Spatial Distribution of Workers in Manufacturing India – 1991 and 2011

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H. Ramachandran and Priyanka Tiwari[*]

[***Abstract***: *For decades, the relationship between structure of the economy and development has been of interest to scholars working on development economics. The major points emerging out in such studies are (a) to grow, countries must undergo 'structural transformation' and (b) this transformation involves shifts in resource, labour force and production from primary through secondary to tertiary activities. Thus, changes in composition of employment and production are important part of process of development. This paper is focussed on the question of change in relative strength of labour engaged in manufacturing activities in India in 1991 and 2011. The analysis is based on GINI values and Index of Concentration computed on the basis of data from Census of India.*

Based on the data analysis the paper concludes that: (1) Although the GDP has increased between 1991 and 2011 by a factor of almost 5, the proportional contribution to the GDP of the secondary sector in general, and the manufacturing in particular, has been more or less the same. (a) As a consequence of the near stagnant manufacturing sector the regional pattern of concentration of the manufacturing activities in the twenty- year period remains similar. (3) While interstate disparity in manufacturing to a large extent has to be addressed by the Union Government, intra-state disparities illustrated by eastern and western parts of Maharashtra, northern and southern regions of West Bengal and other state level regional inequalities have to be essentially corrected by the state governments. (4) We may not be able to address the problems of regional disparities at the national and state levels in the New Economic Policy regime which is grounded in benefitting from human and physical resource advantage, but such policies particularly at the national level, must change tracks to significantly increase the magnitude of manufacturing activities. Among other things, differential package of incentives to promote manufacturing in poorly developed industrial areas needs to considered both at the national and state levels.]

Keywords: *Workers in Manufacturing; inter-district disparities, index of concentration, GINI coefficient.*

I. Introduction

For decades, the relationship between structure of the economy and development has been of interest to scholars working on development economics. The most noted among these include Clark's (1940) analysis of the changes in the use of labour with rising income, Kuznets's study (1957) comparing elements of national accounts, and that of Chenery (1960) in the context of the post-war economy. The major points emerging from such

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studies are (a) to grow, countries must undergo 'structural transformation' and (b) this transformation involves shifts in resource allocation from primary through secondary to tertiary activities. More recently, noted scholars have argued that the pattern of economic development in India is unsustainable, sans industrialisation, and it is also unsustainable because of heavy dependence on a largely informal tertiary sector (Bhalla, 2004). Such a position is anchored by the important work of Kuznets (1957) on economic growth which equates development with industrialisation.

Thus, changes in composition of employment and production are an important part of the process of development. Following the experience of the Industrial Revolution, it is generally expected that a shift of employment and production from agriculture to manufacturing, and then from manufacturing to services would take place and this is the desired pattern of change. The shift in work force and production would take place whether the economy chooses spatially balanced growth or growth based on resource endowment (uneven growth). Baumol (1967) posited that uneven growth will be a general feature of the growth process because different sectors will grow at different rates. Kumar and Sengupta (2008) found through a cross-country comparison that contribution to GDP by the manufacturing sector in India is much lower compared to other developing countries: 35 per cent (China), around 30 per cent in (South Korea, Malaysia and Indonesia), and around 24 per cent in (Argentina and Brazil). They also found that the Indian manufacturing sector exhibits a great deal of regional variation and that the level of labour absorption in the organized manufacturing sector has been weak as reflected in the declining labour intensity in this sector and the fact that growth has been primarily driven by services. Roy (2008) analyzed the growth rate of GDP, manufacturing and services during the period 1981/82 to 2005/06 and concluded that the growth of manufacturing didn't exceed the growth of GDP for most of these years, while the growth of services was higher than the growth of GDP in several years.

Table 1: Distribution of GDP across Broad Sectors and Male Main Workers (Per cent Values)

Sectors	*1991*			*2011*		
	Share of GDP	*Share of Workers*	*GDP/Workers (Column 2/3)*	*Share of GDP*	*Share of Workers*	*GDP/Workers (Column 5/6)*
1	*2*	*3*	*4*	*5*	*6*	*7*
Primary	29.53	67.5	0.44	14.45	52.98	0.27
Secondary	27.63	12.0	2.30	28.23	16.73	1.69
Tertiary	42.55	20.5	2.08	57.32	30.29	1.89

Source: For data on workers - Census of India (1991 and 2011), and data on GDP - data.gov.in

Note: Primary sector includes main workers in occupational category of cultivators, agricultural labourers, workers in agriculture-allied activities and mining. Secondary sector includes manufacturing in household and non-household industry as well as workers in construction activities, Tertiary sector includes workers in electricity, water supply, sewerage, wholesale and retail trade, transportation and storage, accommodation and food service activities, information and communication, financial and insurance activities, arts, entertainment, recreation and other services.

As per the Economic Survey, the size of GDP of India, at constant prices, increased by a factor of 4.8 between 90-91 and 2010-11. A perusal of the table would firstly draw one's attention to the fact that the proportional contribution of the secondary sector to the GDP in general (and manufacturing in particular) has remained more or less the same during 1991 and 2011 at about 28 per cent (Table 1). Secondly, the share of the tertiary sector increased substantially and thirdly, the ratio of GDP by worker was highest in the tertiary sector in 2011 explaining the growth of this sector.

II. Focus of this Paper

This paper is focussed on the question of change in relative strength of labour engaged in manufacturing activities in India in 1991 and 2011. The choice of the time-period of analysis is both because (a) it represents two decades - immediately after new economic policy regime was ushered in - and (b) availability of data on workers from the same source – Census of India.

III. The Data Base on Workers – Census of India

Since we would be using data on workers from the Census of India extensively in the following sections, we start with a brief description of definitions used by the Census relating to workers and their occupations. The definition of workers in the Indian Census is akin to the National Sample Survey Organization's (NSSO) concept of Usual Primary Status (UPS) if only main workers are considered and Usual Primary and Secondary Status (UPSS) if both main workers and marginal workers are considered. Female workers are left out in much of the analysis that follows due to problems of under reporting.

In the 2011 Census, all persons (irrespective of age and sex) who participated in any economically productive activity for any length of time during the reference period (one year prior to the date of survey) are defined as workers. Workers who worked for more than 6 months (180 days) in the reference period are termed as Main Workers. Marginal Workers are those who worked for less than six months (180 days) in the reference period.

The workers classified by the Census of India (1991) can be grouped into 10 categories as follows:

a) Cultivators;
b) Agricultural labourers;
c) Workers in livestock, forestry, fishing, hunting and plantation;
d) Workers in mining and quarrying;
e) Workers in manufacturing, processing, servicing and repairs
f) In household industry;
g) In other than household Industry;
    a. Workers in construction;

b. Workers in trade and commerce;

h) Workers in transport, storage and communications; and

i) Workers in other services.

The Census 2011 data on workers although more elaborate[1], can also be collapsed into the above categories. Household Industry (Va), is defined as an industry when operated by one or more members of the household at home or within the village in rural areas, and only within the precincts of the house where the household lives in urban areas. The larger proportion of workers in the household industry consists of members of the household. The industry is not run on the scale of a registered factory (where more than 10 persons with power or 20 persons without power are employed) which would qualify it to be registered under the Indian Factories Act. The main criterion of a Household Industry even in urban areas is the participation of one or more members of a household. Even if the industry is not actually located at home in rural areas there is a greater possibility of the members of the household participating if it is located anywhere within the village limits.

Questions relating to occupation were asked of those workers (both main and marginal) whose work category was classified as "Household Industry" or "Other Worker". The nature of occupation or the actual work that a person did during the last one year prior to the date of enumeration was ascertained and recorded against this question. This description of work was irrespective of the type of industry, trade or service, etc., in which a person may have worked. In case of persons who were self-employed, the description of the actual work in which they were engaged was recorded.

IV. Regional Distribution of Workers in the Manufacturing Sector: Methodology and Analysis

GINI coefficients have been calculated at all India level with reference to male workers in the manufacturing sector (Categories Va and Vb above) to assess the aggregate degree of inequality. Steps involved in the computation of GINI coefficient with reference to India are as follows:

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[1] A - Agriculture, Forestry and Fishing, B - Mining and Quarrying; C - Manufacturing (HH and NHH separately) i.e. C(a) and C(b); D - Electricity, Gas, steam and Air conditioning Supply; E - Water Supply (Sewerage, Waste Management and remediation activities); F - Construction; G - Wholesale and Retail Trade (Repair of motor vehicles and motor cycles); H - Transportation and Storage; I - Accommodation and food service activities; J - Information and Communication; K - Financial and Insurance activities; L – Real Estate Activities; M – Professional, Technical and Scientific Activities; N – Administrative and Support Services; O - Public Administration and Defence, Compulsory Social Security; P – Education; Q - Human Health and Social Work activities; R - Arts, Entertainment and recreation; S- Other Service Activities

(1) Arranging the states based on per cent male workers divided by total workers, in descending order;
(2) Calculating workers in the manufacturing sector in the state as per cent of total male manufacturing workers in India;
(3) Creating a new column (X_i) which is the cumulative value of the values derived in step 2;
(4) Adding a column which records per cent main workers to total main workers by states;
(5) Creating a new column (Y_i) which is the cumulative value of the values recorded in step 4;
(6) Creating a new column that records values of (X_i) x (Y_{i+1})
(7) Creating a column with values of (Y_i) x (X_{i+1})
(8) Getting GINI value by multiplying totals of the columns created in steps 6 and 7 and divide by 10,000 (100x100).

GINI coefficients have been computed separately for India (states as units of observation) as well as states (districts as units of observation – the steps remain the same as explained above but units of data become state and districts, respectively) for the year 2011 and 1991 pertaining to (a) Total male main workers in the age group of 15+ engaged in the manufacturing activities (household and non-house hold industries taken together and (b) Male main workers (15+ age group in non-household manufacturing Industries.

Table 2 records GINI values at the national level for the years 1991 and 2011 which is helpful in answering the question – are manufacturing activities unequally distributed across states in India? The coefficients do not show regionally unequal distribution of workers in manufacturing, although in general terms, scholars do refer to spatial clusters and industrial hubs. This is because about two thirds of male workers (2011) in household industries as well as non-household industries are in the top six states – Uttar Pradesh (including Uttarakhand), West Bengal, Maharashtra, Tamil Nadu, Andhra Pradesh and Madhya Pradesh in the case of household industries; and in the case of non-household industries, Maharashtra, Gujarat, Tamil Nadu, Uttar Pradesh, West Bengal and Karnataka. A similar spatial pattern is also revealed in 1991, for example, the top six states (Maharashtra, West Bengal, Uttar Pradesh, Tamil Nadu, Gujarat and Andhra Pradesh) recorded cumulatively over 70 per cent of workers in the non-household industries

There is, however, a suggestion of increasing interstate distance between 1991 and 2011. This attribute is stronger when we compare the GINI values of 1991 and 2011 in the case of main workers in non-household manufacturing industries as compared to workers in all manufacturing industries.

The moot question is whether the increasing regional inequality among workers in the manufacturing sector is a result of economic reforms that promote development based on resource endowment.

Table 2: GINI Coefficients: Workers in Manufacturing (Household and Non-Household) in India

	Urban Main Workers in Household and Non-Household Industry	*Total Main Workers in Household and Non-Household Industry*	*Main Workers in Non-Household Industry*
1991	0.113	0.118	0.166
2011	0.134	0.189	0.238

Source: Computed on the basis of Census data described earlier

GINI values for the states of India - districts as observations – are tabulated in Table 3. Suggestion of unequal distribution can be seen in states with low industrial development (such as Arunachal Pradesh and Himachal Pradesh -1991) probably because of availability of fewer options for location. Between 1991 and 2011 there is a marked tendency towards regional concentration in several states such as Bihar (Bihar and Jharkhand), Gujarat, Haryana, Himachal Pradesh, Karnataka, old Madhya Pradesh (Madhya Pradesh and Chhattisgarh), Maharashtra, Tamil Nadu, West Bengal, and old Uttar Pradesh (Uttar Pradesh and Uttarakhand). Smaller states in the northeast such as Manipur, Meghalaya, Mizoram and Nagaland also exhibit this trend. This again raises the question as to whether the increasing regional inequality in the distribution of workers in manufacturing is a result of development based on resource endowment as opposed to the concept of balanced regional development of the earlier era. The increase in regional inequality in the distribution of workers in the non-household manufacturing sector is sharper than the values pertaining to the manufacturing sector as whole.

Table 3: GINI Coefficients by States

India/States	*1991*	*2011*	*1991*	*2011*
	Total Main Workers in Household and Non-household Industries		*Main workers in Non-Household Industries*	
India	0.118	0.189	0.166	0.238
Andhra Pradesh	0.098	0.145	0.121	0.167
Arunachal Pradesh	0.358	0.228	0.382	0.297
Assam	0.133	0.130	0.142	0.148
Bihar + Jharkhand	0.172	0.282	0.284	0.348
Goa	0.014	0.002	0.010	0.002
Gujarat	0.159	0.374	0.183	0.388
Haryana	0.190	0.254	0.227	0.272
HP	0.272	0.362	0.247	0.410
Karnataka	0.154	0.312	0.202	0.359

India/States	*1991*	*2011*	*1991*	*2011*
	Total Main Workers in Household and Non-household Industries		*Main workers in Non-Household Industries*	
Kerala	0.124	0.154	0.129	0.165
Madhya Pradesh + Chhattisgarh	0.162	0.322	0.229	0.382
Maharashtra	0.137	0.360	0.176	0.391
Manipur	0.188	0.332	0.230	0.361
Meghalaya	0.053	0.214	0.091	0.281
Mizoram	0.116	0.289	0.141	0.348
Nagaland	0.264	0.287	0.283	0.320
Orissa	0.134	0.204	0.109	0.265
Punjab	0.154	0.251	0.050	0.272
Rajasthan	0.080	0.212	0.122	0.235
Sikkim	0.094	0.210	0.126	0.233
Tamil Nadu	0.167	0.292	0.171	0.311
Tripura	0.036	0.112	0.034	0.106
Uttar Pradesh + Uttarakhand	0.197	0.288	0.213	0.336
West Bengal	0.094	0.283	0.212	0.319
Puducherry	0.076	0.055	0.076	0.056

While the preceding analysis gives an aggregate picture about inequality in the distribution of manufacturing workers in India and in different states, it does not bring out specific states or districts in which such workers are concentrated. In order to bring out the areas of concentration of main workers in manufacturing (Va + Vb), two indices have been computed based on (a) national level average and (b) state level averages. Per cent workers in manufacturing in each state and in each district are divided by the national average to derive this index. Value of 1 would be equal to the national average. Values above and below unity, would be proportionally above or below the national average. The index values have been calculated for main workers in non-household manufacturing activities (category Vb above) for each district for the years 1991 and 2011. The index value brings out states as well as districts, which are important for manufacturing in India.

Between 1991 and 2011, proportion of districts with index value exceeding three times the national average from about 1 to 4 per cent (Table 4). The proportion of districts with below national average scores also increased significantly from about 52 per cent to 63 per cent. Increasing regional inequality in the distribution of workers in non-household manufacturing is reflected by these figures.

Table 4: Frequency of Districts by Index of Concentration of Workers in Non-Household Manufacturing Industry 1991 and 2011

Index of Concentration	*Number of Districts*			
	1991		*2011*	
	Number of Districts	*Per Cent to Total*	*Number of Districts*	*Per Cent to Total*
> 3.00	5	1.15	25	3.99
1.5 – 3.00	73	16.86	95	15.18
1.00 – 1.5	124	28.63	105	16.77
0.5 – 1.00	134	30.09	207	33.07
< 0.5	97	22.40	194	30.99
Total	433	100.00	626	100.00

Source: Census of India 1991 and 2011

In so far as workers in household industries are concerned, only two states record more than values of 1.5, that is, one and a half times the national average – Uttar Pradesh and West Bengal. On the other hand, there are many states (12) with values less than 0.5 (Table 5). Thus, it would appear that workers in household industries are concentrated in a few states. In the case of non-household industries, higher values (more than 1.5) are found in Gujarat, Tamil Nadu and Goa and the Union Territories of the NCT of Delhi, Dadra and Nagar Haveli and Daman and Diu. Values of less than 0.5 are in Bihar, Sikkim and the north-eastern states.

Figure 1 maps the spatial distribution of districts with a concentration index more than and less than the national average for the year 2011. There are 94 districts that have an index value of more than 1.5 times the national average of which 25 districts score more than 3 times the national average (2011). Fifteen of these 25 districts are in Tamil Nadu (6), Gujarat (5) and Maharashtra (4). The map thus clearly indicates regional concentration of districts with a high proportion of workers in non-household industries.

When compared with the national average, many states become out of reckoning in studying manufacturing workers. In order to focus on the districts of such states, values have also been calculated with reference to state averages of workers in non-household industries and the district index values are also annexed (Annexure I). To summarise, districts with the highest concentration values in each state are given in Table 6. A perusal of Table 6 shows that in most states, districts with the highest concentration of workers in hon-household industries have not changed between 1991 and 2011 – again stressing the fact that the regional patterns of workers in non-household industries remain similar in 1991 and 2011. In fact, in each such district the degree of

concentration has increased substantially during the two decades following the new economic policy. Kerala is the only state, where the increase in the degree of concentration is marginal.

Table 5: Index of Concentration by States – 2011 (Based on National Averages)

	Index - Male Workers in House Hold Industries	*Index - Male Workers Non-House Hold Industries*
Jammu & Kashmir	0.98	0.55
Himachal Pradesh	0.59	0.80
Punjab	1.08	1.29
Chandigarh	0.35	1.34
Uttarakhand	0.80	0.72
Haryana	0.95	1.09
NCT of Delhi	1.04	1.74
Rajasthan	0.89	0.82
Uttar Pradesh	1.52	0.75
Bihar	0.88	0.37
Sikkim	0.41	0.46
Arunachal Pradesh	0.28	0.19
Nagaland	0.37	0.22
Manipur	0.77	0.30
Mizoram	0.43	0.22
Tripura	0.58	0.54
Meghalaya	0.32	0.24
Assam	0.80	0.40
West Bengal	1.70	1.10
Jharkhand	1.01	0.88
Odisha	1.37	0.67
Chhattisgarh	0.62	0.57
Madhya Pradesh	0.91	0.54
Gujarat	0.41	1.99
Daman & Diu	0.12	6.80
Dadra & Nagar Haveli	0.42	5.69

	Index - Male Workers in House Hold Industries	*Index - Male Workers Non-House Hold Industries*
Maharashtra	0.69	1.37
Andhra Pradesh	0.89	0.77
Karnataka	0.79	1.08
Goa	0.80	1.57
Lakshadweep	0.19	0.60
Kerala	0.73	1.11
Tamil Nadu	1.03	1.55
Puducherry	0.42	1.21
Andaman & Nicobar Islands	0.30	0.47

Figure 1: Index of Concentration of Workers in Non-Household Industries (2011)

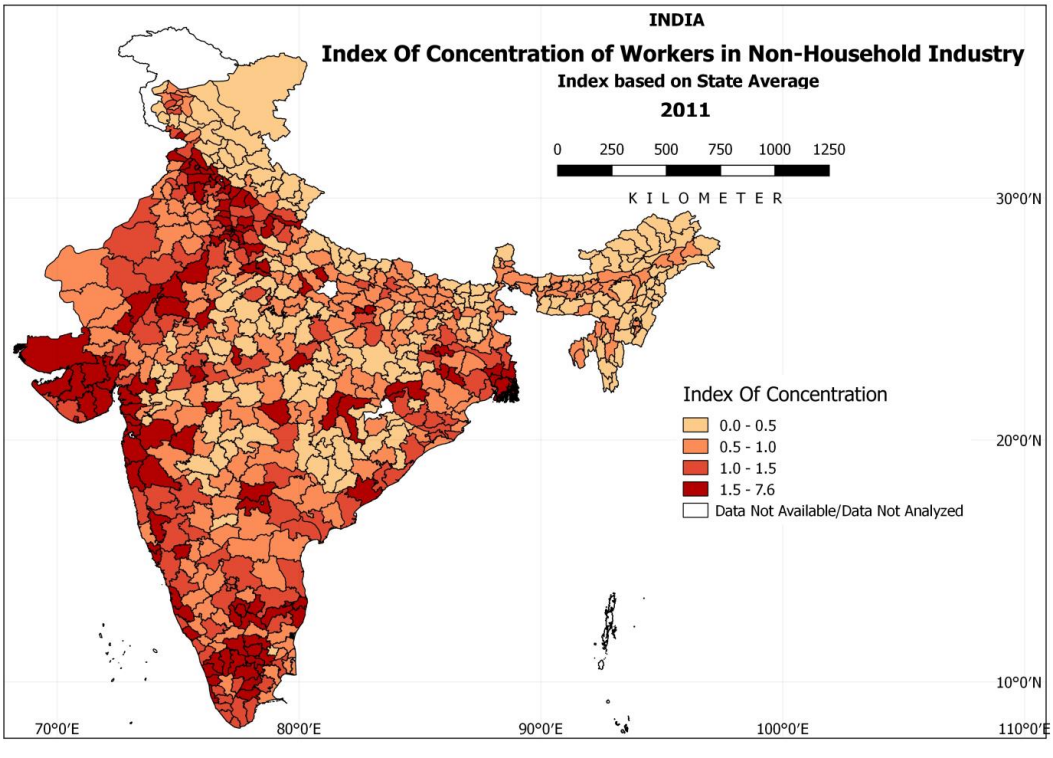

Table 6: Districts with Highest Values of Index of Concentration – Workers in Non-Household Industries (Based on State Averages)

District	*State*	*1991*	*2011*
Rangareddy	Andhra Pradesh	1.78	1.91
Kamrup	Assam	1.32	1.72 (Kamrup Metropolitan)
Purbhi Singhbhum	Bihar	3.47	5.50
Surat	Gujarat	1.57	2.62
Faridabad	Haryana	2.01	2.00
Panipat	Haryana	1.48	2.54
Solan	Himachal Pradesh	2.27	2.67
Bengaluru	Karnataka	1.57	2.43
Ernakulam	Kerala	1.28	1.43
Thane	Maharashtra	1.46	2.12
Sambalpur	Odisha	1.50	2.40
Ludhiana	Punjab	1.02	2.06
Jaipur	Rajasthan	1.17	1.81
Tiruppur	Tamil Nadu	1.57 (Madras)	2.74
Firozabad	Uttar Pradesh	2.32	3.02
Howrah	West Bengal	1.72	2.63

V. Recent Manufacturing Policy Initiatives

During the year 2006 and later, two proactive industry policies were introduced: (a) Special Economic Zone and (b) Industrial and Development Corridors. There is a strong overlap in these the two models. For example, there are several SEZs contained in the proposed industrial corridors. The idea behind SEZs was to promote and create hassle free territorial production complexes that could be established to secure regional balance in development opportunities, substantially increase export avenues, reduce production costs and generate employment, both direct as well as through multiplier effects. While the completion of development corridors would take some time, over 300 SEZs are currently operational. Where are these Zones located? Table 7 cross tabulates the index of concentration of workers in the manufacturing sector (2011) computed in the previous section with the number of SEZs operational and approved till 2014. State averages, rather than the national average have been used to identify districts characterised by a higher proportion of workers in non-household industries since request for approval of proposed SEZs originate from state governments.

Table 7: Index Concentration of Workers in the Manufacturing Sector (2011) and SEZs (2014)

Value of Index of Concentration (2011) Based on State Average	*Number of SEZs (2014)*
Above 1.5	142
1.0 – 1.5	139
0.5 -1.0	96
< 0.5	10
All Categories	387

It would appear from Table 7 that new areas of manufacturing development through SEZs are in districts which already have a higher concentration of workers in that sector – over seventy per cent of the SEZs (approved/operational - 2014) are in districts with above average proportion of workers in the manufacturing sector. If we use the concentration index at the state level, we find that about a third of of the SEZs are concentrated in districts which account for more than one and a half times the state average workers in manufacturing. States with significantly larger numbers of SEZs in districts with higher than average concentration of workers in manufacturing are: Andhra Pradesh (including Telangana – 69 per cent), Haryana (90 per cent), Karnataka (75 per cent), Maharashtra (74 per cent), Tamil Nadu (66 per cent), Uttar Pradesh (92 per cent), and West Bengal (75 per cent). When the states propose new SEZs, they tend to choose areas with relatively higher levels of physical infrastructure. Elsewhere it has been argued that districts with proximity to metro centres, railways and highways have a greater probability of being selected for locating SEZs (Ramachandran and Biswas 2007). It can, therefore, be concluded that these new development initiatives, to say the least, are unlikely to reduce existing regional imbalances in manufacturing activities.

VI. Concluding Observations

Based on the preceding analysis we can conclude that:

(1) Periodic study of changes in composition of employment and production are important in tracking economic development. Census data on employment structure is underutilised, as a result, the Office of the Registrar General, Government of India, responsible for Census Operations, has stopped publishing detailed data but limits itself to publishing a part of single digit occupational classification of workers.

(2) Although the GDP has increased between 1991 and 2011 by a factor of almost 5, the proportional contribution to the GDP of the secondary sector in general, and the manufacturing in particular, has been more or less the same.

(3) As a consequence of the near stagnant manufacturing sector the regional pattern of concentration of the manufacturing activities in the twenty- year period remains similar.

(4) While interstate disparity in manufacturing to a large extent has to be addressed by the Union Government, intra-state disparities illustrated by eastern and western parts of Maharashtra, northern and southern regions of West Bengal and other state level regional inequalities have to be essentially corrected by the state governments.

(5) We may not be able to address the problems of regional disparities at the national and state levels in the New Economic Policy regime which is grounded in benefitting from human and physical resource advantage, but such policies particularly at the national level, must change tracks to significantly increase the magnitude of manufacturing activities.

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* Most of the working papers are downloadable from the institute's website: http://isidev.nic.in/ or http://isid.org.in/

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The Institute for Studies in Industrial Development (ISID), successor to the Corporate Studies Group (CSG), is a national-level policy research organization in the public domain and is affiliated to the Indian Council of Social Science Research (ICSSR). Developing on the initial strength of studying India's industrial regulations, ISID has gained varied expertise in the analysis of the issues thrown up by the changing policy environment. The Institute's research and academic activities are organized under the following broad thematic areas:

Industrialization: Industrial policy, manufacturing sector, MSMEs, technology development, production networks, industrial clusters/corridors, SEZs, land acquisition, natural resources, regional development, entrepreneurship, sustainability, etc.

Internationalization: Cross-border flows of capital flows, FDI, technology transfer, IPRs, balance of payments, trade and investment agreements, etc.

Corporate Sector: Ownership and control, finance and governance, financial institutions, company law, securities legislation, regulatory bodies, M&As, business groups, public enterprises, public-private partnership, business ethics, CSR, etc.

Labour and Employment: Employment growth and structural transformation; labour force; skill development; quality of employment, labour flexibility; differentiations and disparities; informal sector and un-organised workers; etc.

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