ISID Institute for Studies in Industrial Development
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# State-wise Distribution of Manufacturing Units and Employment in India: An Exploration from the Economic Census

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ISID Institute for Studies in Industrial Development
An institution of Indian Council of Social Science Research (Ministry of Education)
4 Vasant Kunj Institutional Area, New Delhi - 110 070
*Phone:* +91 11 2676 4600 | 2689 1111
*E-mail:* info@isid.org.in | *Website:* https://isid.org.in

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# State-wise Distribution of Manufacturing Units and Employment in India: An Exploration from the Economic Census

*Surya Tewari*[*]

***Abstract***: *The paper focuses on changing manufacturing landscape of India between pre and post economic reform periods. As pre-economic reform period was characterised by emphasis on balanced regional development, the development of manufacturing industries took place in some of the so called industrially backward regions of the country. However, with economic reforms, in order to take advantage of global capital, focus has shifted to competitive edge. This has repercussion on both, spatial organisation of manufacturing industries as well as associated factors of production, such as labour. The paper focuses on whether or not manufacturing units and workers have experienced any spatial change in pre and post reform times using economic census three (1990) and six (2013). The results do not depict concentration of units and workers at the state level as the Gini values are small. Moreover, between 1990 and 2013, there is stability in the character of manufacturing in the country. Location quotient also depicts the same. For manufacturing units as well as workers, the level of specialisation is same in states as at national level with position of states roughly the same in both the census. However, at the level of NIC 2-digit and technology groups (low, medium-low, and high-medium), concentration is observed. The Gini values are noted above 0.40 in manufacturing groups such as beverages, tobacco, pharmaceuticals, and those related to engineering (NIC 26 to 30). In general, concentration values have declined across manufacturing groups. With respect to technology groups, the analysis shows an increase in Gini coefficient from low to high technologies. Across all technology groups, majority of the states depict low to moderately high level of specialisation.*

***Keywords***: Manufacturing, Economic Census, Enterprise, Employment, Regional Development

[*] Assistant Professor, Institute for Studies in Industrial Development, New Delhi, India; Email: surya@isid.org.in

# 1. Introduction

The importance of manufacturing for economic development is an established fact. The structural change from low productive agriculture to productive industrial sector in Europe and then in America gave credence to manufacturing as an 'Engine of Growth.' The change was subsequently experienced in countries of East Asia (Szirmai, Naudé, and Alcorta, 2013). It is due to the power of manufacturing that China became an economic powerhouse at the global level. More important is the fact that this transformation in China occurred in the last 40 years. Economies of scale, higher per capita income, higher productivity and capital intensity, stronger linkages and spillover effects, and technological progress are some of the factors that make the shift towards manufacturing desirable.

Manufacturing also has a regional dimension owing to balanced and unbalanced growth models. The proponents of balanced growth emphasised on balanced manufacturing development. The idea was to invest in diverse industries to raise demand, which, in turn, would raise productivity and incomes. The unbalanced growth proponents on the other side emphasised on development of key manufacturing industries having strong backward and forward linkages to foster growth in other sectors. In view of the limited resources to invest in developing countries, the unbalanced growth model became an important strategy for economic development. The works of Francois Perroux (Growth Pole), Gunnar Myrdal (Circular Cumulative Causation – spread effect and backwash), and Albert Hirschman (trickle down and polarisation) became the theoretical underpinnings of regional development models (Hansen, 1981; and Rocha, 2018). Urban areas became the core regions where investment were to be made and from where development was expected to move towards the periphery, thereby bringing regional development.

With reference to India, the balanced growth model was preferred to remove inter- and intra-regional disparities. The idea of social justice, and the fact that India has traditionally been a country with universal presence of village and cottage industries, made the balanced growth model an attractive proposition. The second Five Year Plan (1956–61) made balanced regional development an explicit policy direction. Various mechanisms were used to influence the location of industries. The notable being industrial licensing, use of public sector, freight equalisation policy, industrial estate and rural industries project, backward region development, metropolitan planning, and various fiscal and non-fiscal incentives (Sekhar, 1984). However, these policies had limited impact in effecting geographical distribution of industries. The command and control of the government was found to have stifled the private sector as well (Ahluwalia, 2016).

With the reforms of 1991 the economy has been deregulated, but even then the contribution of manufacturing has been low. The Economic Survey (GOI, 2015) shows 'premature non-industrialisation' of registered manufacturing in output and employment.[1] Taking the

[1] In the Economic Survey (2015) Instead of premature de-industrialisation, the phrase premature non-industrialisation is used as India has not sufficiently industrialised in first place.

period 1980–81 to present, manufacturing sector contribution in Gross Domestic Product (GDP) has remained between 14 and 18 percent (see Papola *et al*., 2011; Nagaraj, 2017; Goldar *et al*., 2019). In such a scenario of stagnation, the question arises whether we expect a regional shift in indicators pertaining to manufacturing such as income, units, employment etc.

With regard to the question of a regional shift, it is important to note that now the focus is not on balanced regional development; rather, effort is being made to foster competitive spirit among states to garner economic benefits both from inside and outside the country. The disparities have therefore to be tackled by states themselves.

With respect to distribution of manufacturing enterprises and employment, studies largely depict stagnancy or declining levels of inequality. The change is noticed at district level, which seems to be too weak to effect state level scenario. Some of the notable recent studies in this regard are those by Ramachandran and Tiwari (2020), Chakraborty and Nagaraj (2020), Ramaswamy (2019), Goldar *et al* (2019), Amirapu *et al* (2019), and, Kathuria (2016).

Using census database on manufacturing workers, the study by Ramachandran and Tiwari (2020) did not find inequality at the state level. Using Gini and location quotient (LQ), the study finds equality in the distribution of manufacturing workers in both 1991 and 2011. At intra-state level (i.e. district level) disparities are noticed that are sharper with respect to non-household manufacturing. There is consistency in districts depicting highest concentration in non-household manufacturing. Moreover, the degree of concentration has increased in these districts between 1991 and 2011. Chakraborty and Nagaraj (2020) using census database on manufacturing employment showed district level localisation from 1991 to 2011 but found it too weak to impact national, state, or district level manufacturing GDP and employment share as well as rankings which suffer from stagnancy. Ramaswamy (2019) in his paper on subnational manufacturing based on ASI and NSS enterprise data computed Herfindahl Hirschman Index (HHI) of manufacturing output (1980–81 to 2013–14), units, and workers for the period 2004–05 to 2015–16. While in the case of output, the author found rising inequality. With respect to manufacturing units and workers, HHI shows no sign of decline in the registered but shows a decline in the unregistered. The HHI values reported are well below 1000.

Goldar *et al* (2019) using NSS EUS (1999–00; 2004–05; 2011–12) database found reduction in the gap between states with respect to manufacturing employment. While the employment in lower wage quartiles is increasing, that of the upper quartile witnessed a decline between 1999 and 2012. At the district level also the gap between advanced and backward districts has narrowed down.

Amirapu *et al*. (2019) using Economic Census data of Fourth, Fifth, and Sixth censuses showed a decline in the concentration in Indian manufacturing. The authors employed Ellison-Glaesar (EG) and spatially weighted EG indexs. Both indexes yielded a decline in concentration. Decline in capital intensive industries is found to have yielded a decline in concentration.

Kathuria (2016) found manufacturing industries to have diffused distribution. Using ASI data of 1997–98 pertaining to 66 manufacturing industries located in 21 states, he found 62 percent of them to be spatially dispersed. Nature of goods, high electricity tariff, and energy gap are found to have induced dispersion. Industrial dispersal policy captured through backward area as a percentage of total state area does not have an influence on industrial dispersal.

Previous studies by Chakravorty (2000; 2003) and Lall and Chakravorty (2005) on organised manufacturing showed increasing concentration with respect to manufacturing investments. Their studies are based on ASI-1994 and CMIE database 1992–98. These studies established the importance of already existing clusters, of coast vis-à-vis inland, of metropolitan suburban districts rather than metro, of other non-metropolitan, non-urban districts in proximity of metro in manufacturing investments.

In the above context, the paper analyses whether there is any regional shift in the states with respect to manufacturing units and employment between pre- and post-reform times using Economic Census Three (1990) and Six (2013). While the Third Economic Census captures the pre-reform context, the Sixth Census allows evaluation of post reform scenario. The use of Sixth Economic Census gives sufficient time lag of two decades to capture the effects of economic reforms.

The variables analysed are units and workers as this is the data which is covered through economic census. However, the advantage is that this is the actual count data where all units whether formal or informal are covered; hence, it gives a complete picture of distribution of manufacturing units and employment. Manufacturing groups of EC-3 that are based on NIC 1987 have been brought up to a comparable level with EC-6 based on NIC 2008. The matching has been done at the highest disaggregated level to enable comparison with respect to manufacturing groups as well.

This paper has four objectives: first, to analyse state-wise growth in manufacturing units and workers post economic reforms; second, to see whether concentration exists among states with respect to these variables; third, to examine the change in the intensity of manufacturing (degree of specialisation); and fourth, to assess the concentration with respect to the types of manufacturing. The paper is divided into 5 sections, where section 2, following this introductory section, explains the database, section 3 deals with methodology, section 4 presents the results, and section 5 sums up the paper.

## 2. Database

This paper is based on EC-3 that covers the pre-reform period, and EC-6 that captures the post-reform context. The significance of using EC-6 is that it covers two decades post the launch of economic reforms in July 1991 and thus includes sufficient time lag for the manufacturing sector to improve and scale up.

Both the censuses with some variation in codes and sub-categories provide information about units and workers. The data on total manufacturing units and total workers is used in the paper. One may argue on the relevance of using count data of units, as there is lot of variation in the number of units when seen through the lens of employment. That, in fact, could be attempted, but in order to show the total picture of units and for reasons of simplicity, an analysis of all units has been made. Also, in order to know whether or not the number of units and employment (workers) are diverging, there is a need to analyse them separately. Studies such as by Ramaswamy (2019) and Goldar *et al*. (2019) have focused on unit counts (net entry) as well.

The analysis covers all states and union territories or UTs (total 34) except Jammu and Kashmir and Lakshadweep. Though EC-6 data is available for these two, but in absence of EC-3 data, they had to be dropped. While Jammu & Kashmir was not covered in EC-3, data on Lakshadweep is reported to have been deleted in the process of transfer from the tapes. The total (all India) wherever mentioned thus includes all states and UTs except Jammu & Kashmir and Lakshadweep.

The analysis has been presented for the new states of Jharkhand, Chhattisgarh, Uttarakhand, and Telangana as well. In EC-3 it was found that data for Chhattisgarh is for all but one district, i.e. Sarguja. The data for Telangana did not include Hyderabad district. The extracted data for all states, that includes united Madhya Pradesh and united Andhra Pradesh, matched with the state-wise data extracted by the computer centre at the Ministry of Statistics and Programme Implementation (MOSPI).[2]

Turning on to National Industrial Classification (NIC), EC-3 is based on NIC 1987, and EC-6 on NIC 2008. While doing comparative analysis of manufacturing sector of two economic censuses, the data of EC-3 is brought at par with that of EC-6. In other words, NIC 1987, which is the basis of EC-3, is concorded with respect to NIC 2008 followed in EC-6. The manufacturing sector codes run from 20 to 39 in NIC 1987, and in NIC 2008 they range from 10–33. The last disaggregation level is 4-digit in NIC 1987, while 5-digit in NIC 2008. However, these last levels of disaggregation are found to be similar on reading their description.

In order to bring the manufacturing sector classification of NIC 1987 at the level of NIC 2008, two methods have been followed: *first*, matching the descriptions. The 4-digit

[2] Chhattisgarh has been retained as one of the district values was there with respect to the state. Moreover, as the unit for analysis is the state, no difference is observed with respect to Gini. The Gini coefficient was re-computed after excluding the state and no difference was observed. As for LQ, it features only in the case of rural units. With the inclusion of the state, the national share of other states does not change. The change in the share of other states is the same whether we include or exclude Chhattisgarh. Both in EC-3 and EC-6, the share of the state in manufacturing units and workers remained less than one percent. The inclusion or exclusion of the state do not change the per unit workers at national level as well. It is only in the case of growth within the state that the change was enormously high which, however, is not presented.

description is matched with that of 5-digit of NIC 2008 (NIC 2008 is up to 5 digits). For many codes, matching is easily accomplished in this way. *Second,* all those categories where description is slightly different or there is a confusion, the categories are searched up to NIC 2008 by considering all NICs in between. Therefore, 4-digit of NIC 1987 is searched in NIC 1998, and further in concorded list of NIC 1998 vis-à-vis NIC 2004, and of NIC 2004 vis-à-vis NIC 2008. The concordance lists are provided in NIC 2004 and NIC 2008. Once this is done the 4-digits of EC-3 are aggregated to 3 digits. This is done because EC-6 data is available up to 3 digits only. This way both datasets have matching 3 digits.

In few of the cases, however, it was observed that a 4-digit of NIC 1987 falls in two of the 5 digits of NIC 2008. The quantum of data that needs to be transferred to 5-digit (actually to 3-digit of NIC 2008) is decided. The procedure for the same is: extracting dataset of EC-3, then bringing together (merging) data column of 3-digit of NIC 2008 corresponding to each of the 4-digit of NIC 1987. The data is then sorted in ascending order of 4-digit codes of NIC 1987. With this sorting the 4-digits to be distributed get clustered together. This is followed by noting down the first and last record numbers of 4-digit code to be distributed. The total records are also noted down. The decision on how much data has to be transferred was based on the number of 4 digits in NIC 1987. So, if there are nine 4-digits with one belonging to another 3-digit, 1/9 of the data is moved to that 3-digit. The procedure followed is, for example, to assign 1/9 of a particular 4-digit to 3-digit then all those record numbers which have remainder as zero are taken as those 3-digits. This is based on Euler's theorem. There were a very few cases in which four digits of EC-3 had to be split into two more 3-digits. In those cases, record numbers with remainders as zero and 1 are distributed in those 3-digits.

In matching the dataset of NIC 1987 to NIC 2008, few categories are found to have shifted their position from manufacturing. These relate to cotton ginning, cleaning, and bailing (2300), and activity of publishing (2840; 2850; 2852; 2853). In NIC 2008, cotton ginning, cleaning, and baling is part of division 01, while publishing is a separate activity in division 58. While codes 2300 and 2852 are entirely dropped, in case of 2840, 2850, and 2853, half of the units have been dropped as these codes also include activity relating to printing which is very much a part of manufacturing in division 18. The exclusion is again based on Euler's theorem. All those records with remainder as zero have been dropped.

The issue of 4-digit codes existing in data but not in NIC 1987 was also encountered. This means that there were codes in EC-3 dataset which were non-existent in NIC 1987. Such cases ran in hundreds. To rectify this, the 3-digit group of NIC 1987 to which the non-existent 4-digit codes could relate are identified and the codes are assigned. However, all those codes for which no 3-digit group was available, have been removed. Overall, 46 codes had to be ignored.

Two digits of manufacturing are also analysed based on their technology group. Following the paper by Rijesh (2020), 2-digit is classified as low technology, medium-low technology, or high-medium technology. Low technology includes 2-digit codes from 10 to 18, 31, and

32. Medium-low includes code 19, 22 to 25, and high-medium includes 20, 21, 26 to 30, and 33 (see Appendix Table A1).

## 3. Methodology

In order to analyse inequality or to say concentration in manufacturing at the level of states, Gini coefficient has been computed.[3] Gini values range from 0 to 1, with 0 indicating equal distribution, and 1 as highest concentration. It is standard to take Gini value of 0.40 as critical value of concentration (UNRISD, 2013).

The steps followed in computing Gini coefficient can be understood from the example of total manufacturing units: (a) Computing of percentage of manufacturing units to total units in the state, (b) Sorting the data obtained in step A, from largest to smallest, (c) Calculating state-wise percentage share of manufacturing units from total manufacturing units in the country ($Y_i$), (d) Calculating state-wise percentage share of total units ($X_i$), (e) Computing cumulative percentages of data obtained in steps C and D such that last cumulative percentage of both is 100, and (f) Computing $X_iY_{i+1}$ and $Y_iX_{i+1}$ To obtain totals of both, and (g) Finally, applying the formula, $G=\frac{1}{100\times100}\left(\sum_{i=1}^{n} X_iY_{i+1}\right)-\left(\sum Y_iX_{i+1}\right)$.

Gini coefficient is also computed for 2-digit manufacturing. In this part, the $Y_i$ variable is 2-digit of manufacturing and $X_i$ is total manufacturing. The robustness of Gini has been checked by computing summary statistic-based convergence methods. Following Barro and Sala-i-Martin (1991) and subsequent studies such as those by Ghatak and De (2020), unconditional beta (β) and sigma (σ) convergence are computed. So, in β convergence if a coefficient on initial log of manufacturing variables (units or workers) in a regression of growth of the variables is negative, then one can expect convergence. Such negative coefficient may support lower inequality if obtained in Gini. As β convergence is a necessary condition, for sufficient condition σ convergence is computed. Sigma convergence measures change in dispersion over time of underlying variable, which is manufacturing unit and worker in the study.

To examine the change in intensity of manufacturing units and employment LQ has been used. LQ measures specialisation with respect to interested variable for each spatial unit vis-à-vis region. When mapped, LQ also gives areas of specialisation/concentration; in other words, it depicts clustering. LQ is calculated, say, for total units as,

$$LQ_i=\frac{\frac{MU_i}{TU_i}}{\frac{MU}{TU}}$$

*where*, $MU_i$ = manufacturing units in state i (i= 1 to 34),
$TU_i$ = total units in state i,
$MU$ = total manufacturing units in the country,
$TU$ = total of total units in the country.

[3] The words inequality and concentration have been used interchangeably in the literature. Increase in inequality means increasing concentration.

In LQ, value of unity denotes that state performance equals country average. Values more than unity indicate better than national performance with higher and increasing values indicating greater or increasing degree of specialisation. Vice versa is the case when values are less than unity. LQ is also calculated with respect to 2-digit manufacturing in order to see to what extent states are specialised as per the manufacturing groups.

## 4. State-wise Results

### 4.1 Manufacturing Units and Workers

As per EC-3, in 1990 there were five million manufacturing units. These units accounted for about 21 million workers.[4] By 2013, the number of units doubled to ten million while the number of workers rose to 30 million. In terms of location, 35 percent manufacturing units were located in urban areas in 1990; in 2013, the share increased to 47 percent. With respect to workers, urban areas accounted for 49 percent workers in manufacturing in 1990. In 2013, the corresponding figure is 55 percent. To reiterate, the distribution of manufacturing units has reached roughly the same level in both rural and urban locations with both accounting for half of the units each, and the number of workers rising slightly to more than half in urban locations. It is important to note that urban workers and urban units do not give the actual picture of urban locations, as it is the surrounding rural areas that may be housing the units meant for urban. In the industrial Policy Resolution of 1977, the decision was made to prohibit location of licensed industries within certain geographical limits of million-plus cities and others with population exceeding half a million (GOI, 2013). The space constraints within city limits and pollution considerations have led to the setting up of industrial units in rural periphery of cities. Taking note of this fact, an analysis is made of the total units and the workers.

Figures 1 and 2 present simple growth and share of manufacturing by units and workers.[5]

Figure 1 shows an increase in units by over 50 percent in most of the states. The increase is twofold and more in the states of Gujarat, Karnataka, Kerala, West Bengal, Bihar, Punjab, and Haryana. In the study by Ramaswamy (2019) on the increase (net entry) in the number of factories between 2005 and 2011, one finds significant net entry of factories in Punjab

[4] The data obtained from extraction is almost the same as claimed by the computer centre at MOSPI. The computer centre gave one-page data in a CD, stating the state-wise total units. The slight difference is in the case of Andhra Pradesh (three units), Assam (six units), Bihar (24 units), Karnataka (one unit), Madhya Pradesh (two units), Manipur (one unit), Rajasthan (13 units), Andaman & Nicobar (two units), and Dadra & Nagar Haveli (one unit).

[5] Growth of workers is computed in terms of Compound Annual Growth Rate as well. With that the growth was obtained in one-to-two-digit terms rather than two/three or more as in the case of simple growth rate. However, the pattern of growth in both, in general, remained the same. Those that were negative in simple growth rate depicted negative CAGR as well. In order to bring parity in presentation via mapping and in explanation, the simple growth rates have been retained.

and Gujarat. Both the states witnessed an increase in unregistered units, which is more in the case of Gujarat. In West Bengal, the unregistered units witnessed an increase. The state showed dismal performance with respect to registered units. West Bengal is the topmost state in terms of housing the maximum number of unorganised units.

**Figure 1: Growth and National Share of Units (1990–2013)**

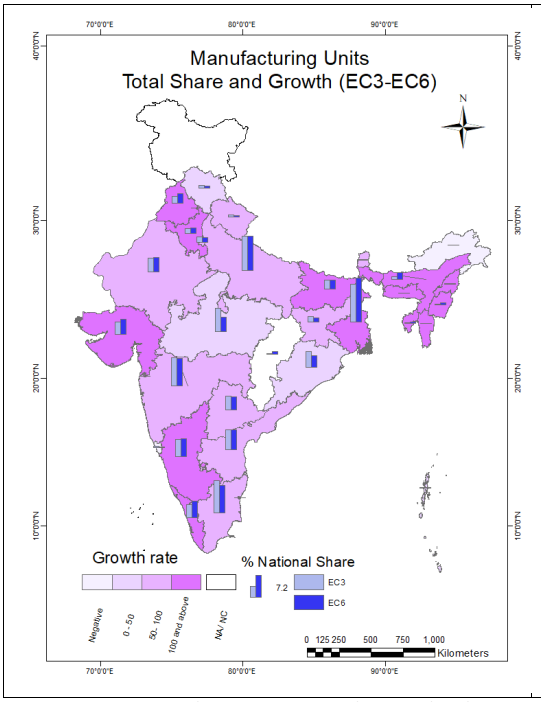
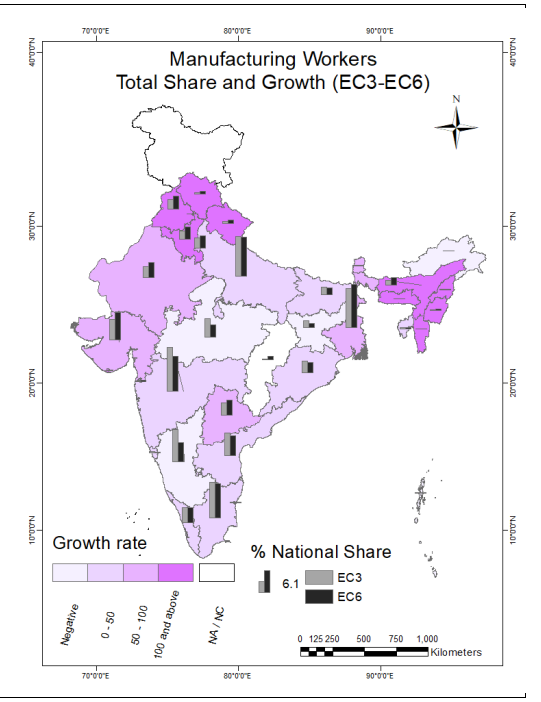



**Figure 2: Growth and National Share of Workers (1990–2013)**




*Source*: Constructed using EC-3 and EC-6 databases.
*Note*: NA/NC is Not Available/ Not Considered

High increase is witnessed in Northeast states as well, but it is largely due to low base. States in the northeastern region account for a miniscule share in the total number of units in the country. From the overlapping bars, it can be observed that in the entire Northeast except Assam, the national share is low. It is the states of West Bengal, Uttar Pradesh, Tamil Nadu, Maharashtra, Andhra Pradesh, and Karnataka that account for around 55 percent of the national units. While the shares of West Bengal and Uttar Pradesh are more than ten percent, the others have share of over five percent. Odisha and Madhya Pradesh also had over five percent share in 1990, which declined in 2013. Between 1990 and 2013, 14 states/UTs saw a decline in their shares. While the decline is very small in many states, it is comparatively high in the case of Madhya Pradesh. The state has seen a decline of three percentage points. The other important states that have seen comparatively large decline are Odisha and Tamil Nadu where the decline is around 1.5 percentage points. West Bengal and Assam have gained units by around two percent.

With respect to workers, many of the states have witnessed growth below 50 percent (Figure 2). The growth rate is negative in Madhya Pradesh, Karnataka, Jharkhand, Arunachal Pradesh, Chandigarh, and Andaman & Nicobar Islands. Growth has doubled in the northeast, Himachal Pradesh, Uttarakhand, Punjab, and Haryana. The growth in the number of workers seems to have moved with the growth in population as the two depict significantly positive growth (r 0.5529, Sig. 1%). Though the units do not depict the relationship with population growth, the correlation coefficient between units and workers is significantly positive (r 0.8121; Sig. 1%). The latter is also corroborated from figures. All those states that account for a larger share of units in the country also show a larger share of workers. Together with Gujarat these states account for over 60 percent of the workers in the country. In terms of units, Gujarat has a share of around four to five percent, in the case of workers it was around six percent in 1990, which rose to eight percent in 2013. Most of the states have increased their national share between 1990 and 2013. The decline is considerable in Karnataka (3.52 percent), Maharashtra (2.5 percent), and Madhya Pradesh (1.7 percent). The gain on the other hand is maximum in Gujarat (2.06 percent), followed by Haryana (1.30 percent), and West Bengal (1.21 percent). Punjab and Rajasthan have also gained by one percent each.

In terms of workers per unit, with a few exceptions, the number has declined across states (Table 1). In Dadra & Nagar Haveli and Daman & Diu there is a spike in the number of workers, while in states such as Goa, Himachal Pradesh, and Uttarakhand, the average number has increased by one to two percentage points. While Dadra & Nagar Haveli and Daman & Diu are frontrunners in labour intensive manufacturing of polyester yarn and plastic, the states of Himachal Pradesh and Uttarakhand have benefited from central government's scheme of Special Package for the two states announced in January 2003 for a period of 10 years (PIB *a*, 2014). Between 2000 and 2013, Himachal Pradesh seen increase in the number of units by 28 percent, the increase in workers on the other hand was of 33 percent. In Uttarakhand the figure is 130 and 490 percent respectively. The package comprised investment subsidy, interest subsidy, comprehensive insurance, and concessions in excise duty and income tax. The scheme was further extended with the benefit of investment subsidy till 2017, whereafter it was reintroduced as Industrial Development scheme for a period of five years (PIB *b*, 2014; GOI, 2018).

**Table 1: Workers Per Unit EC-3 (1990) & EC-6 (2013)**

| *States* | *Total* | |
|---|---|---|
| | *EC-3* | *EC-6* |
| Maharashtra | 5 | 3 |
| Uttar Pradesh | 4 | 3 |
| West Bengal | 4 | 2 |
| Tamil Nadu | 4 | 3 |
| Karnataka | 7 | 3 |
| Andhra Pradesh | 4 | 3 |
| Gujarat | 6 | 5 |
| Madhya Pradesh | 3 | 2 |
| Kerala | 4 | 2 |
| Telangana | 3 | 3 |
| Odisha | 3 | 2 |
| Rajasthan | 3 | 3 |
| Delhi | 7 | 6 |
| Punjab | 5 | 4 |
| Bihar | 3 | 2 |
| Haryana | 6 | 6 |
| Jharkhand | 5 | 2 |
| Assam | 6 | 3 |

| *States* | *Total* | |
|---|---|---|
| | *EC-3* | *EC-6* |
| Uttarakhand | 3 | 5 |
| Himachal Pradesh | 2 | 3 |
| Tripura | 5 | 2 |
| Goa | 4 | 5 |
| Puducherry | 10 | 7 |
| Chandigarh | 9 | 4 |
| Manipur | 2 | 1 |
| Chhattisgarh | 2 | 3 |
| Meghalaya | 4 | 3 |
| Arunachal Pradesh | 5 | 4 |
| Andaman & Nicobar Island | 9 | 3 |
| Nagaland | 5 | 3 |
| Dadra & Nagar Haveli | 15 | 31 |
| Daman & Diu | 10 | 27 |
| Sikkim | 6 | 7 |
| Mizoram | 2 | 2 |
| **Total** | **4** | **3** |

Source: Computed from EC-3 and EC-6

The question arises whether there is any significant change in the distribution of manufacturing units or workers between 1990 and 2013. To find that out, Gini coefficient and LQs have been computed.

**Table 2: State Level Concentration of Manufacturing Units and Workers – Gini Coefficients, EC-3 (1990) & EC-6 (2013)**

| | *Manufacturing Units* | | *Manufacturing Workers* | |
|---|---|---|---|---|
| | EC-3 | EC-6 | EC-3 | EC-6 |
| Top 10 States | 0.09 | 0.11 | 0.10 | 0.08 |
| Remaining States/UTs | 0.09 | 0.13 | 0.12 | 0.17 |
| All States/UTs | 0.11 | 0.12 | 0.11 | 0.11 |

Note: Top ten states are selected on the basis of states' national share in units or workers in EC-3 and EC-6.
Source: Computed from EC-3 and EC-6

In terms of manufacturing units, the Gini values of all states and UTs have slightly increased from 0.11 to 0.12, but with respect to workers they have remained the same at 0.11.[6] The pattern that emerges is therefore that of stability. Moreover, in both the censuses the values are too small and do not depict concentration.

[6] Male workers have the same case as total workers. In rural locations, their Gini value dropped from 0.13 to 0.12, in urban locations it rose to 0.15 from 0.12, and, overall, it rose to 0.13 from 0.11.

While comparing top 10 states with that of remaining states one finds relatively higher Gini in latter. The difference is relatively stronger with respect to workers distribution in 2013. However, the values are small and do not provide an evidence of concentration. In both these categories of states with the exception of workers in top 10 states, the Gini values have increased between 1990 and 2013 but lie below 0.2.

The LQ also shows unconcentrated distribution and stability. All those states whose LQ is one and above with decimals rounded off to two decimal places are presented in Tables 3 and 4. States are arranged from the highest to the lowest LQ value as per EC-3; corresponding to this, actual values are presented for both economic censuses. The distribution is quite balanced across states as the LQ values are near unity in both EC-3 and EC-6 with almost same set of states. Few new states/UTs that have entered the EC-6 list have values near one. Dadra & Nagar Haveli and Daman & Diu also feature in EC-6. The UTs have high proportion of manufacturing workers in their total workers. As already mentioned, UTs have high contribution in plastic and polyester yarn which is 28 and 80 percent respectively (Invest India from website).

Now the question is, Are the results from Gini robust enough to substantiate lower levels of concentration between states? The computation of unconditional beta reveals negative coefficient of manufacturing unit and worker on initial log of both of these variables (see Appendix Table A2 for abbreviations used). From the results we may suppose that states were moving towards convergence between 1990 and 2013. The sigma also supports beta results (Table 5).

**Table 3: Location Quotient – Distribution of Manufacturing Units**

| *SN.* | *State* | *EC-3* | *EC-6* |
|---|---|---|---|
| 1 | Telangana | 1.49 | 1.18 |
| 2 | Madhya Pradesh | 1.29 | 1.26 |
| 3 | Tamil Nadu | 1.27 | 1.05 |
| 4 | Himachal Pradesh | 1.24 | - |
| 5 | Odisha | 1.16 | 1.06 |
| 6 | Manipur | 1.13 | 1.72 |
| 7 | West Bengal | 1.09 | 1.41 |
| 8 | Uttar Pradesh | 1.08 | - |
| 9 | Chhattisgarh | 1.08 | - |
| 10 | Jharkhand | 1.02 | 1.16 |
| 11 | Rajasthan | 1.00 | - |
| 12 | Karnataka | - | 1.17 |
| 13 | Dadra & Nagar Haveli | - | 1.16 |
| 14 | Daman & Diu | - | 1.15 |
| 15 | Punjab | - | 1.15 |
| 16 | Bihar | - | 1.04 |
| 17 | Delhi | - | 1.01 |

Source: Computed from EC-3 and EC-6-

**Table 4: Location Quotient – Distribution of Manufacturing Workers**

| *SN.* | *EC-3* | *LQ_EC-3* | *LQ_EC-6* |
|---|---|---|---|
| 1 | Dadra & Nagar Haveli | 1.82 | 3.24 |
| 2 | Telangana | 1.29 | 0.98 |
| 3 | Tamil Nadu | 1.27 | 1.06 |
| 4 | Haryana | 1.21 | 1.41 |
| 5 | Uttar Pradesh | 1.19 | 1.01 |
| 6 | Gujarat | 1.10 | 1.06 |
| 7 | West Bengal | 1.09 | 1.32 |
| 8 | Andhra Pradesh | 1.07 | - |
| 9 | Punjab | 1.07 | 1.30 |
| 10 | Madhya Pradesh | 1.06 | 1.00 |
| 11 | Delhi | 1.05 | 1.44 |
| 12 | Jharkhand | 1.02 | - |
| 13 | Maharashtra | 1.02 | - |
| 14 | Daman & Diu | - | 3.08 |
| 15 | Uttarakhand | - | 1.26 |
| 16 | Puducherry | - | 1.14 |
| 17 | Manipur | - | 1.07 |
| 18 | Himachal Pradesh | - | 1.05 |

Source: Computed from EC-3 and EC-6

**Figure 3: Beta Convergence among States: Manufacturing Units**

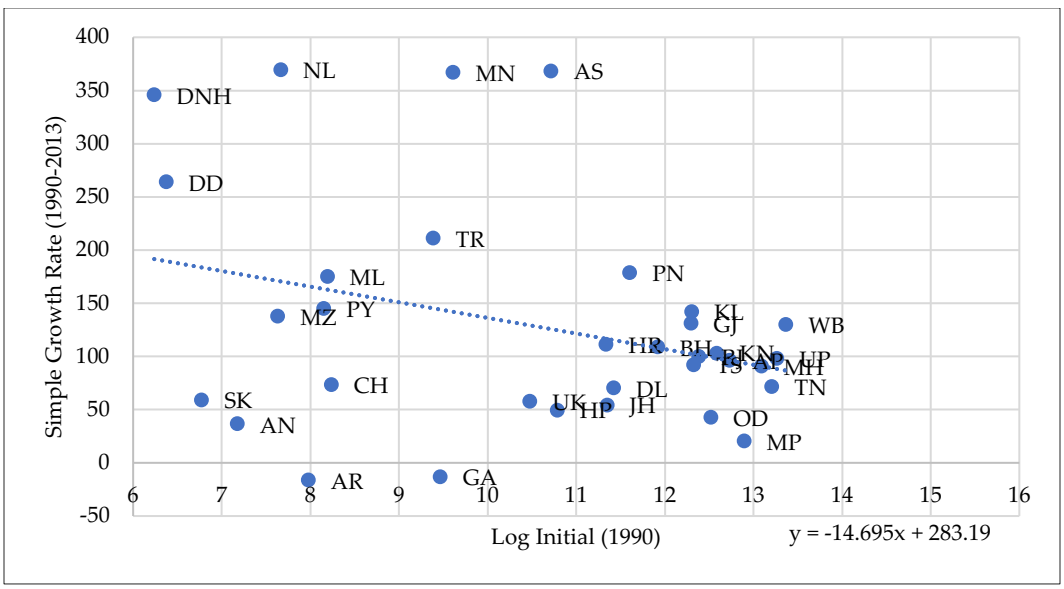


**Figure 4: Beta Convergence among States: Manufacturing Workers**

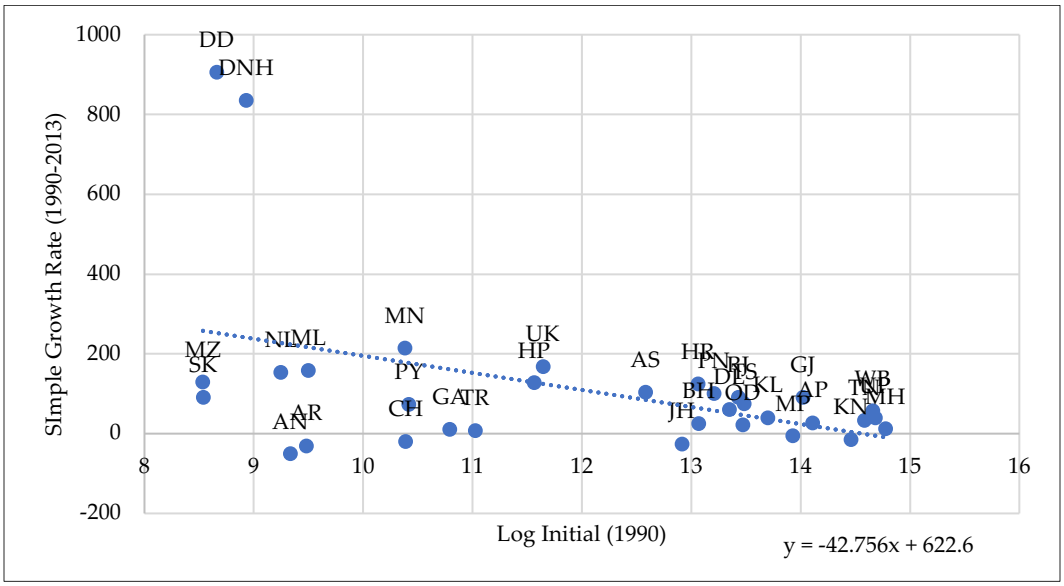



**Table 5: Sigma Convergence Manufacturing Units & Workers EC-3 (1990) & EC-6 (2013)**

| *Sigma* | *EC-3* | *EC-6* |
|---|---|---|
| Manufacturing Units | 1.20 | 1.21 |
| Manufacturing Workers | 1.22 | 1.16 |

Is there any change at the level of type of manufacturing industries? The Gini coefficient computed for each of the 2-digit with respect to both manufacturing units and workers reveals concentration with respect to some of the sectors (Tables 6 and 7). The Gini values are above 0.40 in beverages, tobacco, and manufacturing groups relating to engineering (NIC code 26 to 30).

Concentration has declined in many of the sectors between 1990 and 2013. The exceptions are shown in bold/ italics. The increase in the concentration in pharmaceuticals and related goods (NIC 21) is significant. Increase is also noticed with respect to textiles. Between 1990 and 2013, the decline is sharp with respect to wearing apparel, rubber & plastic products, coke and refined petroleum products, and chemical and chemical products. Same scenario is revealed with respect to workers.

**Table 6: Gini Coefficient Manufacturing Units EC-3 (1990) & EC-6 (2013)**

| *Code* | *Description* | *EC-3* | *EC-6* |
|---|---|---|---|
| 10 | Food Products | 0.19 | ***0.24*** |
| 11 | Beverages | 0.76 | 0.65 |
| 12 | Tobacco Products | 0.50 | ***0.51*** |
| 13 | Textiles | 0.30 | ***0.35*** |

| *Code* | *Description* | *EC-3* | *EC-6* |
|---|---|---|---|
| 14 | Wearing Apparel | 0.62 | 0.19 |
| 15 | Leather & Related Products | 0.40 | 0.35 |
| 16 | Wood & Wood Products except Furniture | 0.20 | ***0.25*** |
| 17 | Paper & Paper Products | 0.36 | 0.34 |
| 18 | Printing & Reproduction of Recorded Media | 0.31 | 0.22 |
| 19 | Coke & Refined Petroleum Products | 0.62 | 0.25 |
| 20 | Chemicals & Chemical Products | 0.49 | 0.29 |
| 21 | Pharmaceuticals, Medicinal Chemical & Botanical Products | 0.35 | ***0.53*** |
| 22 | Rubber & Plastic Products | 0.50 | 0.37 |
| 23 | Other Non-metallic Mineral Products | 0.23 | ***0.25*** |
| 24 | Basic Metals | 0.39 | 0.37 |
| 25 | Fabricated Metal Products except Machinery & Equipment | 0.22 | ***0.26*** |
| 26 | Computer, Electronic & Optical Products | 0.61 | 0.57 |
| 27 | Electrical Equipment | 0.45 | 0.36 |
| 28 | Machinery & Equipment n.e.c | 0.49 | 0.47 |
| 29 | Motor Vehicles, Trailers & Semi-trailers | 0.52 | 0.48 |
| 30 | Other Transport Equipment | 0.55 | 0.38 |
| 31 | Furniture | 0.30 | 0.24 |
| 32 | Other (Jewellery, Music, Sport goods, etc.) | 0.26 | 0.17 |
| 33 | Repair & Installation of Machinery & Equipment | 0.42 | 0.31 |

Source: Computed from EC-3 and EC-6 Database

**Table 7: Gini Coefficient Manufacturing Workers EC-3 (1990) & EC-6 (2013)**

| *Code* | *Description* | *EC-3* | *EC-6* |
|---|---|---|---|
| 10 | Food Products | 0.22 | 0.22 |
| 11 | Beverages | 0.57 | 0.51 |
| 12 | Tobacco Products | 0.53 | ***0.56*** |
| 13 | Textiles | 0.21 | ***0.27*** |
| 14 | Wearing Apparel | 0.69 | 0.15 |
| 15 | Leather & Related Products | 0.28 | ***0.32*** |
| 16 | Wood & Wood Products except Furniture | 0.27 | ***0.28*** |
| 17 | Paper & Paper Products | 0.26 | ***0.27*** |
| 18 | Printing & Reproduction of Recorded Media | 0.30 | 0.24 |
| 19 | Coke & Refined Petroleum Products | 0.62 | 0.35 |
| 20 | Chemicals & Chemical Products | 0.36 | 0.33 |
| 21 | Pharmaceuticals, Medicinal Chemical & Botanical Products | 0.44 | ***0.48*** |
| 22 | Rubber & Plastic Products | 0.41 | 0.39 |
| 23 | Other Non-metallic Mineral Products | 0.26 | ***0.28*** |
| 24 | Basic Metals | 0.42 | 0.32 |
| 25 | Fabricated Metal Products except Machinery & Equipment | 0.24 | ***0.27*** |

| | | | |
|---|---|---|---|
| 26 | Computer, Electronic & Optical Products | 0.54 | 0.49 |
| 27 | Electrical Equipment | 0.38 | 0.37 |
| 28 | Machinery & Equipment n.e.c | 0.44 | 0.43 |
| 29 | Motor Vehicles, Trailers & Semi-trailers | 0.58 | ***0.60*** |
| 30 | Other Transport Equipment | 0.60 | ***0.65*** |
| 31 | Furniture | 0.29 | 0.26 |
| 32 | Other (Jewellery, Music, Sport goods, etc.) | 0.45 | 0.26 |
| 33 | Repair & Installation of Machinery & Equipment | 0.35 | 0.28 |

Source: Computed from EC-3 and EC-6 Database

Location quotient is also computed with respect to units and workers. Tables 8 and 9 present the number of states in each level of specialisation. Between brackets, the numbers have been presented in terms of percentage. The LQ values are considered up to 2 decimal places.

On an average, LQ values have reached up to 3 but in few of the manufacturing groups there are states which have achieved very high level of specialisation as the LQ value is ≥3. Interestingly, there are also states that were not manufacturing certain items in 1990. By 2013, almost all states have taken up manufacturing of all items.

With respect to high and very high specialisation, on an average, 10 to 30 percent of the states/UTs have attained higher level of specialisation with respect to many of the sectors, important being pharmaceuticals; manufacturing groups relating to engineering (electrical equipment, machinery and equipment, motor vehicles, other transport); rubber & plastic products; wood and wood products; paper and paper products; printing; basic metals; and, beverages.

**Table 8: Location Quotient – Frequency Distribution for States by Units EC-3 (1990) & EC-6 (2013)**

| *Code* | *Description* | *Not Manufacturing* | | *Very low to low (<1)* | | *Moderately High (1-2)* | | *High (2-3)* | | *Very High (≥3)* | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *EC-3* | *EC-6* | *EC-3* | *EC-6* | *EC-3* | *EC-6* | *EC-3* | *EC-6* | *EC-3* | *EC-6* |
| 10 | Food Products | | | 15 (44) | 16 (47) | 14 (41) | 16 (47) | 3 (9) | 2 (6) | 2 (6) | 0 (0) |
| 11 | Beverages | | | 26 (76) | 23 (68) | 2 (6) | 6 (18) | 2 (6) | 2 (6) | 4 (12) | 3 (9) |
| 12 | Tobacco Products | 6 (18) | 4 (12) | 24 (71) | 25 (74) | 2 (6) | 2 (6) | 1 (3) | 3 (9) | 1 (3) | 0 (0) |
| 13 | Textiles | | | 25 (74) | 22 (65) | 7 (21) | 11 (32) | 2 (6) | 0 (0) | 0 (0) | 1 (3) |
| 14 | Wearing Apparel | 2 (6) | | 26 (76) | 17 (50) | 2 (6) | 16 (47) | 1 (3) | 1 (3) | 3 (9) | 0 (0) |
| 15 | Leather and Related Products | 1 (3) | | 23 (68) | 23 (68) | 7 (21) | 8 (24) | 1 (3) | 2 (6) | 2 (6) | 1 (3) |
| 16 | Wood and Wood Products of Wood, except Furniture | | | 21 (62) | 20 (59) | 13 (38) | 8 (24) | 0 (0) | 4 (12) | 0 (0) | 2 (6) |
| 17 | Paper and Paper Products | 2 (6) | | 22 (65) | 21 (62) | 5 (15) | 8 (24) | 0 (0) | 1 (3) | 5 (15) | 4 (12) |

| *Code* | *Description* | *Not Manufacturing* | | *Very low to low (<1)* | | *Moderately High (1-2)* | | *High (2-3)* | | *Very High (≥3)* | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *EC-3* | *EC-6* | *EC-3* | *EC-6* | *EC-3* | *EC-6* | *EC-3* | *EC-6* | *EC-3* | *EC-6* |
| 18 | Printing and Reproduction of Recorded Media | | | 19 (56) | 14 (41) | 11 (32) | 14 (41) | 1 (3) | 4 (12) | 3 (9) | 2 (6) |
| 19 | Coke and Refined Petroleum Products | 8 (24) | | 20 (59) | 18 (53) | 3 (9) | 13 (38) | 2 (6) | 3 (9) | 1 (3) | 0 (0) |
| 20 | Chemicals and Chemical Products | 1 (3) | | 23 (68) | 22 (65) | 5 (15) | 8 (24) | 3 (9) | 2 (6) | 2 (6) | 2 (6) |
| 21 | Pharmaceuticals, Medicinal Chemical & Botanical Products | 3 (9) | 2 (6) | 16 (47) | 20 (59) | 11 (32) | 1 (3) | 0 (0) | 5 (15) | 4 (12) | 6 (18) |
| 22 | Rubber & Plastic Products | | | 19 (56) | 21 (62) | 8 (24) | 7 (21) | 0 (0) | 1 (3) | 7 (21) | 5 (15) |
| 23 | Other Non-metallic Mineral Products | | | 23 (68) | 24 (71) | 9 (26) | 8 (24) | 2 (6) | 2 (6) | 0 (0) | 0 (0) |
| 24 | Basic Metals | | | 21 (62) | 17 (50) | 5 (15) | 12 (35) | 5 (15) | 1 (3) | 3 (9) | 4 (12) |
| 25 | Fabricated Metal Products, except Machinery and Equipment | | | 16 (47) | 17 (50) | 14 (41) | 13 (38) | 3 (9) | 4 (12) | 1 (3) | 0 (0) |
| 26 | Computer, Electronic and Optical Products | 3 (9) | | 19 (56) | 24 (71) | 5 (15) | 6 (18) | 1 (3) | 0 (0) | 6 (18) | 4 (12) |
| 27 | Electrical Equipment | 2 (6) | | 17 (50) | 20 (59) | 8 (24) | 6 (18) | 4 (12) | 5 (15) | 3 (9) | 3 (9) |
| 28 | Machinery and Equipment n.e.c | 2 (6) | 1 (3) | 21 (62) | 19 (56) | 4 (12) | 7 (21) | 4 (12) | 4 (12) | 3 (9) | 3 (9) |
| 29 | Motor Vehicles, Trailers, and Semi-trailers | 6 (18) | 1 (3) | 17 (50) | 18 (53) | 4 (12) | 9 (26) | 2 (6) | 2 (6) | 5 (15) | 4 (12) |
| 30 | Other Transport Equipment | 4 (12) | 1 (3) | 20 (59) | 25 (74) | 6 (18) | 4 (12) | 0 (0) | 1 (3) | 4 (12) | 3 (9) |
| 31 | Furniture | 1 (3) | | 14 (41) | 10 (29) | 8 (24) | 20 (59) | 7 (21) | 3 (9) | 4 (12) | 1 (3) |
| 32 | Other Manufacturing | | | 23 (68) | 18 (53) | 10 (29) | 13 (38) | 0 (0) | 3 (9) | 1 (3) | 0 (0) |
| 33 | Repair and Installation of Machinery and Equipment | | | 19 (56) | 18 (53) | 9 (26) | 11 (32) | 2 (6) | 2 (6) | 4 (12) | 3 (9) |

Source: Computed from EC-3 and EC-6 database. Note: Figures in the parenthesis correspond to percentage of states falling under each category. N is 34

**Table 9: Location Quotient – Frequency Distribution for States by Workers EC-3 (1990) & EC-6 (2013)**

| *Code* | *Description* | *Not Manufacturing* | | *Very low to low (<1)* | | *Moderately High (1-2)* | | *High (2-3)* | | *Very High (≥3)* | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *EC3* | *EC6* | *EC3* | *EC6* | *EC3* | *EC6* | *EC3* | *EC6* | *EC3* | *EC6* |
| 10 | Food Products | | | 19 (56) | 17 (50) | 12 (35) | 14 (41) | 2 (6) | 3 (9) | 1 (3) | 0 (0) |
| 11 | Beverages | | | 22 (65) | 17 (50) | 7 (21) | 9 (26) | 0 (0) | 2 (6) | 5 (15) | 6 (18) |
| 12 | Tobacco Products | 6 (18) | 4 (12) | 23 (68) | 24 (71) | 2 (6) | 2 (6) | 1 (3) | 2 (6) | 2 (6) | 2 (6) |
| 13 | Textiles | | | 24 (71) | 22 (65) | 9 (26) | 9 (26) | 1 (3) | 2 (6) | 0 (0) | 1 (3) |
| 14 | Wearing Apparel | 2 (6) | | 27 (79) | 23 (68) | 3 (9) | 11 (32) | 0 (0) | 0 (0) | 2 (6) | 0 (0) |
| 15 | Leather and Related Products | 1 (3) | | 19 (56) | 23 (68) | 10 (29) | 10 (29) | 4 (12) | 1 (3) | 0 (0) | 0 (0) |
| 16 | Wood and Wood Products, except Furniture | | | 18 (53) | 18 (53) | 10 (29) | 10 (29) | 2 (6) | 2 (6) | 4 (12) | 4 (12) |
| 17 | Paper and Paper Products | 2 (6) | | 21 (62) | 21 (62) | 6 (18) | 5 (15) | 3 (9) | 4 (12) | 2 (6) | 4 (12) |
| 18 | Printing and Reproduction of Recorded Media | | | 19 (56) | 19 (56) | 10 (29) | 10 (29) | 3 (9) | 4 (12) | 2 (6) | 1 (3) |
| 19 | Coke and Refined Petroleum Products | 8 (24) | | 19 (56) | 25 (74) | 4 (12) | 5 (15) | 2 (6) | 4 (12) | 1 (3) | 0 (0) |
| 20 | Chemicals and Chemical Products | 1 (3) | | 23 (68) | 23 (68) | 7 (21) | 5 (15) | 3 (9) | 5 (15) | 0 (0) | 1 (3) |
| 21 | Pharmaceuticals, Medicinal Chemical, and Botanical Products | 3 (9) | 2 (6) | 18 (53) | 19 (56) | 8 (24) | 4 (12) | 2 (6) | 1 (3) | 3 (9) | 8 (24) |
| 22 | Rubber & Plastic Products | | | 19 (56) | 20 (59) | 9 (26) | 8 (24) | 3 (9) | 1 (3) | 3 (9) | 5 (15) |
| 23 | Other Non-metallic Mineral Products | | | 22 (65) | 24 (71) | 10 (29) | 8 (24) | 2 (6) | 1 (3) | 0 (0) | 1 (3) |
| 24 | Basic Metals | | | 23 (68) | 18 (53) | 7 (21) | 10 (29) | 3 (9) | 4 (12) | 1 (3) | 2 (6) |
| 25 | Fabricated Metal Products, except Machinery and Equipment | | | 19 (56) | 22 (65) | 12 (35) | 10 (29) | 2 (6) | 1 (3) | 1 (3) | 1 (3) |
| 26 | Computer, Electronic and Optical Products | 3 (9) | | 16 (47) | 23 (68) | 9 (26) | 7 (21) | 2 (6) | 1 (3) | 4 (12) | 3 (9) |
| 27 | Electrical Equipment | 2 (6) | | 23 (68) | 19 (56) | 4 (12) | 7 (21) | 3 (9) | 4 (12) | 2 (6) | 4 (12) |
| 28 | Machinery and Equipment n.e.c | 2 (6) | 1 (3) | 23 (68) | 22 (65) | 5 (15) | 5 (15) | 1 (3) | 5 (15) | 3 (9) | 1 (3) |
| 29 | Motor Vehicles, Trailers, and Semi-trailers | 6 (18) | 1 (3) | 18 (53) | 23 (68) | 5 (15) | 6 (18) | 3 (9) | 2 (6) | 2 (6) | 2 (6) |
| 30 | Other Transport Equipment | 4 (12) | 1 (3) | 23 (68) | 24 (71) | 0 (0) | 3 (9) | 4 (12) | 1 (3) | 3 (9) | 5 (15) |
| 31 | Furniture | 1 (3) | | 13 (38) | 15 (44) | 8 (24) | 14 (41) | 6 (18) | 1 (3) | 6 (18) | 4 (12) |
| 32 | Other Manufacturing | | | 32 (94) | 23 (68) | 1 (3) | 7 (21) | 0 (0) | 4 (12) | 1 (3) | 0 (0) |
| 33 | Repair and Installation of Machinery and Equipment | | | 16 (47) | 21 (62) | 9 (26) | 9 (26) | 4 (12) | 3 (9) | 5 (15) | 1 (3) |

Source: Computed from EC-3 and EC-6 database. Note: Figures in the parenthesis correspond to percentage of states falling under each category. N is 34

With respect to units, the number of states in low to very low level of specialisation has decreased with respect to many of the manufacturing groups between 1990 and 2013. Conversely, the number of states in moderate to high levels of specialisation are found to have increased. The decline is also witnessed in moderate levels in seven of the manufacturing groups. But the decline is of one or two states; in pharmaceuticals, the decline is considerable. In pharma, states are found to have upgraded to high and very high levels of specialisation. With respect to workers, the decline in very low to low level of specialisation is noticed in a few sectors; in moderate also the increase is limited to a few sectors.

Manufacturing groups are also analysed with respect to the technology status (Table 10). The values are extremely low as in case of low technology, depicting non-concentration of low technology manufacturing in the country. In the case of medium-low also, the values are near non-concentration. Concentration is definitely a feature with respect to high-medium technology.

The concentration level is increasing from low to high technologies. An increase is observed for both units and workers.

**Table 10: Gini Coefficient by Technology Groups EC-3 (1990) & EC-6 (2013)**

| *Variable* | *Economic Census* | *Low* | *Medium-Low* | *High-Medium* |
|---|---|---|---|---|
| Units | Three | 0.04 | 0.17 | 0.34 |
| | Six | 0.03 | 0.19 | 0.25 |
| Workers | Three | 0.07 | 0.16 | 0.29 |
| | Six | 0.08 | 0.18 | 0.31 |

Source: Computed from EC-3 and EC-6 database

The value is very low in low technology, depicting the occurrence of these activities across the country. Between EC-3 and EC-6, the values have risen slightly across all technology groups with respect to workers. In the case of units, the rise is only in medium-low technology.

As far as $\beta$ convergence between states is concerned, the values signify negative coefficient of growth of units and workers on initial log of these variables. From this we may presuppose convergence between the states. It also supports lower concentration as obtained from Gini. Sigma also is in line with $\beta$ (Table 11).

**Table 11: Sigma Convergence by Technology Groups EC-3 (1990) & EC-6 (2013)**

| *Variable* | *Economic Census* | *LT* | *MLT* | *HMT* |
|---|---|---|---|---|
| Units | Third | 1.24 | 1.14 | 1.28 |
| | Sixth | 1.24 | 1.18 | 1.09 |
| Workers | Third | 1.25 | 1.19 | 1.46 |
| | Sixth | 1.22 | 1.17 | 1.18 |

**Figure 5: Beta Convergence Units as per Technology Groups**

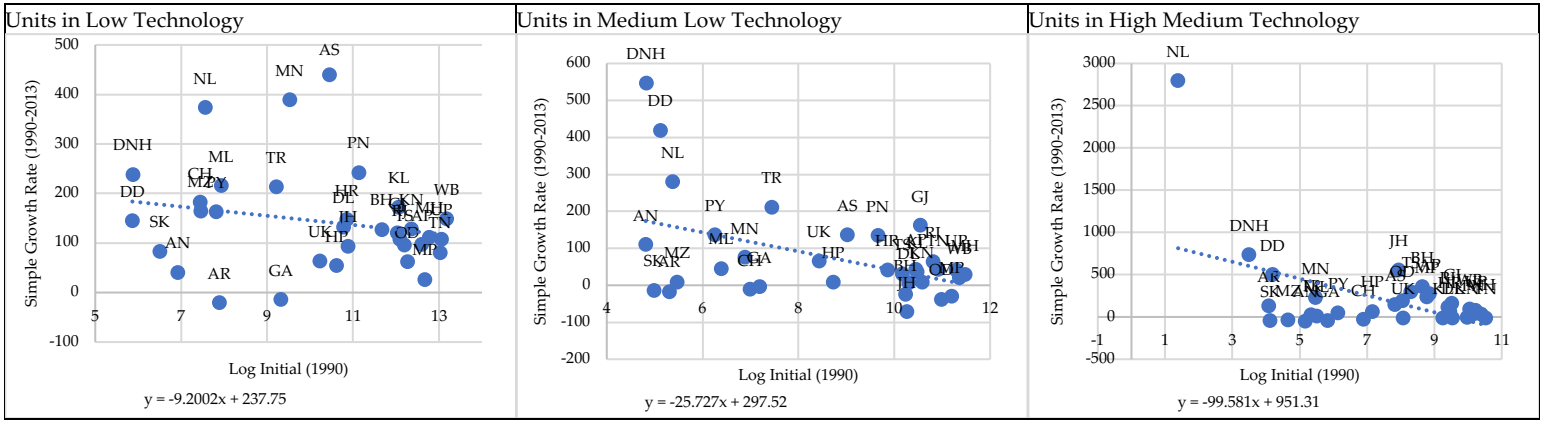
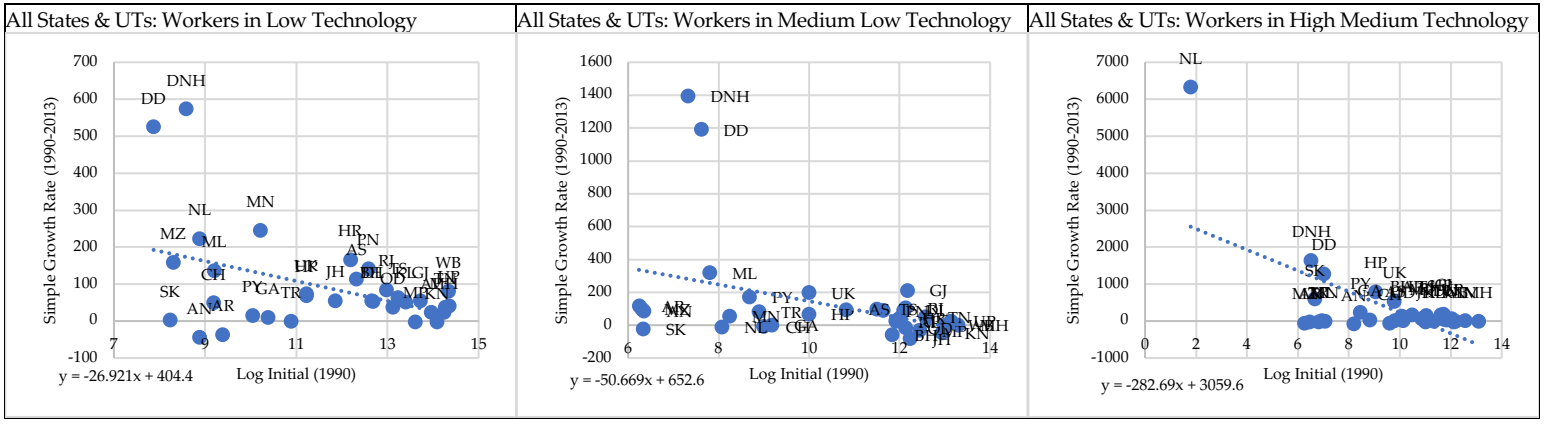



**Figure 6: Beta Convergence Workers as per Technology Groups**



As far as the degree of specialisation is concerned, across all technology groups, majority of the states have low to moderate level of specialisation (Tables 12 and 13). In case of high-medium, very few states have attained high to very high levels of specialisation, as can be seen in Figures 7 and 8.

**Table 12: Location Quotient Units by Technology Groups EC-3 (1990) & EC-6 (2013)**

| *Technology Type* | *Very low to low (<1)* | | *Moderately High (1-2)* | | *High (2-3)* | | *Very High (≥3)* | |
|---|---|---|---|---|---|---|---|---|
| | *EC-3* | *EC-6* | *EC-3* | *EC-6* | *EC-3* | *EC-6* | *EC-3* | *EC-6* |
| Low | 19 | 17 | 15 | 17 | 0 | 0 | 0 | 0 |
| Medium-Low | 17 | 18 | 14 | 14 | 3 | 0 | 0 | 2 |
| High-Medium | 18 | 18 | 9 | 10 | 5 | 4 | 2 | 2 |

Note: N is 34.
Source: Computed from EC-3 and EC-6 database

**Table 13: Location Quotient Workers by Technology Groups EC-3 (1990) & EC-6 (2013)**

| *Technology Type* | *Very low to low (<1)* | | *Moderately High (1-2)* | | *High (2-3)* | | *Very High (≥3)* | |
|---|---|---|---|---|---|---|---|---|
| | *EC-3* | *EC-6* | *EC-3* | *EC-6* | *EC-3* | *EC-6* | *EC-3* | *EC-6* |
| Low | 15 | 17 | 19 | 17 | 0 | 0 | 0 | 0 |
| Medium-Low | 18 | 18 | 15 | 14 | 1 | 2 | 0 | 0 |
| High-Medium | 21 | 19 | 9 | 9 | 3 | 4 | 1 | 2 |

Note: N is 34.
Source: Computed from EC-3 and EC-6 database.

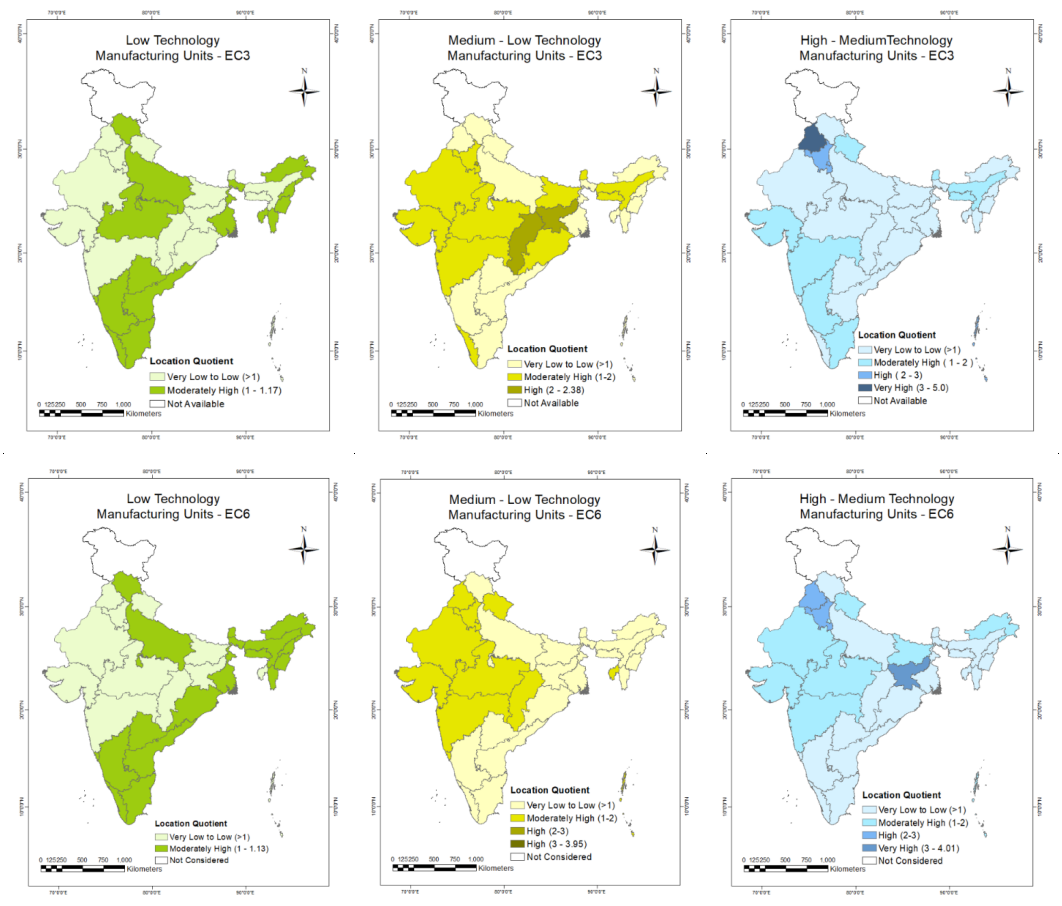
From Figures 7 and 8 it is clear that across units and workers, the maximum level of specialisation achieved in low technology is moderately high, depicted in states in south to east coast and thence to northeast. Uttar Pradesh is another state having moderately high level of specialisation.

In medium-low technology, moderately high concentration is revealed in west and northwest parts of India. High-medium technology has moderate concentration in the same states as in medium-low; few of the states depict high to very high specialisation. These are Punjab, Haryana, and Jharkhand. The states of Punjab and Haryana have high number of units in manufacturing of electrical equipment in the country. The state of Punjab is one of the important states in manufacturing of machinery and equipment and other transport equipment. Haryana on the other side is an important state in computer and electronics. Jharkhand, too, is an important state in units pertaining to computers and electronics. Units are also high in pharmaceuticals and motor vehicles in the state.

In the case of workers, high-medium technology specialisation is high to very high in Haryana, Uttarakhand, Himachal Pradesh, and Sikkim. Both Uttarakhand and Himachal Pradesh employ one of the largest number of workers in pharmaceuticals manufacturing industry. Haryana has highest number of workforce in the country employed in

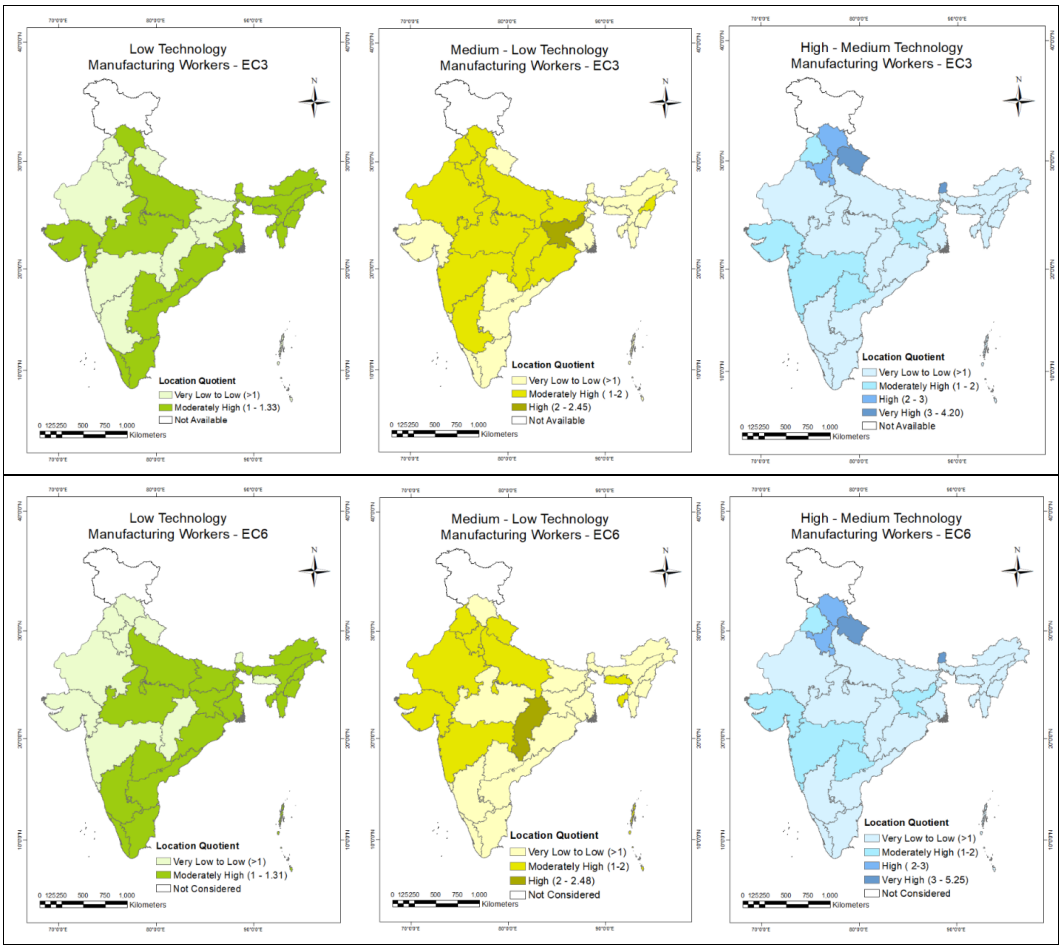
manufacturing of motor vehicles in 2013. The state also has the second highest number of workers after Punjab employed in manufacturing of transport equipment. The other important sector is machinery and equipment wherein Haryana has one of the largest number of workers in the country.

**Figure 7: Distribution of Manufacturing Units by Technology Type EC-3 (1990) & EC-6 (2013)**




Source: Constructed using EC-3 & EC-6 database.

**Figure 8: Distribution of Manufacturing Units by Technology Type EC-3 (1990) & EC-6 (2013)**




Source: Constructed using EC-3 & EC-6 database.

## 5. Summing Up

The post-independence period was one that focused on regional development. Various mechanisms were used to influence the location of industries. Though not much had changed on the ground, few industries came up in so-called industrially backward areas. In the post economic reform period, in order to take advantage of global capital, focus shifted to competitive edge. In this environment of competition, the inter-and intra-state disparities in industrial development have to be tackled by states themselves. Now the question is whether the states have been successful in doing that. Based on Census, NSS and ASI data studies pinpoint towards stagnant or declining interstate inequality in manufacturing employment and enterprises. The change is noticed at district level which seems to be too weak to effect state level scenario.

One of the notable features with respect to manufacturing is that seven of the 34 states, namely West Bengal, Uttar Pradesh, Tamil Nadu, Maharashtra, Andhra Pradesh, Karnataka, and Gujarat account for around 60 percent share in terms of both units and workers in the country. This was true in 1990 as well in 2013. While many of the states have increased their national share in units as well as workers, some have seen a decline. The decline in share is comparatively large in Madhya Pradesh, Odisha, and Tamil Nadu in respect of units and Karnataka, Maharashtra and Madhya Pradesh in respect of workers. The gain is also relatively important as in West Bengal with respect to units and in Gujarat with respect to workers. Their respective gains are maximum at around 2 percentage points.

Between 1990 and 2013, almost all states experienced growth in units. In the case of workers, few experienced negative growth. There was larger growth in manufacturing units than in manufacturing workers. The growth in units was twice and more in the states of Gujarat, Karnataka, and Kerala as well as in West Bengal, Bihar, Punjab and Haryana. In the case of workers, growth has doubled in the Northeast, Himachal Pradesh, and Uttarakhand. Punjab and Haryana also witnessed growth twice as much in workers as in units. But when seen in terms of per unit availability of workers, the ratio has gone down in Punjab and remained stable in Haryana. In fact, across almost all states, the worker to unit ratio has gone down. Notable exceptions are Uttarakhand and Himachal Pradesh.

However, the change in growth and share does not translate into change in distribution pattern of units and workers. For all states and UTs Gini coefficient showed stability in the distribution pattern of both units and workers. The values are small and do not indicate concentrated distribution. The difference is noticed between top ten states and all other with respect to workers distribution in EC-6, however, the Gini values are small. Beta and sigma convergence also substantiate unconcentrated distribution of manufacturing. Stability and unconcentrated distribution are depicted from LQ values as well. For manufacturing units as well as workers, the level of specialisation is the same as the national average. The position of states is also roughly the same between both the censuses.

As the aggregate picture hides the pattern as existing at smaller level of disaggregation, at NIC 2-digit level, concentration is revealed with respect to some of the manufacturing groups, namely beverages, tobacco, pharmaceuticals, and manufacturing groups relating to engineering (NIC 26 to 30). Few of the sectors like coke & refined petroleum, rubber & plastic products, and wearing apparel that showed concentration in 1990, depict a decline in 2013. In general, Gini values have declined across sectors between 1990 and 2013. As far as specialisation at NIC-2 digit is concerned, roughly 10 to 30 percent of the states/UTs have high to very high specialisation with respect to many of the sectors. Aggregating NIC 2-digit by technology type, one finds low technology manufacturing to be non-concentrated. In case of medium-low also the values are near non-concentration. However, the values increase from low technology to medium-low and further to high-medium. Concentration is a feature with respect to high-medium technology.

Across all technology groups, majority of the states depict low to moderate levels of specialisation. In low technology, none of the states record higher levels of specialisation; the maximum reached is moderately high. In case of high-medium, few states recorded high to very high levels of specialisation. The states in this category are Punjab and Haryana in respect of units, and Haryana, Uttarakhand, and Himachal Pradesh in the case of workers.

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# Appendix

**Table A1: Classification of Manufacturing Groups by Technology Type**

| *Low* | | *Medium-Low* | | *High-Medium* | |
|---|---|---|---|---|---|
| 10 | Food Products | 19 | Coke & Refined Petroleum Products | 20 | Chemicals & Chemical Products |
| 11 | Beverages | 22 | Rubber & Plastic Products | 21 | Pharmaceuticals, Medicinal Chemical & Botanical Products |
| 12 | Tobacco Products | 23 | Other Non-metallic Mineral Products | 26 | Computer, Electronic & Optical Products |
| 13 | Textiles | 24 | Basic Metals | 27 | Electrical Equipment |
| 14 | Wearing Apparel | 25 | Fabricated Metal Products except Machinery & Equipment | 28 | Machinery & Equipment n.e.c |
| 15 | Leather & Related Products | | | 29 | Motor Vehicles, Trailers & Semi-trailers |
| 16 | Wood & Wood Products except Furniture | | | 30 | Other Transport Equipment |
| 17 | Paper & Paper Products | | | 33 | Repair & Installation of Machinery & Equipment |
| 18 | Printing & Reproduction of Recorded Media | | | | |
| 31 | Furniture | | | | |
| 32 | Other (Jewellery, Music, Sport goods, etc.) | | | | |

Source: Based on Rijesh (2020).

**Table A2: Abbreviations Used for States**

| *State* | *Short* |
|---|---|
| Andaman & Nicobar Island | AN |
| Andhra Pradesh | AP |
| Arunachal Pradesh | AR |
| Assam | AS |
| Bihar | BH |
| Chandigarh | CH |
| Dadra & Nagar Haveli | DNH |
| Daman & Diu | DD |
| Delhi | DL |
| Goa | GA |
| Gujarat | GJ |
| Haryana | HR |
| Himachal Pradesh | HP |
| Jharkhand | JH |
| Karnataka | KN |
| Kerala | KL |
| Madhya Pradesh | MP |
| Maharashtra | MH |
| Manipur | MN |
| Meghalaya | ML |
| Mizoram | MZ |
| Nagaland | NL |
| Odisha | OD |
| Puducherry | PY |
| Punjab | PN |
| Rajasthan | RJ |
| Sikkim | SK |
| Tamil Nadu | TN |
| Telangana | TS |
| Tripura | TR |
| Uttar Pradesh | UP |
| Uttarakhand | UK |
| West Bengal | WB |

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