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The pattern of industrial location in India under liberalization: an analysis of the organized manufacturing industries

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The economic liberalization policy initiated since the early 1991 has made large-scale delicensing of industry and changes in the industrial location policies, and thus, curtailed the role of the state as industrial owner and location regulator. With the increasing dominance of private sector in industrialization under liberalization it is expected that industries will be more spatially concentrated in the leading industrial regions. However, the neoclassical principle suggests that in the long run "divergence is followed by convergence". This is in contrast with the theory that raises the question about the regional industrial development in India under the two policy regimes. The main objective of the paper is to examine what happened to the location concentration of industries across the states in the post-liberalization period in India, and thus, understands the influence of economic liberalization on industrial location. This has been examined with the employment data of organized manufacturing sector for the pre- and post-reform periods by: first, looking at the trend of regional concentration of industries over the years, and second, looking at the regional industrial structure and the industrial diversification of regions during the pre- and post reforms periods. The findings suggest that concentration of industries has increased in the post liberalization period in India and the tendency to catch up the industrially developed states is hardly seen among the backward states.

Keywords: Industrial location, regional diversification, India.

INTRODUCTION

The question of regional spread of industries is very important to understand the development potential of the sub-national regions in India, since traditionally industrialization is considered as sine qua non for economic growth (Kaldor, 1967; Hirschman, 1958) and, in modern view, economic growth is a story dynamic cities, which are highly industrialized (World Bank, 1999; Chakravorty, 2003a; Chakravorty and Lall, 2007). Empirical studies show that owing to the increasing dominance of the private sector in industrialization location concentration of industries has increased in the post reform period and this is one of the major causes of regional inequality in India (Chakravorty, 2003a; Lall and Chakravorty, 2005). The literature of regional economies

suggest that industries tend to concentrate in order to realize tangible benefits from being close to other firms and to consumers, market access, thick labor markets, available infrastructure, transportation, raw materials and resources, agglomeration benefits, knowledge and technology spillover, externalities, etc.

Although private industries seek to locate in this profit maximizing locations, the location decisions of State owned industries are influenced by the consideration of balanced regional development. However, the role of the State as industrial owner and industrial location regulator has been substantially curtailed under the regime of liberalization and structural reforms. Therefore, with the increasing dominance of private sector industrialization, it

is expected that industries will be more spatially concentrated in leading industrial regions, which will lead to higher levels of regional inequality. Conversely, the neoclassical theory suggests that in the long run "divergence is followed by convergence": that is inter-regional inequality increases during the early phases of industrial development, being concentrated in metropolitan areas, and begins to decline at some later indeterminate point. This is in contrast with the theory that raises the question about the regional development of the industrialization in India under the two policy regimes, namely the in-ward looking restrictive industrial policies (until the mid 1980s) and the liberalization policies since the early 1990s and that of the effect of economic liberalization on industrial location in India.

The main thrust of the paper is to examine the process of industrial location in India and how it has changed in the post-liberalization period. The specific objectives of the paper are two-fold: first, to examine whether there is convergence or divergence of industrial concentration across the Indian states in the post-liberalization period and second, to examine the industrial structure of the states. These two objectives are examined with the data from Indian manufacturing industries for the period 1980-81 to 2002-03 and it is done in two steps: first, we compute the coefficient of variation of organized industrial employment aggregated for all industries across the states for the entire period and second, we have selected 16 Indian states and computed the location quotient and specialization coefficient, disaggregated into use-based manufacturing sectors (consumer goods, intermediate goods and capital goods) for each of the state to examine the regional industrial structure.

The remaining of the paper is organized in the following sections. Section 2 explains the context of the study. Section 3 discusses the theoretical perspectives of industrial location. Section 4 reviews the existing literature on industrial location in India. Section 5 explains the data source and methodology. Section 6 discusses the empirical findings. Section 7 sums up our discussion.

The India Context: Industrial Policy Regime

India has been followed a path of rapid industrialization in a very conscious and planned manner over the years since gaining independence with the objective of balanced regional development (Mohan 1997 and Ahluwalia, 2002a). In order to achieve this goal the governments have given preferential treatment to less developed states in distribution of public sector industries and most of the industrial policies were designed to influence industrial location away from the large cities and towards the backward areas. The importance of the public sector enterprises lies on the establishment of industries in the backward areas, since there is lack of private initiative in areas, which requires bulky investment

and long gestation period. Because the public sector industries are large and concentrated in the basic and capital goods industries, they are expected to form the core of the subsequent development and therefore, the location of the public sector enterprises have the critical importance to bring about a better balance of industry in the country.

Sekhar (1983) have reviewed at some policies such as industrial licensing, the location of public sector industries, location policies for metropolitan cities, small-scale industries location policies, the distribution and pricing policies for intermediate industrial inputs and other government location incentives, which were aimed at influencing inter-state distribution industries. The Industrial Development and Regulation (IDR) Act, 1951 was the principle instrument for channeling the investment in the industrial sector in socially desired directions. The act controlled not only entry to an industry and expansion of capacity, but also technology and import content (Ahluwalia, 1991). Industrial licensing has been used increasingly for attaining the objective of regional dispersal of industrialization by favouring the applications by the private sector for setting up industries in backward areas. The industrial policy 1977 decided not to be issued licenses for new industries within the peripheries of metropolitan cities. Furthermore, the financial institutions have also been instructed to deny finance to new industries, which do not require an industrial license and which would like to locate in these areas. The second and third plan emphasized on promoting greater integration between the large scale and small scale enterprises by providing fiscal incentives and reservations for the small-scale sector (Ahluwalia, 1991). Under the policy of backward area development programme, the second and third plan have emphasized on the development of infrastructure in backward areas and the promotion of small scale industries as the main instrument for industrial development. Various incentives for encouraging industrial growth were capital investment subsidy, transport subsidy, income tax concessions, concessional finance from financial institution, state government incentives and so on. In 1988 the growth center approach was introduced with the objective of developing the infrastructure of centers that could act as magnets for attracting industries to these areas through providing basic facilities like power, water, telecommunication and banking. Another important policy has been the control of distribution and pricing of key industrial products through the operation of freight equalization scheme (Mohan, 1997). Among the other polices influencing inter-regional distribution of industries the industrial estate programme, the rural industries project etc. were important.

However, since the mid-1980s the public sector industrial policy gradually lost its momentum in growth. The establishment of a large number of major industrial projects in less developed regions has not had any signi-

ficant impact on the industrial or overall economic growth of these regions (Ramadhyani, 1984). The industrial licensing and location policy resulted in fragmented and under-utilized capacity and thus, concentration of industries in few pockets. Bhargava (1995) remarked, "The licensing regime resulted in concentration of large industries in relatively few hands. Licensing and location restrictions resulted in fragmented and underutilized capacity. The objectives of balanced regional growth were also not achieved, as successful industries were concentrated in a few regions of the country." Mohan (1997) contends that the policy instruments that were used to influence industrial location may have been somewhat inadequate in greatly altering the distribution of industries across the country. Facing with such situations a series of internal de-regulation policies were taken by the government during the mid 1980s and, then in 1991, the severe financial crisis faced by the Indian economy forced the central government to take a drastic stabilization-cum-structural adjustments policy measures to set industry free of excessive regulation in tune with the pro-market reforms. (The economic liberalization policies in India have mainly three aspects: trade liberalization, industrial liberalization and financial liberalization (Narayana and Joseph, 1993), with two main thrusts: first, to integrate India with the rest of the world through trade liberalization, and second, to give a much greater role to the private sector in industrial development of the economy through abolition of industrial licensing and other controls and permits (Balakrishnan, 2003; Subrahmanian, 2003). However, our interest in this paper is only on the later one: policy-shifting relating to the industrial sector.)

The large scale de-licensing of industry and changes in industrial location policies were two of the major policy changes of the stabilization-cum-structural adjustments process of the early 1990s. (Stabilization involves short-term demand management through monetary and fiscal policies. The specific objectives of stabilization are: first to bring inflation under control through restrictive monetary policies and secondly, to correct deficit in the balance of payments usually through devaluation of exchange rates accompanied by import liberalization and thirdly, to check fiscal deficits by curbing government spending, particularly the non-developmental expenditures. Structural adjustment, on the other hand, is combined with the supply side of the economy or raising the long-term growth through improving efficiency, productivity and competitiveness. (Joseph, 1987 and 1997)). Regarding the changes in the industrial policy, Mohan (2006) remarks "The obsolete system of capacity licensing of industries was discontinued, the existing legislative restrictions on the expansion of large companies were removed, phased manufacturing programs were terminated, and the reservation of many basic industries for investment only by the public sector was removed. At the same time restrictions that existed

on the import of foreign technology were withdrawn, and a new regime welcoming foreign direct investment, hitherto discouraged with limits on foreign ownership, was introduced." Under the new policy regime there are very few location restrictions. The private enterprises can establish industries anywhere of the country they wish without facing restrictions, except a few environmental, pollution and other local land-use-related restrictions and also up to a certain distance from the metropolitan cities. The role of the central government as industrial owner and location regulator, thus, has curtailed and the role of private sector in industrialization has increased under the liberalization policy regime.

In a liberalized policy regime, we could have two sets of possible situations: first, under the dominance of the private sector in industrialization it is likely that industries will be more concentrated in the already industrially developed states leading to widening of interregional divergence. This is because since each state has an equal opportunity to lure industrial investment the developed states will take the advantage of available infrastructure to attract investment. The second view argued that although in the liberalized era the role of the central government in industrialization has curtailed, the state governments would have greater freedom and scope to attract private investment (including foreign investment) into the state by adopting pro-active industrial policies and practices offering attractive investments and conditioning the investment climate market friendly for entry and operation of industries in the state, which will provide advantage to the industrially backward states to accelerate industrial growth through its own policies and thus, reduce inter-regional variation in industrial disparities (see Subrahmanian, 2003). With such conflicting views it is not clear what has happened to the regional spread of industries in the post liberalization period. This is the thrust of the paper.

Theoretical Perspectives of Industrial Location

The literature of regional development is rich with theoretical formulation and empirical studies on the concentration of economic activities in some particular regions. In the early location theories firm's location decision is exogenously determined by given spatial distributions of natural resource endowments, technological differences and factors endowments. (For a review of these theories see Webber (1985), Smith (1981) and Chapman and Walker (1991). However, these theories have been criticized with the development of research on externalities, increasing returns to scale and imperfect competition (Redding, 2009). Krugman (199la and 199lb) and Fujita et al., (1999) have analytically modeled increasing returns to scale, based on the technological externalities, pecuniary externalities, monopolistic competition and transport cost. With the

development of this line of research, known as the new economic geography (NEG), the focus has shifted to these activity-specific factors ("second nature geography" according to Krugman, 1993), which are typically endogenous and could be influenced by policy (Redding, 2009), and thus, location decision becomes entirely endogenous. In these new models location choices are determined by a tension between "centripetal" or agglomeration forces, which promote the spatial concentration of economic activity, and "centrifugal" or dispersion forces, which favour an equal distribution of economic activity across space. (The agglomeration forces arise from pecuniary externalities (labor market pooling, input-output linkages, and migration induced demand linkages etc.) due to a combination of variety preferences, increasing returns to scale and transport costs. On the other hand, the dispersion forces arise in the form of high wages driven by competition among firms for skilled labour, high rent due to increased demand for housing and commercial land; and various negative externalities such as congestion, etc.) Thus, the location decision of an industry in a particular place depends on the relative strength of these two opposite forces, which in turn depends on transport costs, so that changes in transport costs result in endogenous changes in the distribution of economic activity across space.

Empirical studies have provided evidences for a wide range of factors influencing industrial location. Summarizing a corpus of empirical literature Deichmann et al., (2008) pointed out that factors like high factor prices, land laws and labour laws, etc. have negative effect, whereas good market access, financial incentives, transportation and communication facilities, socio-economic infrastructure, technology and knowledge spillover, agglomeration economies, inter-industry and intra-industry spillovers, etc. have positive effect on firm's location decision. (However, studies show that the magnitude of these factors varies place to place. For example, study done by Mani et al., (1997) have found positive effects of factor prices on industrial location in India, while Head and Ries (1996) have found no effect of factor prices on industrial location in China and Deichmann et al., (2005) and Henderson et al., (1996) have found negative effect of factor prices on in Indonesia (cited in Deichmann et al., 2008).) Further, state regulations (such as environmental and pollution standards, incentives in lagging regions or for emerging technologies, etc.) and the general level of political support (Lall and Chakravorty, 2005 and Deichmann et al., 2008) plays important role in influencing firm's location decisions.

Impact of Globalization

The theoretical predictions about industrial location from macro models of globalization are ambiguous. Different theories and empirical analyses often reach contrasting results about the regional impact of globalization. Chakravorty (2003a) has identified three main strands of this literature. The Myrdal (1957) and Hirschman (1958) approach of "cumulative causation" is the first strand of this literature, which suggested that industrialization follows the classic virtuous cycle principles, and hence, regional imbalances in industrial development are likely to widen in the absence of state intervention. The second approach, perhaps the most dominant and widely used approach in the literature, is the neoclassical approach of divergence followed by convergence, where "regional development models are equilibrium and convergence seeking" (Chakravorty, 2000). This neoclassical principle suggests that regional inequality increases during the early years of industrial development being concentrated in metropolitan areas, and begins to decline at some later indeterminate point.

Contrary to these two models, which are based on the assumptions of policy continuity which no longer holds under globalization, (The assumptions of policy continuity suggests that the regulatory conditions under which location decisions are taken do not change, and therefore, the key of urban and regional change is not political action, but the rise and fall of agglomeration advantages (Chakravorty, 2000).) the new economic geography (NEG) models have argued for an inverted U-shaped relationship between trade reforms and spatial concentration of industries, where regional inequality first rises and then falls in the presence of increasing returns to scale and transport costs. Elizondo and Krugman (1992) have suggested that post-reform regional development is likely to be more evenly balanced. They argued that the magnitude of internal trade is much larger than foreign trade in inward-looking trade regimes, which leads to concentration of production and trading activities in large metropolis. When, trade is liberalised it breaks the monopoly power of these highly concentrated production and trading centres and weaken the traditional forward and backward linkages. The centripetal forces such as proximity to local markets, inter-firm spill overs and so on, become weaker because producers can now depend on external demand, while the higher wages, land-rent, high transport cost due to congestion in the established markets act as centrifugal forces compelling them to relocate to less established regions.

Similar to the inconclusive theoretical predictions, the empirical evidences from different countries are contradictory. While evidences in support of positive impact of globalization on spatial concentration are found from various countries, for instance, Hanson (1998, 2005), Elizondo (1992) and Elizondo and Krugman (1992) for Mexico; Krugman and Venables (1995), Kim (1995), and Venables (1996) for the US; Brulhart and Torstensson (1996) for the European Union and Tomiura (2003) for Japan; the evidences in support of negative impact of globalization on spatial concentration are also glaring, for instance, Kanbur and Zhang (2005) for China;

Sala-i-Martin (1996) and Paluzie (2001) for Spain; Kanbur and Venables (2005) for cross country study of 50 developing countries.

Some evidence from existing studies

The uneven development of industrial sector in India is not a new phenomenon; it is long back to the colonial period. One of the intrinsic patterns of economic development and industrialization in the colonial period has been the concentration of development in certain areas. As observed by Meher (2000), "The modernization process of the Indian economy and society, though started during the British rule, remained confined to a few pockets and enclaves of colonial interests." The base of manufacturing were in the export-related processing of basic goods such as tea and jute at the independence and most of these industries were concentrated in and around the major ports of Bombay, Calcutta and Madras, which provided good avenue of transport for the goods being delivered and received from the interior and abroad (Mohan, 1997; Roth, 1970 and Meher, 2000). Apart from the uneven distribution of industries and infrastructure among the states, the concentration of the industries in certain metropolitan regions was most glaring. Given this historical pattern of industrialization in India, as Mohan (1997) observed, "there has been a longstanding concern with the location of industries in the country".

Though the literature on Indian industry is rich with the policy-oriented approaches that focus on details of the regulatory system governing Indian industrialization and the analysis of industrial productivity and growth, there is very little literature on the regional inequality in industrialization, except some early works by Alagh et al., (1971a, 1971b), Shetty (1982), Subrahmanian and Pillai (1986), Paranjape (1988) and some recent studies by Chakravorty (2003a, 2003b), Lall and Chakravorty (2005), Deichmann et al., (2008), etc. To start with, the empirical research carried out by Alagh et al., (1971a, 1971b) for 15 Indian states for the period 1956 to 1965 have found that the traditional primary-resource-oriented industrial base was the basic characteristics of the regional economies in India, except for the states like Maharastra, Tamil Nadu, West Bengal and to some extent Punjab. Further their studies have shown that, Maharastra, Tamil Nadu and West Bengal were the most diversified states, while states like Punjab, Gujarat, Madhya Pradesh, Uttar Pradesh etc, were the middle diversified states and other states like Rajasthan, Bihar, Assam, Jammu and Kashmir, Orissa, Kerala have least diversification. Their conclusion was that, the least and middle diversified states, in general, specialized in resource-based industries, while the diversified states apart from resource based industries specialized in capital and demand oriented consumer goods industries.

A further study by Subrahmanian and Pillai (1986) in the context of Kerala for the period 1960 to 1980-81 has drawn the same conclusion about the concentration and diversification of industries in the Indian states.

Shetty (1982) observed that the four major industrialized states namely, Maharashtra, West Bengal, Gujarat and Tamil Nadu together accounted for 44.7% of factories, 37.9% of the fixed capital and 40.8% of productive capital, while Bihar had only 5-6% share of all attributes whether relating to employment or output. Further, these five above mentioned states and Uttar Pradesh, Madhya Pradesh, Andhra Pradesh and Karnataka accounted for 78.4% of total number of factories, 79.0% of fixed capital and productive capital, 82.4% of factory employment, which indicate the concentration of industries in few states and this concentration continue to rising over the years.

A joint study by the World Bank and the Confederation of Indian Industry found that the investment climate varies widely across states and these differences are reflected in a disproportional share of investment, especially foreign investment, being concentrated in what are seen as the more investor-friendly states (Maharashtra, Gujarat, Karnataka, Andhra Pradesh and Tamil Nadu) to the disadvantage of other states (like Uttar Pradesh, Bihar and West Bengal) (Stern, 2001, cited in Ahluwalia, 2002b). A recent study by Chakravorty (2003a) on the location of industrial investment in India has found more concentration of industry on the west and east coasts, and the sparseness of industry in Bihar, eastern Uttar Pradesh, and central Madhya Pradesh in the post liberalization period. States like Andhra Pradesh, Bihar, Maharastra, Uttar Pradesh, Kerala and West Bengal have lost their share in investment in the post reforms period as compared to the pre reforms period, while states like Assam, Gujarat, Karnataka, Madhya Pradesh, Orissa etc. have gained share in investment. The district wise desegregation shows that the metropolitan districts have lost their share of investment in the post reforms period, whereas some sub-urban districts and even non-urban districts have gained (Chakravorty, 2003a). However, Deichmann et al (2008), in their comparative study on industrial location in the developing countries have found that in India although the largest increase in the manufacturing activities during the period 1989 to 1996 have taken place in the secondary and periphery areas (which indicate some de-concentration of activities), metropolitan areas retained their dominance in rapidly growing industrial sectors. Both the empirical studies concluded that there is inter-regional divergence and intra-regional convergence of the location of industrial investment in India in the post liberalization period.

At the same time, Lall and Chakravorty (2005) have found that new private sector industrial investments in India are biased toward existing industrial and coastal

districts and that the structural reforms lead to increased spatial inequality in industrialization. Awasthi (2000) in a district level survey in Gujarat also finds that investment have flown mostly to the districts that have proximity to some major industrial concentration with the advantage of forward and backward linkages, or are on major trunk route or near the ports. Similarly, Subrahmanian (2003) also finds that there has not been a major change in the ranks (This relative rank is on the basis of a composite index computed by using seven indicators to capture the industrial development of a state. The indicators are: percentage share of factories in the registered factory sector, percentage share of output of registered factory sector, percentage share of employment in the registered factory sector, value added per worker in the factory sector, per capita value added, percentage share of domestic product originating from manufacturing sector, per capita output of each state.) of the states under the pro-market liberalized policies: the already developed states continue the top rank, which implies the continuation of the earlier pattern of the industrial development under the state-lead policy regime.

Thus, we can see that there are differences in the empirical evidence of industrial location in India, which is mainly due to the different variables used for the purpose of analysis. However, most of the evidence shows that although the share of the large cities has declined and that of the secondary cities and periphery areas increased, the already industrialized areas have continued the dominance in the industrial development even in the post reforms period. But these evidences are not enough to reach at a general conclusion about the pattern and regional dispersal of industrial location in the post liberalization period and to examine the influence of economic liberalization on industrial location in India, since the period covered by most of these studies is prior the year 1997-1998, which is too early to realize the long term impact of liberalization. Our study covers the period up to 2002-2003.

Data Source and Methodology

Data Source

We have used the Annual Survey of Industries (ASI) data on organized manufacturing industries for the period 1980-81 to 2002-2003. The data has been collected from the "Annual Survey of Industries: A Database on the Industrial Sector in India", Economic and Political Weekly (EPW) Research Foundation, 2003-2004 (Vol. II). Appendix-I provides a brief explanation of the ASI database and the aggregation of data.

Our analysis considers only the organized (or registered) manufacturing sector. This implies the exclusion of unorganized manufacturing activities along with electricity, water and gas supply undertakings and repair services units, all of which count as industry. We have used the employment data of the organized manufacturing sector to represent the industrial activities. (However, other variables like the gross value of output, net value added by the industries and investment in the industries can also be used effectively to represent the industrial activities.) The rationale of using the manufacturing employment is because of the fact that the primary objective of inducing industrial development in the lagging regions is to generate local employment opportunities (Paranjape, 1988), and thus, reduce the regional imbalances in income distribution. However, as Nagaraj (2000) has pointed out that the registered manufacturing sector accounts only one-fifth of the industrial employment (cited in Chaudhury, 2002), our study will not explain a large part of the industrial sector. This limitation of our study should be kept in mind throughout the paper. By employment, we use the concept of "total persons engaged" in the ASI frame, which includes all the workers, (In the ASI frame workers are defined as all the persons employed directly or through any agency whether for wages or not and engaged in any manufacturing process or in cleaning any parts of the machinery or premises used for manufacturing process or the subject of manufacturing process. The number of workers and employees, in the ASI frame is an average number obtained by dividing man-days worked by the number of days the factory had worked during the reference year, where man-days represent the total number of days paid for during the reference year.) persons holding supervisory or managerial positions, engaged in purchase of raw materials etc. or purchase of fixed assets for the factory and watch and ward staff; and all working proprietors and their family members who are actively engaged in work of the factory even without any pay and unpaid members of the cooperative societies who worked in or for the factory in any direct or productive capacity.

For the purpose of a comparative analysis of the pre- and post liberalization periods we have considered four time points covering both the period: 1881-1882, 1988-1989, 1995-1996 and 2002-2003. The analysis has been carried out across 16 states with manufacturing employment share more than 1% each. (The selected states are Andhra Pradesh, Assam, Bihar, Delhi, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bangle.)

METHODOLOGY

The technique of analysis used in this paper is simple economic-base type of analysis. We have used the coefficient of variation statistic in order to capture the regional concentration of industries across the states
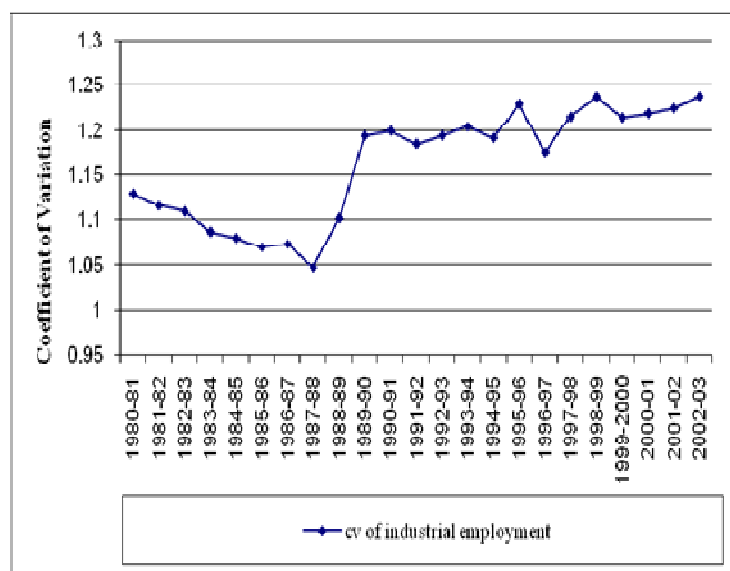
Figure 1. Coefficient of Variation of Industrial Employment in India
Source: Author's own Computation using ASI data

over the years. In order to make an assessment of what type of industries are located where we have followed the location quotient technique. Finally to examine how diverse are the states in terms of industrial mix we have employed the specialization coefficient technique. These measures have been explained in Appendix II. The estimates are based on employment statistics for the organized manufacturing sector.

Empirical Findings

Inter-Regional Inequality in Industrial Location

We begin our analysis by attempting an assessment of the concentration of regional distribution of the industries by using coefficient of variation (CV) of the organized manufacturing industry sector employment in India for the period 1980-1981 to 2002-2003. Figure 1 shows the CV of industrial employment in India over the years. It is obvious from the figure that there was successive decline in the CV between 1980-1981 and 1987-1988, which implies that some de-concentration in the regional distribution of industries was taken between this periods. However, between 1987-**19**88 and 1989-1990 there was an increase in the CV from 1.05 in 1987-1988 to 1.2 in 1989-1990 and since then it continues to remain more or less same up to 1994-1995. Further, the year 1995-**19**96 again witnessed a steep increase in the CV followed by a significant decline in the next year (1997-1998) and then continues to increase. Thus, there was a convergence in the distribution of Indian manufacturing industries be-

tween the period 1980-1981 to 1987-1988 and then a sharp divergence has taken place in the previous two years liberalization and since then it continues to diverse over the year (except a decline in 1996-1997), which implies that in the post liberalization period the manufacturing industries are more concentrated in some regions and other regions are lagging behind.

This is quite understandable by looking at the inter-regional distribution of manufacturing employment. Figure 2 and Table 1 reports the percentage share of the regions and states in organized sector manufacturing employment at four time points. It is obvious that the Southern region has gained employment shares over the years (increased to 35.3% in 2002-2003 from 28% in 1980-1981), while the Eastern region has considerably lost their share (declined to about 12% from 20.82% during the same period). The employment share of the Central region remains more or less same until 1995-1996 and since then sharply declined, while that of the Northwest region remains more or less same over the years.

A state level analysis of the employment share shows that the sharp decline in the share of the Eastern region is largely due to the sharp decline in the share of West Bengal and to some extent also Bihar (the share of Assam and Orissa being remain more or less same). On the other hand, the sudden fall in the share of Central region between 1995-1996 and 2002-2003 is mainly due to the decline in the share of Maharashtra (the share of Gujarat and Madhya Pradesh being decline marginally and that of Rajasthan remains more or less same). The continuous increase in the share of the Southern region is mainly due to the increase in the share of Tamil Nadu
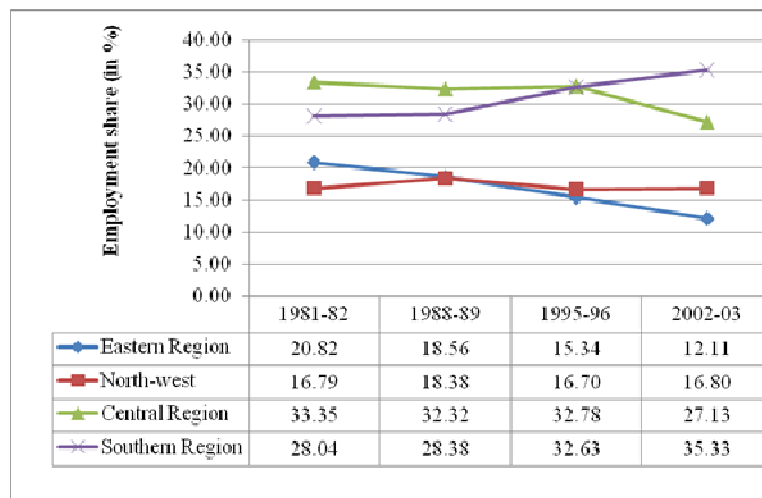
Figure 2. Regional distribution of Industrial Employment Share in India
Source: Author's own Computation using ASI data

Table 1. Percentage share of Industrial Employment of the States of India

States	1981-1982	1988-1989	1995-1996	2002-2003
Assam	1.64	1.70	1.67	1.43
Bihar	4.91	4.92	3.47	2.63
Orissa	1.55	1.72	1.72	1.49
West Bengal	12.73	10.23	8.48	6.57
Eastern Region	**20.82**	**18.56**	**15.34**	**12.11**
Delhi	1.50	1.89	1.59	1.65
Haryana	2.51	2.85	3.29	3.74
Punjab	3.23	4.31	4.04	4.21
Uttar Pradesh	9.55	9.34	7.78	7.20
North-west	**16.79**	**18.38**	**16.70**	**16.80**
Gujarat	9.38	9.17	9.17	8.09
Madhya Pradesh	4.08	4.61	4.97	3.64
Maharashtra	17.67	16.14	16.00	13.10
Rajasthan	2.22	2.41	2.65	2.31
Central Region	**33.35**	**32.32**	**32.78**	**27.13**
Andhra Pradesh	9.81	9.80	10.94	12.48
Karnataka	4.65	5.06	5.28	5.98
Kerala	3.90	3.02	3.38	3.44
Tamil Nadu	9.69	10.51	13.03	13.43
Southern Region	**28.04**	**28.38**	**32.63**	**35.33**
Total of the 16 states	**99.00**	**97.65**	**97.45**	**91.38**
Other States/ UTs	1.00	2.35	2.55	8.62
All India	**100.00**	**100.00**	**100.00**	**100.00**

Source: Author's own computation using ASI data

and Andhra Pradesh. Among the central region states the shares of Haryana and Punjab have marginally increase, while the share of Delhi remains more or less and that of Uttar Pradesh has declined marginally.

However, on the whole the shares of these 16 states have declined from 99% in 1981-82 to 91.38% in 2002-2003. In fact, the decline is more significant (more than 6% point) between the period 1995-1996 and 2002-2003. This implies that some redistribution has taken place in the manufacturing sector employment among the states during this period. However, a careful analysis shows that this redistribution has largely taken place only among six large states viz. West Bengal, Uttar Pradesh, Gujarat, Maharashtra, Andhra Pradesh and Tamil Nadu, whose combined share, which was 68.83% in 1981-1982, still remained 60.87% in 2002-2003. Considering the ranks of the states in terms of the employment share, we have found hardly any change in their relative ranks. The states continue to be remaining more or less at the same ranks over the years. The rank correlation matrix (Table 2) shows that the coefficients are very high and significant at 1% level, implying that there is hardly any change in the relative ranks in terms of employment share of the states over the years. Thus, the regional distribution of the industries still remains concentrated in few states in the post liberalization period as in the pre liberalization period.

Industrial Base of the Regions

To explain the relative regional concentration of industries we have calculated the location quotient for each of the sixteen sates and four regions using the employment data of the manufacturing industries, the result of which is given in Table 3. The concept of "industrial base" will be helpful at this stage to understand the structure of regional distribution of industries and also for inter-regional comparison of the industrial location pattern. To start with, it is obvious that the industrial base of the Southern regions consists of a set of consumer goods industries in both the pre and post liberalization period, while that of the Eastern region consists of a set of resource based intermediate goods industries. Although the Eastern region had some base in capital goods industries in 1981-1982, it lost its base, in 1988-1989. The Northwest region's industrial base mainly consists a set of consumer goods (but, lost its base in 2002-2003) and capital goods in both the pre and post liberalization periods, while the industrial base of the Central region comprises of a set of intermediate goods and capital goods industries in both the period.

At the state level, it is found that for all the states except Delhi, Haryana, Uttar Pradesh, Maharashtra, Karnataka and Punjab the industrial base mainly consist of a set of demand driven consumer goods and resource based intermediate goods industries. For example, the

industrial base of the states like Assam, Andhra Pradesh and Kerala comprise of a set of consumer goods industries in both the pre and post liberalization periods. Similarly, the industrial base of Bihar, Orissa, West Bengal, Gujarat, Madhya Pradesh, Rajasthan and Tamil Nadu comprise of a set of intermediate goods industries in both the pre and post reforms period.

However, a number of changes have taken place in the industrial base of the states in the post reforms period in comparison to the post reforms period. For example, in case of capital goods industries states like Bihar and Rajasthan had some share in the pre liberalization period, which they have lost in the post liberalization period. Similar is the case for West Bengal, which had some base in the capital goods industries till 1995-1996 and after then it has lost its base. On the other hand, Tamil Nadu and to some extent Gujarat and Madhya Pradesh, which has no base in capital goods industries in the pre reforms period, have improved their base in capital goods industries. Similarly, in the case of intermediate goods industries Delhi and Karnataka have emerged as industrial base in intermediate goods in the post liberalization period, whereas Punjab and Madhya Pradesh have lost their base in the post liberalization period, which they had before liberalization. The similar is the case for Maharashtra (who emerged as a base) and Karnataka (who lost its base) in the post liberalization period in case of the consumer goods industries. Thus the location quotient for the period 1981-1982 to 2002-2003 shows that the industrial base of all the states except for Delhi, Haryana, Maharashtra, Karnataka, Punjab and Uttar Pradesh comprise of a set of resource based consumer goods and intermediate goods industries in both the pre and post reforms period. The summary result of the industrial base of the regions obtains from the location quotient are given in the following table.

Regional Diversification of Industries

To examine whether the overall industrial system of the states-regions has a concentrated or diversified pattern, we computed the specialization coefficient (S_k), the result of which are given in Table. 5. Considering the four regions for analysis, it is found that the specialization coefficient for the Eastern and Northwest regions have increased, while that of the Central and the Southern regions have declined over the years, which implies that in the Eastern and Northwest regions concentration has increased and the Central and Southern regions have more diversified over the years. Now, classifying the regions into three broad groups according to their levels of diversification, it is found that Delhi, Karnataka, Madhya Pradesh, Maharashtra, Punjab, and Tamil Nadu are the diversified states, whereas Bihar, West Bengal, Orissa, Haryana, Uttar Pradesh, Gujarat, and Rajasthan

Table 2. Rank Correlation Matrix of Employment Shares of the States

Year	1981-82	1988-89	1995-96	2002-03
1981-82	1.000			
1988-89	0.9735*	1.0000		
1995-96	0.9471*	0.9676*	1.0000	
2002-03	0.8765*	0.9324*	0.9588*	1.0000

* Significant at 1% significant level
Source: Author's own Computation using ASI data

Table 3. Location Quotient of the Regions/States

States	1981-1982			1988-1989		
	Consumer goods	Intermediate goods	Capital goods	Consumer goods	Intermediate goods	Capital goods
Assam	2.31	0.50	0.21	2.43	0.62	0.15
Bihar	0.68	1.17	1.04	0.37	1.28	1.04
Orissa	0.80	1.35	0.26	0.63	1.42	0.27
West Bengal	0.43	1.20	1.41	0.46	1.17	1.23
Eastern Region	**0.66**	**1.17**	**1.10**	**0.63**	**1.20**	**0.96**
Delhi	0.75	0.90	1.75	0.78	0.91	1.58
Haryana	0.63	0.93	1.89	0.70	0.79	2.02
Punjab	0.70	1.06	1.33	1.07	0.91	1.18
Uttar Pradesh	1.61	0.69	0.85	1.46	0.74	1.12
North-west	**1.21**	**0.79**	**1.20**	**1.18**	**0.79**	**1.28**
Gujarat	0.54	1.35	0.75	0.54	1.29	0.77
Madhya Pradesh	0.81	1.21	0.70	0.90	1.15	0.70
Maharashtra	0.73	1.04	1.34	0.81	1.00	1.27
Rajasthan	0.50	1.17	1.35	0.46	1.31	0.85
Central Region	**0.67**	**1.15**	**1.12**	**0.72**	**1.12**	**1.05**
Andhra Pradesh	2.17	0.46	0.60	2.28	0.55	0.57
Karnataka	1.05	0.92	1.14	0.96	0.82	1.60
Kerala	1.97	0.63	0.40	1.76	0.82	0.48
Tamil Nadu	0.88	1.19	0.63	0.81	1.20	0.67
Southern Region	**1.51**	**0.82**	**0.67**	**1.44**	**0.87**	**0.79**

could be grouped in the middle level of diversification; and Assam, Andhra Pradesh and Kerala are the less diversified states.

Considering the changes in the diversification of industries that took place during the period 1981-1982 to 2002-2003, it is observed that among the diversified states Punjab and Tamil Nadu have registered a decrease in the degree of diversification, while Karnataka, Delhi and Madhya Pradesh have shown some

increase in the degree of diversification and Maharashtra showed no change over the years. In the middle level category, while on the one hand, West Bengal, Gujarat and Uttar Pradesh have shown some increase in the degree of diversification during 1981-1982 to 2002-2003 followed by a decline in 2002-2003 in the degree of diversification; on the other, Orissa and Rajasthan have registered a decline during 1981-1982 to 2002-2003 followed by an increase in 2002-2003. However, Bihar

Table 3. Location Quotient of the Regions/ States *(contd.)*

States	1995-1996			2002-2003		
	Consumer goods	**Intermediate goods**	**Capital goods**	**Consumer goods**	**Intermediate goods**	**Capital goods**
Assam	2.49	0.56	0.24	2.42	0.51	0.14
Bihar	0.35	1.31	0.99	0.41	1.34	0.85
Orissa	0.83	1.35	0.24	0.98	1.23	0.19
West Bengal	0.50	1.23	1.04	0.60	1.27	0.73
Eastern Region	**0.72**	**1.22**	**0.83**	**0.82**	**1.22**	**0.63**
Delhi	0.76	0.99	1.35	0.65	1.06	1.45
Haryana	0.81	0.80	1.80	0.61	0.83	2.38
Punjab	0.92	0.90	1.38	1.00	0.84	1.59
Uttar Pradesh	1.46	0.73	1.12	1.25	0.82	1.21
North-west	**1.14**	**0.78**	**1.33**	**0.98**	**0.78**	**1.66**
Gujarat	0.56	1.29	0.79	0.42	1.30	0.98
Madhya Pradesh	0.80	1.20	0.70	0.75	1.13	0.97
Maharashtra	0.78	0.96	1.40	1.15	0.91	1.06
Rajasthan	0.39	1.36	0.81	0.54	1.28	0.83
Central Region	**0.69**	**1.11**	**1.11**	**0.83**	**1.07**	**1.07**
Andhra Pradesh	2.23	0.58	0.54	1.81	0.72	0.51
Karnataka	0.77	0.98	1.36	0.79	0.99	1.43
Kerala	2.03	0.73	0.37	1.96	0.65	0.48
Tamil Nadu	0.73	1.14	0.95	0.62	1.19	1.00
Southern Region	**1.38**	**0.90**	**0.80**	**1.20**	**0.97**	**0.76**

Source: Author's own computation using ASI data

Table 4. Summary of the Industrial Base of the States

	Pre Liberalization Period	**Post Liberalization Period**
Consumer goods	Assam, AP, Kerala, UP, Punjab, Karnataka	Assam, AP, Kerala, UP, Maharashtra, Punjab
Intermediate goods	Bihar, Orissa, WB, Gujarat, MP, Rajasthan, Tamil Nadu Punjab, Maharashtra,	Bihar, Orissa, WB, Gujarat, MP, Rajasthan, Tamil Nadu, Delhi
Capital goods	Bihar, WB, Delhi, Haryana, Punjab, Maharashtra, Karnataka, Rajasthan, UP	Delhi, Haryana, Punjab, UP, Maharashtra, WB, Tamil Nadu

Source: Summarized from Table 3.

and Haryana, in the middle category have registered a decline in the diversification over the years. In the less diversified group, Andhra Pradesh has witnessed highest increase in the degree of diversification, while Assam and Kerala have registered increase in the degree of diversification during 1981-1982 to 1988-1998 and since then declined.

In terms of the relative ranking of the states according to the level diversification, it is found that the less diversified states remain in the same relative rank over the years, while changes have taken place in the relative ranks of the middle level diversified group and diversified.

However, these changes in the relative ranks are mostly within the respective groups. In the diversified group, Karnataka continues to be at the top rank (except slipped to 4th in 1988-1989); Maharashtra continues to be at the second rank (except slipped to 5th in 2002-2003); for Delhi the rank is improved; while, for the others it changes within them. Similarly, in the middle level diversified group, the relative rank of Orissa has improved, while that of Bihar and Rajasthan has declined; and West Bengal, Gujarat and Uttar Pradesh has remained more or less at the same relative position. The rank correlation matrix of the states in terms of diversification over the years shows that the coefficients are high and significant

at 1% level of significant (Table 6), which implies that there is hardly any change in the relative ranks of the states.

An interesting feature of the regional diversification of the industries in the country is that the nature of specialization varies with the degree of diversification. A comparative analysis of Table 3 and Table 5 shows that the less diversified states, in general, specialized only in a set of consumer goods industries; while the specialization of the middle level diversified and diversified states is in intermediate goods industries and capital goods an industry. For example all the less diversified states namely Assam, Kerala and Andhra Pradesh are specialized only in a set demand oriented consumer goods industries. On the other hand, all the middle level diversified states specialized in resource based intermediate goods industries, except Haryana and Uttar Pradesh who specialized in capital goods industries. Similarly, almost all the diversified states specialized in a set of capital goods industries, except Madhya Pradesh and to some extent Tamil Nadu who specialize in a set of intermediate goods.

CONCLUSION AND IMPLICATIONS

Industrial growth is essential for raising the economic growth in a country like India. However, the regional variation in the industrial development is one of the primary causes of the regional disparities in India. In this paper we have made an attempt to compare the process of industrial location in India in the pre- and post-liberalization period taking the year 1991 as the point of departure. The findings show that the post liberalization period has witnessed more concentration of manufacturing industries, which suggests widening the inter-regional divergence in India in terms of industrial development in the post liberalization period. The Southern region has gained employment shares over the years at the cost of the Eastern region and to some extent Central region. At the states level, the share of West Bangle and Maharashtra has declined significantly, while that of Andhra Pradesh and Tamil Nadu has in-

creased. Considering the degree of diversification it if found that Central and Southern regions have become more diversified, while Eastern and Northwest regions become less diversified over the years. It is observed that the nature of specialization varies with the degree of diversification. The less diversified states, in general, specialized in a set of consumer goods industries, while the middle level diversified and diversified states are specialized in intermediate goods and capital goods industries. Further, the results show that the less diversified states remain in the same relative ranks over the years, while changes have taken place in the relative ranks of the middle level diversified and diversified states. On the whole, our discussion leads to the conclusion that India is diverging, not converging in terms of inter-regional distribution of manufacturing industries in the post liberalization period. The tendency to catch up the industrially developed states is hardly seen among the backward states.

However, our conclusion is not the precise, since we consider only the organized manufacturing sector. Our study does not cover the small scale and unorganized manufacturing sector, whose coverage is much more than the organized sector. Further, our study considers only the organized manufacturing sector employment to explain industrial activities. The result may be different if we include the small-scale and un-organized manufacturing sector and consider gross value of industrial output or industrial investment, other than employment to represent industrial activities.

Though the structural reforms of 1991 were used to be a point of departure in the analysis, it does not imply that this concentration process is purely the result of the economic liberalization. Our study does not investigate the influence of economic liberalization on industrial location, as well as the factors causing the industrial concentration in the post reforms period. The probable reasons of industrial concentration in the post reforms period could be the traditional factors that we have mentioned above or some region specific factors such as cost structure, characteristics of labour forces, geographical characteristics, investment climate, political condition, etc.

It is worthwhile to emphasize the importance of industrial and incentive policies at the state level, as the central government has minimal role to play in industrial location in the post liberalization period. Ahluwalia (2002 b) emphasized that 'because liberalization has created a more competitive environment, the pay off from pursuing good policies has increased, thereby increasing the importance of state level action'. Under the liberalization policy regime the states have more freedom and flexibility, and thus, they could take the advantage of initial development, physical capabilities and economic and geographical environment to attract and develop industries (Dholakia, 2000). Now a day several state governments are competing with each other in "incentive

Table 5. Specialization Coefficient of the Regions/ States

States	1981-1982 Value of S_k	Rank	1988-1989 Value of S_k	Rank	1995-1996 Value of S_k	Rank	2002-2003 Value of S_k	Rank
Less Diversifies States								
Assam	0.794	16	0.743	16	0.775	16	0.811	16
Andhra Pradesh	0.709	15	0.663	15	0.638	15	0.465	14
Kerala	0.591	14	0.397	12	0.536	14	0.549	15
Middle level Diversified States								
Bihar	0.218	5	0.362	11	0.381	11	0.425	12
Orissa	0.390	13	0.457	14	0.396	12	0.281	6
West Bengal	0.346	9	0.280	8	0.262	7	0.315	9
Haryana	0.367	10	0.416	13	0.355	10	0.452	13
Uttar Pradesh	0.372	11	0.273	7	0.281	8	0.302	8
Rajasthan	0.301	7	0.350	10	0.403	13	0.327	9
Gujarat	0.373	12	0.317	9	0.310	9	0.336	11
Diversified States								
Madhya Pradesh	0.252	6	0.186	3	0.238	6	0.160	3
Maharashtra	0.163	2	0.136	2	0.200	5	0.156	2
Delhi	0.345	8	0.255	6	0.174	2	0.200	4
Karnataka	0.069	1	0.208	4	0.160	1	0.125	1
Punjab	0.180	3	0.110	1	0.189	4	0.222	5
Tamil Nadu	0.195	4	0.223	5	0.176	3	0.280	7
Region Wise								
Eastern Region	0.20		0.21		0.22		0.24	
North-west	0.21		0.22		0.22		0.24	
Central Region	0.20		0.15		0.16		0.10	
Southern Region	0.31		0.23		0.19		0.12	

Source: Author's own computation using ASI data

Table 6. Rank Correlation Matrix of the States in terms of Diversification

	1981-82	1988-89	1995-96	2002-03
1981-82	1.000			
1988-89	0.8496*	1.0000		
1995-96	0.8059*	0.8830*	1.0000	
2002-03	0.7761*	0.8430*	0.8481*	1.0000

* Significant at 1% significant level
Source: Author's own Computation using ASI data

war" such as relief from sales tax, electricity and water rebates, capital subsidy, and preferential treatment in government purchases, etc. to attract new investment in to the state. Although these direct government incentives are necessary for attracting industrial investment, they are unlikely to be sufficient. Factors that are likely to be more important are availability of transport and communications, water and power, and services and social amenities. Therefore, the backward states should emphasize more on providing appropriate physical infra-

structure (power, water, transport and telecom), legal and financial infrastructure (corporate law, accountancy norms, and banks, capital markets), and social infrastructure to attract new industrial investment. Another important point, as Bhargava (1995) pointed out, is the regulatory regime prevalent in the states. Although industrial licensing system has been abandoned, several labour, company, and tax laws and environmental licenses and permits need to be taken for access to land, water and power etc. Under such a situation, states having fewer complexities in these regulations along with other advantages will attract more industrial investment, and thus, results in more concentration of industries. Therefore, the states are required to reconsider their development strategies, alter necessary policy decisions and change institutional structure to attract more industrial investment in their economies.

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Appendix-I

A Note on Asi Data

The Annual Survey of Industries (ASI) is the principle source of industrial statistics in India. It is conducted every year (since 1959) by the National Sample Survey Organization (NSSO) and processed by the Central Statistical Organization (CSO). The ASI relates to the organized (or registered) manufacturing sector. It covers industrial units registered under the sections 2m(i) and 2m(ii) of the Factories Act, 1948 and Bidi and Cigar establishment registered under the Bidi and Cigar Workers (Conditions of Employment) Act, 1966. The ASI collects data using two methods: a 'census' sector survey with 100% coverage of units employing 50 or more persons with the aid of power and employing 100 or more persons with the use of power; and a 'sample' sector survey of the smaller units employing 10 or more persons with the aid of power and 20 or more persons without the aid of power.

The ASI organized the data on the basis of the National Industrial Classification (NIC). Until 1997-1998 the ASI data was organized according to the NIC-1987 classification and then the NIC-1998 classification has followed until 2003-04 and since then the NIC-2004 classification has been followed. We have collected the ASI data published in "Annual Survey of Industries: A Database on the Industrial Sector in India", Economic and Political Weekly (EPW) Research Foundation, 2003-04 (Vol. II) at the NIC-1987 two-digit code for the period 1980-1981 to 1997-1998 and at the NIC-1998 three-digit code for the period 1998-1999 to 2002-2003. In order to arrive at a consistent data set in terms of industrial classification at the two-digit level we have reclassified the data for the period 1998-1999 to 2002-2003 to the NIC-1987 two-digit code following the concordance table published by the CSO (see Table-A.1).

Data Aggregation

The ASI data were reported at the 2-digit NIC code. The ASI data, which are reported in NIC 2-digit codes, were further aggregated following the use-based classification (However, the manufacturing sector can also be classified in to input-based classification also. Under the input-based classification, the manufacturing sector is classified into agro- based, metal-based and chemical-based subgroups, depending on the source of raw materials.) as suggested by Ahluwalia (1991) in order to make our analysis easier and simple. As Ahluwalia pointed out, "Use-based classification not only constitutes economically meaningful groups which have interest from the point of view, but they also have a practical advantage because of the smaller noise element in the data. Under the use-based classification the

manufacturing sector has been divided into in to capital goods, intermediate goods, consumer durables and consumer non-durables (Ahluwalia, 1991). This use-based classification is somewhat different from the traditional use-based classification of the industries, which has an additional use-base sector, i.e. basic goods. The exercise done by Ahluwalia on the use-based classification of manufacturing industries is similar to the one followed by the Reserve Bank of India in which the bank (and now the CSO also) prepares composite indices of the industrial production (Ahluwalia, 1991). However, a major problem of the use-based classification is that even 3 digit NIC product groups are not fine enough in quite a few cases to enable on to precisely classify them (Chaudhury, 2002). Constrained by this, we have merged the consumer durables and non-durables into one group. The use-based classification of industries at the two-digit level is not precise one and we may lose some information for this. But, we assume that this lose of information is minimal and will not affect our analysis. The analysis has carried out for all the three industry sectors identified here for analysis. The use-based classification of the manufacturing industries followed in our analysis as per the NIC-1987 classification is given in Table-A.2.

Problems with the Asi Data

Some of the limitations of ASI data are worth noting. Firstly, since the definition of industry was set by the Factories Act, certain types of establishments such as software manufacturers and everything in the service sector are not covered by the ASI. Secondly, the ASI covers only the organized sector of India's industrial economy. The number of employees covered, for instance, is less than ten million, which clearly is a far lower number than the true size of the population engaged in formal and informal industrial activity (Lall and Chakravorty, 2005). Thirdly, the survey data are naturally subject to the problem of variation in response and therefore in coverage (Ahluwalia, 1991). Fourthly, establishment under the control of the Defense Ministry, Oil Storage and distribution units, restaurants and cafes, and technical teaching institutions not providing anything for sale or exchange were kept outside the coverage.

Appendix-II

Measures of Concentration and Diversification Coefficient of Variation

The coefficient of variation (CV) is used to measure the variation of a variable. By definition, it is defined as the

TABLE-A.1. Concordance Table

NIC 1987 code	NIC 1998 code	NIC 1987 code	NIC 1998 code
20-21	151+152+153+154	31	23+25
22	155+16	32	26
23-25	171	33	27+371
26	172+173+181	34	2811+2812+289
27	20+361	35-36	2813+29+30+31+32
28	21+22	37	34+35
29	182+19	38	33+369
30	24	39	725

Source: 'National Industries Classification', CSO

Table-A.2. Use Based Classification of Manufacturing Industries

Industry Group	NIC1987	Two-digit industries included in the Industry Group
	20-21	Manufacture of Food products
Consumer	22	Manufacture of Beverages, Tobacco and related products
Goods Industries	28	Manufacture of Paper and Paper Products and Printing, Publishing and allied Industries
	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 cotton)
	26	Manufacture of Textile Products (including wearing apparel)
	27	Manufacture of Wood and Wood Products
	29	Manufacture of Leather and Products of Leather, Fur and substitutes of Leather
	30	Manufacture of basic Chemicals and Chemical Products (except products of Petroleum or coal)
Intermediate Goods Industries	31	Manufacture of Rubber, Plastic, Petroleum and Coal Products, and Processing of Nuclear Fuels
	32	Manufacture of Non-Metallic Mineral Products
	33	Basic Metal and Alloys Industries
	34	Manufacture of Metal Products and Parts, except machinery and equipment
Capital Goods	35-36	Manufacture of Machinery and Equipment other than transport equipment
Industries	37	Manufacture of Transport Equipment and Parts

standard deviation divided by mean, symbolically

$$CV_x = \frac{\sigma_x}{\mu_x} \qquad .... (1)$$

Where σ is the standard deviation, μ is the mean of the variable X (say, industrial employment in this case). A higher value of the CV means that there is concentration of the industries in some specific regions and other regions are lagging behind. On the other hand, a lower CV implies that the industries are relatively equally diversified across the regions. We have estimated the coefficient of variation of manufacturing employment for the country as a whole in order to estimate the regional variation of industrial location across the states. This will help us in achieving the first objective of our study.

Location Quotient

The location quotient is a measure of relative regional concentration of a given industry compared to total national magnitudes. In the present study, a location quotient is expressed in terms of employment share ratio. The numerator of the ratio is the share of a region's total employment accounted for by the given industry, and the denominator of the ratio indicates the share of the overall

country's total manufacturing employment accounted for by the same industry. This may be expressed as:

$$l_{ik} = \frac{e_{ik}/E_k}{E_i/E} \qquad \ldots\ldots\ldots\ldots(2)$$

$$or \qquad l_{ik} = \frac{a_{ik}}{a_i} \qquad where, \ a_{ik} = \frac{e_{ik}}{E_k} \ and \ a_i = \frac{E_i}{E}$$

Where,

e_{ik} = Employment in the ith industry of the kth region (i=1,2…n; k=1,2…m)

E_k = Total employment in the kth region of all industries;

$$E_k = \sum_{i=1}^{n} e_{ik}$$

E_i = Total employment in the ith industry of all the regions; $E_i = \sum_{k=1}^{m} e_{ik}$

E = Total employment in the regions, $E = \sum_{i=1}^{n} \sum_{k=1}^{m} e_{ik}$

The value of lik connotes that, if $0 \le lik < 1$ then less than proportionate share of ith industry is in k^{th} region and if $lik \ge 1$ then, more than proportionate share of industry i^{th} is in k^{th} region. For example, if $lik = 1$, it means that the regions share of the particular industry/sector is equal to its share of all industries and $lik = 3$ means that the regions share of that industry/sector is three times its share of all industries (Lall and Chakravorty, 2005).

The location quotient, which indicates the industries that are concentrated, or otherwise, in a region, would provide the basis for a qualitative judgment about the "structural base" of the region's industrial economy. Given the sets or blocks of interrelated industries it is possible by using location quotient analysis to identify one or more sets of interrelated industries in which a region specializes. The industries for which $Iij > 1$, may be taken as constituting an interrelated set or block of industries and one or more such sets or blocks of industries located in a region may be defined as the "industrial base" of the region (Alagh, Subrahmanian and Kashyap, 1971) and the industries with low location quotients are relatively non-concentrated.

Specialization Coefficient

The specialization coefficient (S_k) measures the extent to which a given region's industrial economy has a diversified pattern. From the location quotients of different industries in a region, the coefficient of specialization for the region can be calculated. The specialization coefficient is computed by taking the sum of difference of the denominator and numerator of the location quotient without considering the sign and dividing the sum by 100. Symbolically,

$$S_k = \frac{\sum_{i-1}^{n} (\frac{e_{ik}}{E_k} \times 100 - \frac{E_i}{E} \times 100)}{100} \qquad \ldots\ldots(3)$$

The value of the specialization coefficient lies between zero and unity $(0 \le S_k \le 1)$. If a region's industrial economy is as diversified as the national industrial economy its specialization coefficient will be zero and on the other hand, if all its industrial employment is concentrated in one industry, its coefficient will be one. Given the values of the specialization coefficients of each region, we can classify the regions broadly by their levels of diversification into three categories: 'diversified' regions ($0 < S_k < 0.25$), 'middle level' diversification $(0.25 < S_k < 0.50)$ and 'less diversified' regions $(0.50 < S_k < 1)$ as suggested by Alagh et al (1971a, 1971b). Change in the value of specialization coefficient across regions/states and between different time points reflect the degree of industrial diversification of the given region. A less diversified industrial structure in a region is likely to cause a growth-rate pattern somewhat different from the nation.