7.02	7.15	2.76	-2.32	-0.71	5.65	-2.60	-16.61	0.82
1980-81 to 2000-01	1.95	2.67	-1.97	16.87	0.04	0.99	3.06	3.32	10.28	4.12	6.21	1.88	-0.45	3.04	-1.32	2.31
Assam																
1980-81 to 2000-01	-1.28	...	5.98	...	1.36	-2.78	...	-4.86	19.10	9.06	5.79	8.79	-11.83	...	2.18	0.29
1991-92 to 2000-01	1.21	...	-4.77	...	-37.09	1.87	...	3.17	1.15	4.22	-5.71	-0.95	-16.47	...	-16.56	-0.97
1980-81 to 2000-01	0.41	...	2.03	...	-11.49	10.99	...	-0.56	8.83	3.79	-0.23	2.26	-5.29	...	-0.66	0.69
Bihar																
1980-81 to 2000-01	-12.20	4.72	-1.03	...	7.66	-11.84	-1.01	-1.23	-0.21	0.11	2.73	2.24	1.32	...	-4.48	-0.42
1991-92 to 2000-01	-5.38	-3.44	-1.77	...	2.95	-8.61	0.75	-4.48	-2.01	-1.77	-1.37	-5.73	-8.42	...	-2.76	-3.12
1980-81 to 2000-01	-5.32	5.64	-3.29	...	4.60	-7.29	-1.18	-2.65	0.39	-0.01	-0.41	-2.28	-1.66	...	-1.65	-1.20
Gujarat																
1980-81 to 2000-01	-2.45	-3.11	-5.33	9.21	-2.04	0.35	-2.57	4.21	6.67	1.04	2.26	2.23	-0.51	5.92	3.32	-0.92
1991-92 to 2000-01	1.00	-0.54	-1.17	0.23	7.57	1.11	2.50	7.61	2.18	-0.03	0.00	1.96	3.48	10.10	-9.36	1.92
1980-81 to 2000-01	0.67	-3.16	-2.80	3.18	1.25	1.37	3.77	5.75	5.87	0.52	1.50	2.28	3.83	7.11	-0.48	0.96
Haryana																
1980-81 to 2000-01	2.85	2.99	-2.90	-1.01	3.55	0.97	20.93	1.21	1.33	8.99	-1.76	1.35	7.37	5.24	-0.07	1.95
1991-92 to 2000-01	1.07	-5.03	-6.70	33.07	6.57	-3.97	31.87	5.21	3.58	0.56	-1.00	2.66	12.47	3.80	-20.64	3.88
1980-81 to 2000-01	3.88	2.26	-0.54	16.12	5.63	-1.30	19.32	3.85	1.61	1.29	-0.86	2.44	8.35	8.25	-4.82	3.28
Karnataka																
1980-81 to 2000-01	-3.58	-1.29	-3.33	9.11	-2.47	0.77	22.48	0.44	3.91	1.90	-2.54	4.45	1.90	9.67	2.88	0.50
1991-92 to 2000-01	3.09	2.06	-4.88	15.87	0.05	1.26	-1.21	7.40	7.92	-0.14	-1.55	0.59	3.73	1.15	-3.72	3.32
1980-81 to 2000-01	0.17	2.21	-2.53	18.39	-4.55	0.81	14.40	2.78	4.68	0.32	-1.19	2.93	2.15	5.17	2.33	2.56
Kerala																
1980-81 to 2000-01	-5.46	0.79	-0.88	-3.21	-4.48	-1.73	...	1.18	1.47	2.22	3.29	2.17	-1.19	2.63	0.60	-1.94
1991-92 to 2000-01	3.16	-20.70	4.80	15.29	2.53	2.60	...	1.19	6.78	0.81	5.55	-0.03	-2.82	-7.06	-5.28	1.33
1980-81 to 2000-01	2.62	-2.77	1.98	-1.34	-1.05	1.50	...	1.65	6.04	1.65	3.16	1.21	-0.43	1.10	-0.80	1.88
Madhya Pradesh																
1980-81 to 2000-01	-1.90	5.25	-2.58	-6.95	0.04	-0.49	8.99	2.30	19.93	6.21	4.03	3.25	2.30	8.06	4.68	1.73
1991-92 to 2000-01	-1.42	-3.05	0.79	20.88	-4.14	-4.06	1.71	1.39	5.00	-2.58	1.56	-1.44	2.55	9.96	-3.13	0.06
1980-81 to 2000-01	1.25	0.92	-0.89	6.00	-2.50	-0.51	3.28	3.54	14.77	2.16	2.23	1.90	4.40	12.99	4.66	1.76

Maharashtra																
1980-81 to 2000-01	-2.96	0.31	-3.11	-1.04	-3.79	-2.38	9.39	0.10	0.40	1.02	-1.76	-0.88	-2.20	0.47	5.37	-1.37
1991-92 to 2000-01	2.91	-0.41	-3.95	8.20	17.58	1.93	-1.46	1.15	2.79	-2.06	0.53	3.02	1.07	7.54	-16.42	1.08
1980-81 to 2000-01	1.52	1.48	-2.85	4.98	2.04	-0.24	3.40	1.17	2.60	-0.56	-0.43	1.49	-0.92	5.59	0.44	0.56
Orissa																
1980-81 to 2000-01	-3.54	0.69	7.51	22.30	-2.24	-2.51	...	7.60	13.04	-0.53	0.89	8.49	...	...	0.45	1.55
1991-92 to 2000-01	5.44	17.12	-8.11	0.86	-0.23	-4.53	...	-1.63	8.67	-4.21	1.96	-3.42	...	...	-5.13	-0.14
1980-81 to 2000-01	4.38	4.26	0.44	13.64	-2.14	-1.33	...	3.40	17.52	0.88	1.76	1.96	...	...	0.11	1.66
Punjab																
1980-81 to 2000-01	6.88	5.55	4.00	11.76	-6.76	12.45	11.29	5.04	10.50	8.58	1.01	1.65	5.49	-2.75	-0.05	4.63
1991-92 to 2000-01	4.91	3.13	-2.39	7.71	15.16	1.92	12.74	4.28	2.67	8.45	-2.11	1.45	-1.42	6.59	3.02	1.56
1980-81 to 2000-01	3.43	4.22	0.68	8.33	2.72	4.20	9.04	2.90	7.26	2.92	-0.52	2.27	4.70	3.17	1.87	2.81
Rajasthan																
1980-81 to 2000-01	-2.18	1.60	2.31	5.35	6.36	0.61	...	1.35	11.48	6.51	2.44	2.89	-2.60	4.61	5.59	2.53
1991-92 to 2000-01	1.55	6.65	0.71	14.17	22.70	1.84	...	6.05	3.07	4.60	1.56	0.10	-9.46	17.30	-14.05	1.68
1980-81 to 2000-01	0.74	7.74	3.07	6.13	12.01	0.73	...	1.09	9.05	5.36	1.60	2.37	-5.83	10.60	0.07	2.67
Tamil Nadu																
1980-81 to 2000-01	-2.92	-1.61	1.35	10.09	-2.19	1.92	8.83	4.20	3.57	1.23	-3.38	2.27	2.28	3.42	4.45	1.71
1991-92 to 2000-01	1.22	0.69	1.77	13.14	0.19	0.71	-1.14	3.23	1.03	0.15	1.84	0.19	-2.92	9.32	-4.74	2.02
1980-81 to 2000-01	0.96	0.33	2.19	13.84	-0.72	1.86	5.98	3.89	3.46	1.28	0.42	1.54	0.43	8.51	2.37	2.80
Uttar Pradesh																
1980-81 to 2000-01	-3.66	-5.70	-0.18	2.43	6.98	3.82	5.69	3.91	4.24	1.07	0.21	4.22	2.11	8.94	1.08	-0.08
1991-92 to 2000-01	-2.51	3.12	-6.70	10.66	9.22	-0.45	2.27	0.95	1.07	-5.48	-0.44	-1.25	-3.37	9.15	-6.38	-1.47
1980-81 to 2000-01	-1.45	0.57	-3.63	8.93	4.84	2.79	3.00	3.49	4.65	-2.42	-0.89	2.36	0.17	7.43	1.96	0.19
West Bengal																
1980-81 to 2000-01	-3.69	-1.18	-4.07	-3.41	-1.82	-6.84	-3.87	-1.97	-0.73	-3.67	-2.85	-3.89	-6.06	-1.05	2.22	-3.72
1991-92 to 2000-01	1.10	9.29	0.20	-4.58	0.04	-3.75	0.71	-1.37	-4.04	-3.00	-2.50	-2.89	-9.96	-1.68	-4.36	-1.68
1980-81 to 2000-01	-0.25	7.11	-1.78	-1.85	0.42	-2.71	-1.68	-1.34	-1.35	-1.97	-1.58	-2.12	-4.91	-0.63	2.62	-1.61

Annexure 8

Growth of Fixed Capital

State/Year	20-21	22	23+24+25	26	27	28	29	30	31	32	33	34-36	37	38	Other	Total
Andhra Pardesh																
1980-81 to :	4.71	1.83	6.22	1.65	-2.61	3.47	8.79	3.78	15.70	8.05	5.48	5.55	6.99	-1.80	0.78	3.77
1991-92 to :	0.93	-23.17	-13.83	9.37	5.95	2.66	-1.60	4.36	4.08	5.94	1.21	0.64	3.06	-1.54	-1.97	-2.82
1980-81 to :	3.59	-6.46	-0.46	4.92	2.85	3.91	5.65	3.16	11.00	7.05	3.06	3.59	4.40	-0.13	2.40	1.76
Assam																
1980-81 to :	-1.24	...	0.45	...	-0.65	-0.54	...	-5.56	11.15	13.79	3.17	2.56	-4.12	...	-2.46	-0.19
1991-92 to :	2.13	...	-3.44	...	-15.79	2.92	...	-3.75	5.86	2.48	-0.80	4.05	-10.23	...	-2.83	-0.55
1980-81 to :	-0.12	...	-1.47	...	-5.63	1.87	...	0.07	7.41	3.69	1.36	0.89	-4.60	...	-0.98	-0.50
Bihar																
1980-81 to :	-9.35	-3.15	-10.62	...	-3.26	-5.14	1.16	-5.78	4.74	1.78	-4.89	-4.78	4.65	...	-3.85	-2.77
1991-92 to :	-1.58	3.59	-1.39	...	1.36	-4.10	-3.23	-2.66	-0.41	-5.25	-0.62	-6.07	1.06	...	-2.05	-2.68
1980-81 to :	-4.72	-4.43	-5.88	...	1.73	-4.50	-2.10	-2.10	1.79	-0.14	-2.57	-3.37	2.41	...	-2.97	-1.80
Gujarat																
1980-81 to :	-3.67	-4.44	-3.28	-1.03	-2.31	1.03	-8.79	2.31	2.98	0.93	3.14	0.19	-0.23	-5.62	0.81	-0.62
1991-92 to :	2.90	3.26	0.98	4.09	5.24	2.31	2.18	7.16	2.78	2.04	2.30	3.14	2.80	-0.72	-2.95	2.96
1980-81 to :	0.16	-1.41	0.14	2.13	-0.24	2.01	-4.01	4.55	3.20	1.37	2.57	1.70	2.59	-3.03	0.48	1.45
Haryana																
1980-81 to :	5.49	3.11	-3.54	2.89	-0.58	1.80	12.10	0.20	0.78	28.28	1.33	-0.52	7.42	-2.80	-0.52	2.07
1991-92 to :	0.02	10.16	0.74	18.91	9.10	0.97	18.01	5.16	6.77	0.67	1.37	3.45	8.33	2.32	-1.28	3.48
1980-81 to :	3.74	6.61	0.99	14.12	5.78	2.06	10.76	2.82	3.59	6.21	0.25	1.29	6.95	2.25	2.95	2.69
Karnataka																
1980-81 to :	1.43	0.20	-3.08	-0.57	-1.85	0.16	14.05	0.25	2.16	2.73	0.37	2.21	2.73	6.22	-0.60	0.68
1991-92 to :	1.04	1.36	-11.54	11.10	-0.04	3.05	2.26	3.15	4.26	1.39	0.11	3.48	7.47	1.70	-0.17	1.94
1980-81 to :	0.33	2.09	-4.69	9.65	-2.54	0.73	11.73	0.58	3.27	2.07	-0.18	3.35	3.85	3.71	0.94	1.45
Kerala																
1980-81 to :	-0.92	-3.15	0.98	-6.36	-0.08	0.76	...	2.71	0.70	4.89	0.49	2.17	-1.92	0.54	2.24	0.44
1991-92 to :	5.33	-16.76	6.09	16.95	2.15	3.17	...	2.64	6.26	6.18	10.70	1.93	-2.89	1.22	-1.99	3.24
1980-81 to :	2.56	-3.49	4.53	-1.72	1.35	2.44	...	3.27	6.20	7.36	5.00	2.46	-0.37	3.26	2.19	3.00
Madhya Pradesh																
1980-81 to :	-1.78	-1.28	-2.68	0.66	-6.11	-2.53	6.33	3.22	11.41	4.66	4.46	4.58	3.21	6.17	2.79	0.56
1991-92 to :	2.07	-6.44	-9.96	4.39	0.80	2.50	23.78	2.04	4.92	-0.64	2.52	3.43	5.81	-2.04	-0.18	0.54
1980-81 to :	1.57	-4.26	-2.77	1.42	-3.16	2.38	7.98	3.01	9.45	2.84	4.32	4.89	4.74	4.18	1.95	1.51

Maharashtra																
1980-81 to 1	-0.77	-3.72	-1.38	-0.96	-3.30	-0.55	-1.63	0.07	0.90	0.50	-0.72	0.29	0.36	-1.43	3.47	-0.34
1991-92 to 1	3.01	-7.02	-4.18	3.35	3.11	3.17	7.28	3.79	2.34	-1.52	3.88	1.97	5.99	4.90	-4.95	1.71
1980-81 to 1	2.26	-2.53	-1.75	3.62	-2.07	1.16	3.05	2.69	2.73	-0.03	1.47	1.60	3.66	2.65	1.57	1.43
Orissa																
1980-81 to 1	-4.21	-9.06	-0.11	9.91	-4.54	-1.26	...	4.82	11.31	4.94	1.69	1.82	...	...	1.98	-1.07
1991-92 to 1	2.31	12.75	-4.89	-0.82	-4.00	-4.06	...	0.83	5.70	-0.13	4.21	-0.87	...	...	-3.78	0.15
1980-81 to 1	0.69	-2.54	-0.22	6.11	-2.65	-1.18	...	2.25	9.60	3.75	2.83	1.35	...	...	-0.57	0.63
Punjab																
1980-81 to 1	6.67	4.07	-4.58	4.91	-2.74	3.62	4.93	-0.92	1.79	5.96	0.43	0.05	2.73	-1.38	-0.52	1.07
1991-92 to 1	3.46	17.71	-5.21	1.42	14.95	2.40	31.95	4.56	-1.83	9.45	-1.36	1.64	-0.89	5.65	7.52	1.47
1980-81 to 1	3.28	6.55	-2.62	4.48	1.89	2.89	13.15	1.60	2.18	5.02	-0.53	0.79	1.35	2.74	3.29	1.33
Rajasthan																
1980-81 to 1	-0.55	-7.99	2.70	1.60	-1.72	0.79	...	1.36	4.04	3.98	0.13	2.28	2.84	1.82	1.25	1.77
1991-92 to 1	1.00	6.88	-1.53	7.86	13.03	4.85	...	2.45	7.01	7.14	5.48	2.09	4.15	5.60	-5.64	3.00
1980-81 to 1	1.60	0.51	3.44	6.89	4.65	1.18	...	1.92	8.05	6.99	3.83	2.94	1.20	6.04	-0.67	3.87
Tamil Nadu																
1980-81 to 1	1.57	-9.52	3.11	4.42	2.00	3.37	6.51	3.19	5.40	7.35	1.55	4.10	5.69	0.23	4.16	2.95
1991-92 to 1	0.64	3.82	1.52	8.74	-0.08	1.86	-0.34	4.65	2.40	2.47	2.05	1.22	3.27	7.13	-0.28	2.22
1980-81 to 1	2.04	-0.91	4.56	8.55	2.21	2.69	6.19	4.62	4.65	5.38	1.33	2.71	4.09	4.87	3.79	3.70
Uttar Pradesh																
1980-81 to 1	2.37	-14.21	2.30	10.62	10.97	5.64	2.32	9.00	13.28	4.81	1.02	3.77	5.51	7.65	5.76	2.90
1991-92 to 1	-0.85	2.66	1.22	7.39	11.23	1.12	3.09	0.38	-0.23	-1.63	0.15	0.17	2.13	2.64	1.17	0.69
1980-81 to 1	0.75	-4.84	0.81	10.15	9.88	3.37	3.35	5.71	7.76	1.44	0.29	2.65	3.94	5.06	3.38	2.21
West Bengal																
1980-81 to 1	-3.49	-2.96	-5.24	-3.54	-2.10	-2.23	-1.62	-1.13	-1.68	-0.95	-2.37	-2.68	-3.98	-3.76	1.56	-2.51
1991-92 to 1	1.66	24.85	-1.56	1.19	0.41	-1.91	7.54	1.37	1.65	-1.14	-0.91	-0.37	-2.00	3.22	-0.06	0.98
1980-81 to 1	0.36	13.39	-2.65	-1.25	-0.76	-1.20	3.03	0.50	0.63	0.67	-1.49	-0.24	-1.99	0.27	2.02	0.05

Annexure-9

Share of Employment of each Industry in National Aggregate (1980-81)

State/Ind	20-21	22	23+24+25	26	27	28	29	30	31	32	33	34+35+36	37	38	Others	Total
Andhra P	11.57	60.60	4.11	1.07	3.78	7.68	2.33	6.21	12.84	7.89	2.51	5.76	3.65	6.49	8.64	9.46
Assam	7.09	0.03	0.15	0.26	18.13	1.36	0.00	0.97	1.47	0.53	0.29	0.29	0.58	0.00	1.49	1.76
Bihar	3.78	1.39	0.77	0.76	3.00	4.79	4.66	4.09	8.48	10.82	17.85	2.92	7.24	0.12	5.63	4.76
Gujarat	6.29	3.32	18.55	6.60	5.40	6.59	1.52	15.31	8.98	15.68	4.28	9.49	2.67	10.68	4.31	9.63
Haryana	1.21	0.38	1.60	1.91	0.93	3.79	0.11	1.22	4.51	2.63	2.72	5.16	4.61	2.70	0.27	2.19
Karnataka	4.95	3.25	3.73	8.72	12.42	6.98	0.97	3.27	3.00	6.75	4.71	7.69	4.18	8.72	5.31	5.02
Kerala	9.39	4.65	1.29	6.36	18.48	3.86	0.31	3.09	4.35	4.44	0.67	1.67	1.04	2.64	5.43	3.84
Madhya F	2.62	3.76	4.69	3.18	4.29	5.06	1.41	3.03	0.81	5.71	8.05	3.48	1.20	0.50	7.18	4.24
Maharash	11.64	10.28	22.65	30.70	8.16	20.07	8.65	27.66	21.81	11.72	12.43	25.34	20.40	30.55	11.07	18.06
Orissa	0.85	0.43	0.65	0.18	4.55	5.06	0.46	0.92	0.13	3.90	5.93	0.59	0.09	0.31	2.95	1.60
Punjab	3.32	0.69	3.42	4.91	1.54	0.99	1.73	1.43	2.56	0.39	4.49	3.99	4.95	4.57	6.63	3.49
Rajasthar	1.25	0.51	2.90	3.71	0.45	1.19	0.00	3.21	1.01	4.70	2.25	1.84	3.85	2.04	5.37	2.62
Tamil Nac	11.22	2.60	10.20	17.98	7.29	11.98	36.86	15.48	9.96	7.14	5.75	10.70	14.67	7.91	11.76	10.66
Uttar Prac	18.65	6.72	5.19	4.67	3.40	7.42	17.74	5.83	4.21	10.74	5.85	7.68	7.15	7.53	17.06	9.59
West Ben	6.16	1.39	20.10	9.01	8.17	13.17	23.25	8.30	15.87	6.96	22.23	13.43	23.71	15.24	6.91	13.08

Share of Employment of each industry in National Aggregate (1991-92)

State/Ind	20-21	22	23+24+25	26	27	28	29	30	31	32	33	34+35+36	37	38	Others	Total
Andhra P	13.14	58.19	5.31	1.06	3.61	10.21	2.47	4.27	4.81	11.12	7.63	8.19	2.34	6.60	9.99	10.67
Assam	7.00	0.03	0.21	0.07	20.86	0.95	0.00	0.13	2.06	1.60	0.33	0.31	0.11	0.00	1.22	1.51
Bihar	2.22	2.77	0.63	0.39	3.81	1.66	2.07	2.73	9.64	10.69	20.38	2.13	7.28	0.45	2.23	4.49
Gujarat	6.84	1.88	14.05	7.15	4.24	6.93	0.56	16.07	8.81	12.76	4.09	9.21	2.44	10.37	7.02	8.77
Haryana	3.53	0.58	1.89	1.54	1.44	3.63	0.50	1.21	3.87	5.07	2.27	4.94	5.45	4.06	3.22	3.04
Karnataka	5.34	2.48	3.18	13.99	9.11	8.49	3.27	3.00	4.40	6.04	3.47	8.92	5.08	10.76	5.84	5.30
Kerala	8.68	8.21	1.42	2.31	17.06	3.14	0.00	3.32	3.91	3.87	0.78	1.60	0.93	4.68	2.33	3.44
Madhya F	3.43	4.58	4.81	0.62	4.58	5.39	1.44	2.87	2.97	8.75	11.41	4.16	2.15	1.35	3.63	4.65
Maharash	12.57	14.01	16.22	12.74	6.29	16.54	2.73	21.99	17.95	10.20	10.02	21.11	15.94	23.93	23.03	15.83
Orissa	0.92	0.27	1.03	0.47	4.62	3.87	0.17	1.49	0.49	3.92	5.65	1.05	0.09	0.22	1.03	1.56
Punjab	6.17	1.00	5.11	7.26	0.92	2.66	1.71	2.05	5.18	0.38	3.90	4.15	8.25	2.55	1.59	4.17
Rajasthar	1.16	0.43	4.70	1.40	0.40	1.19	0.30	1.18	3.47	6.46	2.19	2.30	2.58	4.76	5.97	2.71
Tamil Nac	11.73	2.44	13.22	24.28	7.08	13.63	38.29	17.05	10.37	7.41	4.44	11.22	17.31	9.68	11.92	12.11
Uttar Prac	11.73	2.44	13.22	24.28	7.08	13.63	38.29	17.05	10.37	7.41	4.44	11.22	17.31	9.68	11.92	12.11
West Ben	5.54	0.69	15.02	2.43	8.90	8.08	8.20	5.57	11.71	4.32	19.00	9.49	12.74	10.90	9.07	9.66

Share of Employment of each Industry in National Aggregate (2000-01)

State/Ind	20-21	22	23+24+25	26	27	28	29	30	31	32	33	34+35+36	37	38	Others	Total
Andhra P	13.84	67.25	2.62	2.54	5.29	8.48	0.75	6.54	6.12	12.78	7.26	6.64	4.55	1.75	6.11	10.78
Assam	6.39	0.04	0.27	0.00	0.25	1.64	0.00	0.32	2.22	2.91	0.17	0.24	0.03	0.00	0.97	1.40
Bihar	1.04	2.37	0.52	0.05	4.88	0.76	1.49	1.48	7.36	9.28	18.10	1.69	4.67	0.04	3.36	3.34
Gujarat	5.96	1.73	13.18	3.01	5.75	8.30	0.34	22.40	9.16	11.87	5.61	12.43	3.66	14.25	6.46	9.68
Haryana	3.45	0.48	1.29	3.46	2.44	2.74	6.14	1.34	3.97	4.37	2.15	7.01	11.80	4.02	0.49	3.62
Karnataka	6.15	2.35	2.44	19.76	6.32	6.84	3.01	3.39	4.47	6.54	3.13	8.59	5.96	7.67	6.99	5.95
Kerala	11.51	1.00	2.20	1.20	17.42	4.64	0.82	2.38	7.72	4.18	0.85	1.71	0.68	1.24	3.42	3.72
Madhya P	3.06	3.19	3.94	1.04	3.67	3.81	1.52	3.12	4.64	8.66	11.59	4.50	3.09	1.66	8.22	4.33
Maharash	13.20	10.28	12.24	6.79	20.28	18.79	3.15	14.50	19.63	8.03	11.12	22.46	20.93	30.22	10.82	14.46
Orissa	1.10	1.76	0.59	0.18	3.91	2.83	0.00	1.39	1.51	3.13	8.24	0.65	0.07	0.00	1.57	1.62
Punjab	6.45	1.21	4.43	3.29	1.50	2.67	3.29	1.72	6.33	0.44	3.97	4.45	8.91	3.51	3.08	4.11
Rajasthar	1.25	1.38	5.87	1.53	1.54	1.37	1.12	1.42	2.38	10.05	2.57	2.03	0.87	5.72	2.65	2.82
Tamil Nac	10.96	1.90	17.95	28.02	9.36	15.61	35.08	17.94	9.39	6.92	5.02	10.62	14.13	12.58	16.46	13.47
Uttar Prac	10.96	1.90	17.95	28.02	9.36	15.61	35.08	17.94	9.39	6.92	5.02	10.62	14.13	12.58	16.46	13.47
West Ben	4.67	3.16	14.50	1.12	8.00	5.89	8.21	4.11	5.72	3.93	15.22	6.35	6.51	4.75	12.96	7.23

Annexure 10

Table-3.6 Investment Ratio Across the Industries(State-wise)

Investment Ratio

Year	AP	ASM	BHR	GUJ	HAR	KAR	KER	MP	MAH	OR	PUN	RAJ	TN	UP	WB
1980-81	7.20	4.01	7.60	5.79	3.34	8.29	3.67	19.39	4.56	11.22	3.02	7.54	4.30	4.93	3.77
1981-82	5.66	6.63	9.09	5.16	4.02	7.34	4.20	17.07	5.02	8.84	3.56	6.84	7.07	14.30	6.16
1982-83	6.16	2.41	11.50	6.09	4.68	8.20	8.35	12.58	4.86	11.55	4.62	8.07	5.76	4.75	4.68
1983-84	12.40	4.02	7.83	10.80	4.76	12.18	7.56	12.23	5.40	14.69	5.64	11.56	6.77	6.10	4.92
1984-85	7.00	7.22	6.22	5.17	5.92	7.92	4.73	20.08	6.53	11.84	5.04	12.04	6.42	5.23	4.38
1985-86	5.67	11.59	6.39	6.24	7.42	8.69	6.57	16.51	5.66	11.42	3.72	12.26	6.11	6.47	8.84
1986-87	6.99	12.29	8.92	8.11	4.83	6.67	5.65	9.12	5.05	17.95	3.73	6.22	5.22	5.17	4.61
1987-88	7.34	5.20	8.31	6.44	4.13	6.00	4.74	11.46	5.39	48.61	4.97	8.46	4.61	6.20	5.87
1988-89	5.60	8.14	6.28	5.09	5.16	7.25	4.33	8.27	5.47	14.15	5.34	7.51	6.70	7.77	5.70
1989-90	5.50	5.45	7.34	6.39	4.42	6.66	3.17	8.66	6.35	5.70	4.96	4.36	5.79	6.68	5.84
1990-91	10.57	6.87	8.96	8.52	2.59	6.43	4.84	7.16	5.41	12.54	4.17	7.20	8.09	5.51	9.39
1991-92	8.75	6.42	12.25	7.15	5.69	1.25	3.47	6.55	6.47	17.02	3.69	12.78	6.30	7.53	15.04
1992-93	8.79	5.91	8.28	6.34	5.79	6.37	4.03	15.43	7.89	14.79	4.32	8.10	7.62	6.82	11.26
1993-94	6.56	6.05	13.76	10.54	8.69	5.99	5.50	11.33	7.13	22.54	4.89	8.28	9.71	6.95	9.71
1994-95	8.08	6.19	23.90	8.89	5.68	9.04	6.45	21.04	7.42	16.77	5.28	9.63	14.20	12.50	7.37
1995-96	8.60	10.92	13.25	17.10	8.26	8.13	5.21	10.52	8.52	17.99	6.93	9.33	8.49	11.49	6.90
1996-97	8.49	4.35	11.75	10.78	6.29	11.27	5.38	9.29	12.76	12.84	4.36	8.01	8.19	12.36	5.10
1997-98	5.96	4.69	7.21	10.76	4.48	10.67	3.69	9.21	6.59	9.52	4.16	7.16	5.07	8.67	4.43
1998-99	5.69	2.94	15.54	11.17	8.39	24.82	6.12	7.74	5.53	8.70	4.41	7.69	7.80	13.50	4.07
1999-00	5.31	4.23	-1.13	8.63	7.10	13.19	3.99	3.50	5.19	-3.07	3.29	5.43	5.47	5.60	1.14
2000-01	3.51	25.30	13.22	4.25	5.46	7.57	2.48	4.91	4.62	5.53	2.89	3.99	5.57	4.61	4.16

Investment ratio = (gfcf/output)*100

profit share=(profit/output)*100

Year	AP	ASM	BHR	GUJ	HAR	KAR	KER	MP	MAH	OR	PUN	RAJ	TN	UP	WB
1980-81	1.49	5.71	-1.95	3.96	5.97	5.37	4.20	8.27	5.75	3.20	3.18	2.15	4.98	4.15	1.15
1981-82	3.29	8.16	5.62	4.24	6.57	4.25	3.53	11.35	5.41	1.06	4.35	2.41	4.67	1.15	-0.26
1982-83	3.35	10.33	1.06	3.81	4.77	3.73	3.55	10.28	4.10	-3.03	3.71	2.13	5.55	2.99	0.40
1983-84	6.60	14.96	3.87	5.88	4.46	8.02	5.75	9.16	4.63	-0.64	4.44	8.17	4.88	-5.33	-1.62
1984-85	5.50	17.87	2.69	3.41	4.78	3.55	8.12	2.86	2.88	-4.51	3.37	4.09	7.07	-0.13	-1.55
1985-86	1.30	17.81	3.64	5.20	4.96	6.08	3.44	3.82	6.27	-1.67	4.37	0.88	4.49	1.16	0.71
1986-87	0.40	18.61	3.70	4.89	5.08	4.02	3.62	0.67	4.24	-1.16	2.72	2.67	4.08	2.84	-1.65
1987-88	-0.18	17.17	5.53	3.52	3.77	2.46	6.15	3.87	2.29	-1.43	2.45	1.30	2.86	2.44	2.98
1988-89	0.07	6.80	11.18	5.92	4.12	2.31	4.96	7.56	5.23	4.86	3.11	1.16	5.49	1.60	-3.32
1989-90	1.05	16.92	8.36	4.70	4.84	5.66	10.80	5.30	4.50	7.20	4.71	2.87	5.64	3.09	-2.89
1990-91	-0.83	17.84	6.75	3.70	5.95	5.77	6.09	7.69	5.34	5.63	4.62	5.32	7.76	3.08	0.58
1991-92	-1.75	11.74	8.20	2.86	4.23	6.37	5.80	5.29	1.45	3.13	4.94	3.46	5.97	3.74	-1.14
1992-93	-0.84	10.22	0.76	6.51	2.37	5.18	5.10	3.81	5.14	-0.18	2.48	3.59	5.05	3.29	-1.72
1993-94	0.36	14.93	5.62	7.04	5.76	6.42	7.22	7.97	9.07	-0.21	7.26	2.65	8.70	5.95	2.95
1994-95	5.03	10.06	5.23	12.00	4.70	8.68	8.59	8.44	8.41	3.33	7.25	6.19	7.32	7.86	1.65
1995-96	5.85	10.88	7.10	10.62	6.09	6.42	6.94	5.60	8.17	2.56	5.31	5.75	7.37	6.48	0.02
1996-97	5.03	4.05	10.84	9.83	7.48	6.22	6.27	6.22	6.59	-2.71	7.91	3.30	5.59	8.84	-1.61
1997-98	8.11	10.14	14.88	1.68	5.49	4.56	4.34	10.34	5.11	-1.82	4.54	1.79	2.76	4.87	-0.87
1998-99	2.39	12.25	17.72	6.47	5.11	5.61	9.33	5.61	5.73	0.24	7.32	3.22	4.61	3.86	0.18
1999-00	2.48	13.64	15.02	5.63	5.62	5.12	4.85	4.31	6.20	4.25	5.93	4.58	3.58	4.25	-3.35
2000-01	2.20	5.49	0.20	3.31	3.05	4.07	3.45	6.20	4.66	-0.29	2.85	6.30	4.35	3.44	-2.85

Annexure-11

Technical Efficiency Across The Industries (State-wise)

State/Industry	20-21	22	23+24+25	26	27	28	29	30	31	32	33	34+35+36+38	37
Andhra Pradesh													
1980-81 to 1989-90	0.781	0.404	0.772	0.371	0.755	0.144	0.373	0.488	0.236	0.725	0.638	0.897	0.467
1991-92 to 2000-01	0.716	0.316	0.613	0.407	0.742	0.323	0.407	0.333	0.253	0.671	0.548	0.914	0.543
1980-81 to 2000-01	0.749	0.360	0.693	0.389	**0.748**	0.233	0.390	0.410	0.245	0.698	0.593	**0.905**	0.505
Assam													
1980-81 to 1989-90	0.935	...	0.732	...	0.702	0.111	...	0.157	0.748	0.329	0.553	0.880	0.790
1991-92 to 2000-01	0.913	...	0.554	...	0.687	0.277	...	0.059	0.759	0.252	0.453	0.899	0.828
1980-81 to 2000-01	**0.924**	...	0.644	...	0.694	0.193	...	0.108	**0.753**	0.290	0.503	0.890	0.809
Bihar													
1980-81 to 1989-90	0.761	0.862	0.719	0.427	0.691	0.112	0.535	0.274	0.264	0.340	0.932	0.821	0.882
1991-92 to 2000-01	0.692	0.828	0.536	0.462	0.675	0.278	0.565	0.138	0.282	0.262	0.911	0.849	0.904
1980-81 to 2000-01	0.727	**0.845**	0.628	0.444	0.683	0.195	0.550	0.206	0.273	0.301	**0.921**	0.835	**0.893**
Gujarat													
1980-81 to 1989-90	0.788	0.381	0.831	0.569	0.602	0.132	0.362	0.734	0.375	0.533	0.674	0.652	0.488
1991-92 to 2000-01	0.726	0.293	0.705	0.599	0.583	0.307	0.396	0.622	0.393	0.458	0.590	0.701	0.563
1980-81 to 2000-01	0.757	0.337	0.769	0.584	0.592	0.219	0.379	**0.678**	**0.384**	0.495	0.632	0.677	0.526
Haryana													
1980-81 to 1989-90	0.927	0.452	0.859	0.867	0.894	0.179	0.854	0.457	0.282	0.571	0.831	0.890	0.923
1991-92 to 2000-01	0.903	0.364	0.750	0.879	0.888	0.367	0.866	0.301	0.300	0.499	0.781	0.908	0.938
1980-81 to 2000-01	0.915	0.408	0.805	**0.873**	**0.891**	**0.272**	**0.860**	0.379	0.291	0.535	0.806	0.899	**0.930**
Karnataka													
1980-81 to 1989-90	0.808	0.875	0.969	0.552	0.645	0.159	0.600	0.495	0.183	0.717	0.655	0.938	0.881
1991-92 to 2000-01	0.751	0.844	0.943	0.584	0.627	0.342	0.628	0.340	0.199	0.662	0.568	0.949	0.903
1980-81 to 2000-01	0.779	**0.860**	**0.956**	0.568	0.636	0.250	0.614	0.418	0.191	0.689	0.612	**0.943**	0.892
Kerala													
1980-81 to 1989-90	0.931	0.378	0.930	0.758	0.507	0.184	...	0.546	0.367	0.450	0.899	0.924	0.823
1991-92 to 2000-01	0.909	0.290	0.872	0.778	0.486	0.373	...	0.396	0.385	0.371	0.868	0.936	0.855
1980-81 to 2000-01	0.920	0.334	0.902	0.768	0.497	**0.278**	...	**0.471**	0.376	0.411	**0.884**	0.930	0.839
Madhya Pradesh													
1980-81 to 1989-90	0.730	0.509	0.974	0.475	0.691	0.140	0.876	0.515	0.175	0.899	0.939	0.978	0.760
1991-92 to 2000-01	0.654	0.423	0.952	0.509	0.675	0.317	0.886	0.362	0.191	0.877	0.920	0.982	0.802
1980-81 to 2000-01	0.692	0.466	**0.963**	0.492	0.683	0.228	**0.881**	0.439	0.183	**0.888**	**0.929**	**0.980**	0.781

Maharashtra													
1980-81 to 1989-90	0.946	0.489	0.919	0.866	0.856	0.181	0.809	0.897	0.429	0.789	0.817	0.957	0.924
1991-92 to 2000-01	0.929	0.402	0.853	0.878	0.848	0.369	0.824	0.847	0.447	0.745	0.764	0.964	0.938
1980-81 to 2000-01	**0.937**	0.445	0.886	**0.872**	**0.852**	**0.274**	**0.816**	**0.872**	**0.438**	**0.767**	0.791	**0.960**	**0.931**
Orissa													
1980-81 to 1989-90	0.615	0.232	0.633	0.412	0.660	0.125	...	0.192	0.195	0.691	0.848	0.606	0.886
1991-92 to 2000-01	0.519	0.156	0.422	0.447	0.643	0.296	...	0.080	0.212	0.632	0.802	0.660	0.907
1980-81 to 2000-01	0.567	0.194	0.528	0.430	0.651	0.210	...	0.136	0.203	0.662	**0.825**	0.633	0.897
Punjab													
1980-81 to 1989-90	0.958	0.608	0.949	0.925	0.628	0.105	0.536	0.569	0.178	0.349	0.675	0.624	0.527
1991-92 to 2000-01	0.944	0.531	0.907	0.932	0.610	0.268	0.566	0.421	0.194	0.270	0.591	0.676	0.598
1980-81 to 2000-01	**0.951**	0.570	0.928	**0.928**	0.619	0.186	0.551	0.495	0.186	0.310	0.634	0.650	0.563
Rajasthan													
1980-81 to 1989-90	0.762	0.439	0.960	0.706	0.708	0.113	...	0.536	0.335	0.783	0.566	0.950	0.761
1991-92 to 2000-01	0.693	0.350	0.925	0.729	0.693	0.280	...	0.385	0.354	0.738	0.467	0.958	0.803
1980-81 to 2000-01	0.727	0.395	**0.942**	0.717	0.700	0.196	...	0.461	0.345	0.761	0.517	**0.954**	0.782
Tamil Nadu													
1980-81 to 1989-90	0.911	0.503	0.907	0.498	0.527	0.151	0.506	0.375	0.334	0.945	0.576	0.792	0.739
1991-92 to 2000-01	0.882	0.418	0.831	0.531	0.507	0.331	0.538	0.222	0.352	0.933	0.478	0.824	0.785
1980-81 to 2000-01	0.897	0.460	0.869	0.515	0.517	0.241	0.522	0.298	0.343	**0.939**	0.527	0.808	0.762
Uttar Pradesh													
1980-81 to 1989-90	0.826	0.896	0.769	0.682	0.517	0.117	0.501	0.564	0.273	0.396	0.871	0.823	0.435
1991-92 to 2000-01	0.774	0.870	0.609	0.706	0.496	0.285	0.532	0.415	0.291	0.317	0.832	0.851	0.514
1980-81 to 2000-01	0.800	**0.883**	0.690	0.694	0.507	0.201	0.516	0.490	0.282	0.357	**0.851**	0.837	0.474
West Bengal													
1980-81 to 1989-90	0.742	0.508	0.807	0.799	0.581	0.125	0.650	0.409	0.266	0.570	0.467	0.843	0.579
1991-92 to 2000-01	0.669	0.422	0.666	0.816	0.562	0.297	0.675	0.254	0.284	0.498	0.360	0.868	0.646
1980-81 to 2000-01	0.706	0.465	0.737	0.807	0.572	0.211	0.663	0.332	0.275	0.534	0.414	0.856	0.613