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Editor's Note

Bringing out Sarveshana has always been a pleasant and enlightening endeavor. First issue of Sarvekshana was released during July, 1977. Sarvekshana is 107th issues old now. The present, 108th, issue comes with three papers namely (i) Continuous Time Stochastic Model for Estimating the Level of under Employment, (ii) Employment Growth in Indian Manufacturing Industries – An Empirical Study Using ASI Data and (iii) Productivity Dispersion and Firm size: An inquiry with Indian Manufacturing firms. Additionally, highlights of the NSS Report No. 583: Persons with Disabilities in India and NSS Report No. 584: Drinking Water, Sanitation, Hygiene and Housing Condition in India of NSS 76th round (July-December 2018) have also been given in this issue.

Sarvekshana since its inception has been an important platform for encouraging research and analysis among academia and officials in the Government on various socio-economic aspects using National Sample Survey data and other surveys/sources as well. This is proving to be good experience and is giving variety to the content.

Referees have been very kind in examining the papers in detail and offering their suggestions in a short span of time. I offer my sincere gratitude to them and solicit continued support for the Journal. Authors of the papers too, have been cooperative in acceding to the suggestions for repetitive revisions. I congratulate them for their work which has found favour with the experts and has been included in the Journal. Officers of Survey Coordination Division have been very meticulous at various stages of publication and their hard work deserves unqualified appreciation.

The Sarvekshana is a known Journal among researchers, academicians and policy makers. I welcome students, researchers, government officials and all those working on development data to contribute unpublished papers for this Journal. Suggestions for improvement in the various aspects of the Journal are welcome.

apradhan

(Amitabha Pradhan)
Additional Director General (SCD) &
Managing Editor, Sarvekshana

New Delhi
June, 2020

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PART-I

TECHNICAL PAPERS

Continuous Time Stochastic Model for Estimating the Level of under Employment

P. D. Joshi[1]

Abstract:

Statistical analysis of stochastic process suited to the phenomenon of labour force (employed and unemployed together) does not appear to have received much attention except duration-specific model. Incidentally, Heckman and Barajas (1980) have advocated the importance of continuous time stochastic model. This paper presents a continuous time stochastic model in the form of doubly inflated negative binomial distribution under realistic assumption for estimating the level of under-employment as an alternative of Binomial Beta model derived by Vidwans (1980) which is an approximation and rests on discrete time formulation. The application of the model has been made to a set of data.

Keywords : Stochastic, Model, Under- employment, Parameter, Estimate
JEL Code : C51

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[1]. Former Deputy Director General, NSSO, Government of India. The views expressed are personal and not of the organization to which the author belonged.

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1. Introduction

Statistical analysis of stochastic process suited to the phenomenon of labour force (employed and un employed) dynamics for the measurement of un-employment does not appear to have received much attention except duration-specific models as may be seen in Lancaster (1979,1985), Heckman and Singer (1982), Chamberlain (1984) , Kiefer (1988) and Sawyer (1989). However, Vidwans (1980) proposed a model based on discrete time which is an approximation. It is inefficient from the point of its structure and formulation.

Heckmen and Berjas (1980) have mentioned the importance of continuous time stochastic model in connection with time aggregation problem, tests for true state dependence and linkage with theoretical models of labour force dynamics. Further, if time is taken as continuous variable, then the distribution may be developed either directly through integration or through characteristic function. This paper, therefore, presents a continuous time stochastic model for the variation in number of days available for work to a person during a time interval (0, t) of length t under realistic assumptions. It takes into account not only two states, viz., employed and un-employed but also an intermediate state (under-employment) having its linkage with the phenomenon of employment and un-employment and compares with that of a model proposed by Vidwans (1980). It is expected that the proposed model-based estimates of employment, unemployment and under-employment (under-utilisation of labour time) will be useful for planning of employment oriented public works programme of the government.

2. Model

The labour force has been regarded to be consisted of a mixture of three sub populations instead of two viz., employed and un-employed. The three subpopulations as per NSS concepts on employment and un-employment are

i) Employed i.e. those who were employed for the entire period and were not available for work on any day during the time period (0, t),

ii) Un-employed i.e. those who did not have any work and were available at any time or entire period during the time period (0, t),

iii) Under-employed i.e. those persons who had work on some days but had no work on some other days during the time period (0, t).

Assumptions

i) The number of days available for work to a person during a time interval (0,t) of length t is a random variable.
ii) Employability, i.e. the probability that a person in the labour force will get employment in a spell of time says, a day is λ and is constant for all the spells.
iii) The spells are mutually independent.
iv) Employability, i.e. λ varies from person to person because of the structural relationship in certain unmeasured variables.

If λ follows the distribution F(λ) given by Pearson Type III distribution, the probability density for the number of days (x) available for work is given by

$$\int P(x)dF(\lambda)$$

The choice of Pearson Type III distribution i.e. Gamma distribution is justified by its flexibility and its use in the past for similar situation as may be seen in Brass (1958), Singh (1964, 1968).

The waiting time distribution of persons in the labour force, is given by

$$f(t) = \lambda e^{-\lambda t} \quad \text{.....(1)}$$

If x stands for the number of days available for work (or days of un-employment) in a time period (0,n) of length n , then from Feller (1957,1966) the probability that a person whose expected rate of getting employment is λ will be employed for r days is,

$$P[X=r] = (\lambda t)^r e^{-\lambda t}/r! , \quad \text{..... (2),}$$

$$r=0, 1, 2,3....$$

Under assumption (iv)

$$f(\lambda) = a^k e^{-a\lambda} \lambda^{k-1}/ \Gamma k \quad \text{.....(3)}$$

Compounding (2) and (3), we obtain

$$P[X=r] = \int_0^{\infty} \frac{1}{\Gamma(k)} . \left(\frac{(\lambda t)^r e^{-\lambda t}}{r!}\right) . \left(a^k e^{-a\lambda} \lambda^{k-1}\right) d\lambda$$

$$= \left(\frac{a^k}{\Gamma(k)}\right) . \left(\frac{t^r}{r!}\right) \int_0^{\infty} e^{-(a+t)\lambda} \lambda^{r+k+1} d\lambda$$

$$= \left(\frac{a^k}{\Gamma(k)}\right) . \left(\frac{t^r}{r!}\right) \frac{\Gamma(r+k)}{(a+t)^{(r+k)}}$$

$$= \frac{(r+k-1)!}{(k-1)!r!} \left(\frac{a}{a+t}\right)^k \left(1 - \frac{a}{a+t}\right)^r$$

$$= \frac{(r+k-1)!}{(k-1)!r!} p^k (1-p)^r \quad \text{.....(4)}$$

where p= a/(a+ t)

$$= ((r+k-1)! / (k-1)! r!) (U/V)^r (1-U/V)^k$$

where U=(1-p)/p , V=1+U =1/p

Thus, expression (4) is the probability density function of negative binomial distribution, which can be written as

$$P[X=r] = (a/a+ t)^k (t/a+ t)^r (\Gamma (r+k) / \Gamma(r)*\Gamma(k)$$

Now as stated in the beginning, in the observed distribution of labour force by the number of days available for work, there is a possibility that a proportion say α_1 of persons are those who were fully employed during the reference period and therefore not available for work for any day of the reference period. Other possibility may be that another proportion say, α_2 of persons are those who did not have any work and were available for their entire period. Moreover, there may exist a proportion of under-employed persons in the sense that they had work on some days of the reference period but had no work on other days for which they may be considered as available for work. This proportion may therefore be given by $(1-\alpha_1-\alpha_2)$. Under these situations the probability that a person from the labour force chosen at

random is found un-employed i.e. available for work for r days during the time period (0, t) of length t is given by

$$P[X=r]=\begin{cases}\alpha_1+(1-\alpha_1-\alpha_2)*(1/V)^k & \text{for } r=0\\ (1-\alpha_1-\alpha_2)*((k+r-1)!/r!*(k-1)!)\,(U/V)^r(1-U/V)^k & \text{for } r=1,2,3,\ldots(.n-1)\\ \alpha_2+(1-\alpha_1-\alpha_2)*((k+r-1)!/r!*(k-1)!)\,(U/V)^r(1-U/V)^k & \text{for } r=n\end{cases}$$

The recurrence relation for the probability function is given by,

$$P[X=r+1]=((k+r)/(r+1)\,U/V))*P[X=r],\ r=1,2,3,.....(n-2)$$

The proposed model may also be viewed as a doubly inflated compound distribution or inflated negative binomial distribution of second order. The derived model may be considered as an alternative of Binomial-beta model considered by Vidwans (1980) whose structure is based on discrete time stochastic process. This is an approximation because changes in employment status can take place at any time and movements taking place between the points of observation are not accounted for. Further, if the time is treated as continuous variable, then distribution may be derived through integration or characteristic function. Our model has therefore, been developed in continuous time stochastic process whose importance has already been mentioned by Heckman and Berger(1980) in connection with time aggregation problem, tests for true state dependence, linkage with theoretical models of labour market turnover.

3. Estimation

The model derived above involves four parameters viz., α_1, α_2, a and k. It is difficult to estimate all the parameters simultaneously if efficient method of estimation such as maximum likelihood method is employed, because the method does not provide analytical solution of the parameters. Estimating equations are algebraically intractable. The numerical solution can be found out by Newton-Raphson Method, which requires several iterations. Moreover, asymptotic distributions of parameters, which can be obtained by the usual variance-covariance matrix, are not easy to obtain as the elements of the matrix turns out to be algebraically messy expressions. Thus, the estimates are difficult to compute. We have therefore, estimated the parameters using method of moments and two-cell frequencies (i.e. first cell frequency and the last cell frequency).

Thus, using moment generating function (*mgf*) of Negative Binomial Distribution (NBD), we have

$M_x(t) = E(e^{tx})$

$= \alpha_1 + \alpha_2 e^{tn} + (1-\alpha_1-\alpha_2).(mgf \text{ of NBD})$

$= \alpha_1 + \alpha_2 e^{tn} + (1-\alpha_1-\alpha_2)(Q-P e^t)^{-k}$

Thus, r^{th} moment is given by

$\mu_r'' = \alpha_2 n^r + (1-\alpha_1-\alpha_2).(r^{th} \text{ moment of NBD})$

In particular,

$$\mu'_1 = n\,\alpha_2 + (1 - \alpha_1 - \alpha_2)\,k\,U$$
$$\mu'_2 = n^2\,\alpha_2 + (1 - \alpha_1 - \alpha_2)\,k\,U + (V + k\,U)$$

Following Brass (1958), we have

$$P^* = \ddot{x}^*(1 - f_1/N_1)/S^{2^*}$$
$$k^* = (\ddot{x}^* - (f_1/N_1))/(1 - p^*)$$

Where $\ddot{x}^* = \Sigma f_i x_i / n_1$, $n_1 = n - n_0$

$$S^{2^*} = (n_1/(n_1 - 1))\,[\Sigma f_i x_i^2 - n_1 \ddot{x}^{*2}]$$

$$a = t\,p^*/(1 - p^*), \quad U = t/a, \quad V = 1 + U$$

Knowing p*and k* and thereby U and V, we have

$$\Delta^* \alpha_{2=} \begin{vmatrix} \mu'_1 & k\,U \\ \mu'_2 & K\,U + (V + k\,U) \end{vmatrix}$$

$$\Delta^* (1 - \alpha_1 - \alpha_2) = \begin{vmatrix} n & \mu'_1 \\ n^2 & \mu'_2 \end{vmatrix}$$

Where $\Delta =$

$$\begin{vmatrix} N & k\,U \\ n^2 & K\,U + (V + k\,U) \end{vmatrix}$$

4. Application

Distribution of observed proportion of persons by number of days available for work for spatial and inter-temporal comparison is not available in published form from the NSS reports on employment unemployment based on central sample. We have, therefore, applied the model to an example available from Vidwans (1980). It relates to a table for the state of rural Maharashtra generated from labour time disposition available from employment unemployment survey based on the first sub-round of state sample of National Sample Survey, 27th round (October 1972- September 1973).

The estimates of the parameters as obtained by the aforesaid method of estimation and the estimated distribution along with the observed distribution are as under:

Table: Distribution of observed and estimated persons (in per cent) by number of days available for work

Number of days available for work in last week preceding the date of survey	Percentage distribution of persons		
	Observed	Estimated	
		Joshi	Vidwans
(1)	(2)	(3)	(4)
0	77.05	77.08	77.05
1	7.98	8.00	6.51
2	4.10	4.85	4.88
3	1.80	2.91	3.49
4	2.15	1.75	2.32
5	1.62	1.05	1.39
6	1.62	0.63	.70
7	3.66	3.73	3.66
Total	**100**	**100**	**100**
		Estimates of parameters	
		P=0.3926	α =1.0
		K=1.00	β =3.00S
		a =4.5243	λ=68.69
		U= 1.5471	μ=3.43
		α_1=.3354	
		α_2=.0254	

Source: Vidwans, S.M. (1980), "A New Analysis of NSS Data on Rural Under Employment", Sankhya, Series B, Vol.42, Parts 1&2, pp110-125

The fitted distribution reveals that there is a clear agreement between the observed and the expected proportion of persons employed, unemployed and underemployed. It, therefore, justifies the suitability of the proposed model. The result shows that proportion of employed, unemployed and underemployed persons were 33.54%, 2.54 %, and 63.92% respectively in the rural sector of Maharashtra in the year 1972-73. Thus, for the purpose of planning of employment oriented public works programme of the government, the proposed model based estimates seem to be useful.

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Employment Growth in Indian Manufacturing Industries – An Empirical Study Using ASI Data

Sayan Kumar Gupta[1] and Panchanan Das[2]

Abstract:

This paper estimates the employment structure in manufacturing industry groups at NIC 2-digit level over the period from 2000-01 to 2014-15 by applying fixed effect panel data regression model in terms of gross value added, plant size and production technology of the industries. The theoretical background of our study is based on Das (2007), Kapoor (2014) and Das and Sengupta (2015). The share of workers and supervisors employed varies widely across the industry groups over the period due to their heterogeneity in major structural parameters, are captured by their summary statistics. The estimation shows the prevalence of unobserved industry specific heterogeneity across the industry groups. While gross value added has a positive effect on the employment of workers, it has an employment reducing effect for the supervisors. Production technology has an employment reducing effect for both workers and supervisors, while the plant size is found to have a significant positive effect on employment for both workers and the supervisors.

Keywords: Employment, Manufacturing, India
JEL Codes: C23, J23, L60

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1. Introduction

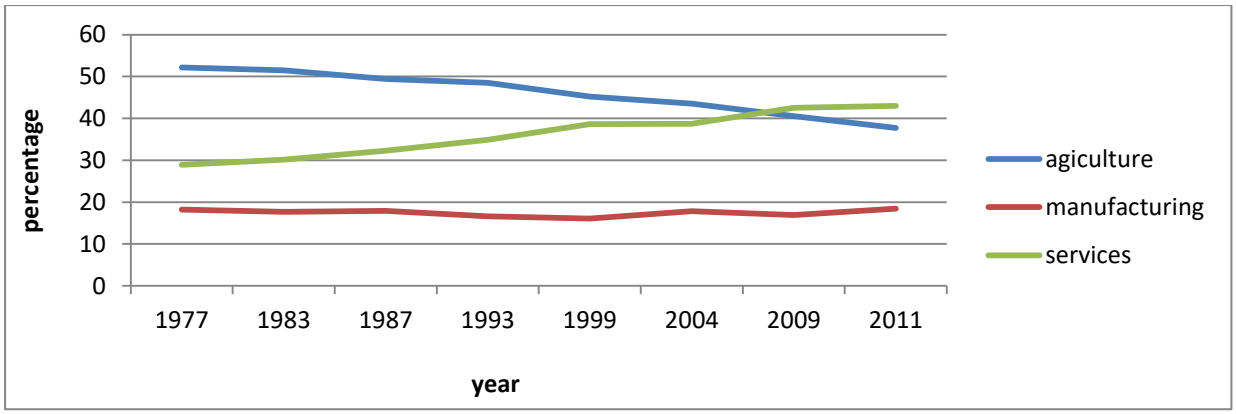
Manufacturing has been traditionally treated as an engine of growth as it plays a crucial role in employment generation. The strong linkage, both forward and backward, creates a high spill over effect on other sectors. As the non-manufacturing sectors provide inputs to the manufacturing firms, an increase in demand for final output of the latter will, in turn, induce a demand for goods and services in the former. Also, manufacturing has a strong forward linkage as it provides capital goods to the primary as well as tertiary sector. Hence, in both ways the sector plays an important role in creating jobs. Thus, in order to exploit the demographic dividend by generating employment in India, it has to create enough 'Productive Jobs', (Kapoor, 2014), which is possible only through a strong industrial base as manufacturing sector has a capacity to absorb surplus labour from the less-productive sectors like agriculture.

Historically this sector has played an important role in providing employment opportunities for unskilled or semi-skilled workers across the globe, whereas in India it has failed to create productive jobs despite its higher productivity growth (Kapoor, 2014). Kaldor (1966) hypothesised that output growth in manufacturing raises labour productivity which brings in employment growth, but at a slower pace than rise in productivity due to the presence of increasing returns to scale in the manufacturing industries. In many cases, where the production process in the manufacturing is driven by new technology, output growth fails to increase demand for un-skilled labour and raise only the demand for skilled labour. As the skilled workers are less in numbers and having a supply constraint the wage rate rises and through substitution effect labour is replaced by capital, causing creative destruction of jobs in Schumpeterian sense (Das and Sengupta, 2015). The openness of domestic market and free movement of capital, on the other hand, make the capital import cheaper in a transitional developing economy like India encouraging labour displacing technological change in such an economy (Sen and Das, 2014). Thus, in a labour abundant economy like India, it is important to be concerned with how the structure of employment is changing within the organised manufacturing sector as there has been already a change in the occupational structure quite prominent with labour force moving from the agricultural towards the non-agricultural sector due to higher payoff.

India, with surplus labour in the agricultural sector, is supposed to be on a high growth trajectory over time, due to the productivity growth in the manufacturing sector powered by the transfer of the labour from agriculture and allied sector which dominates the occupational structure of the working population in India. But if we look at the Indian scenario, labour force distribution across the broad three sectors (Primary, Secondary and Tertiary Sector) using the NSSO Employment and Unemployment Situation, 68th round report data, by compiling the per 1000 distribution of usually employed persons across the broad industry division, during NSS survey rounds from 32nd (1977-78) to 68th (2011-12) rounds, we find a picture of change in occupational structure with a decline in the percentage share of labour-force in the agricultural sector and a rise in the services sector. With little growth of labour absorption the percentage share of labour force in the manufacturing sector remained more or less stagnant over the period (plotted in figure 1). This explains the violation of the "sector

thesis", in Indian economy where the manufacturing sector despite having the strong potentiality in employment generation could not show its capacity in creating employment in India. Thus, the transfer of labour from the less-productive agricultural sector has not taken place to the manufacturing sector, at least in India. Although we find that the services sector show a rise in the labour absorption but from several studies we find that this sector generally absorbs specifically skilled workers, thus the huge semi-skilled and poorly educated part of the labour force remains out of purview of the growth, which is supposed to be done by the manufacturing sector. A transfer of resources to the services sector without a strong manufacturing sector would lead to an unstable growth in the economy as productivity in services is relatively lower than manufacturing and creates 'Structural Change Burden', as argued by Baumol (1967 et al. 1985) as referred by Kathuria and Raj (2010). As India did not follow the path of development, as suggested in the "sector thesis" by Fisher (1935) and Clark (1940) (mentioned by Thirlwall, 2011) and shifted straight from agriculture to service led growth, leapfrogging the manufacturing sector, created a wide gap between the growth in output and employment (Kapoor, 2014).

Figure 1: Percentage share of workforce across the three sectors



Source: Author's calculation from NSS Report No. 554 (68/10/1)

This change in occupational structure is not only a matter of concern in India, but there has been a structural change in the employment being experienced in the Asia and Pacific region as a whole, since past few decades. As has been explained in a recent report by ILO (2019), the eastern and south-eastern Asia significantly experienced a shift in the employment towards the services sector away from the agricultural sector, since 2000. Southern Asia, on the other hand showed a slower pace of such transformation with agricultural sector still employing a bulk of the labour force (43 per cent of total employment) while manufacturing sector with only 12 per cent share of total employment, in 2018.[3] The Indian scenario shows that despite no significant change in the size of the factory sector during the 1980s and 1990s, there has been a steady growth in the proportion of the size of manufacturing workforce to the total workforce, at 10.6 per cent between 1983-84 and 1993-94.[4] Economic reform has

[3]ILO, 2019
[4]See Thomas (2019)

accelerated the growth of output as well as the employment. The star manufacturing performers of the immediate post reform period were the minerals and metals, machinery, automobile and the chemical and petrochemicals. However, after 2011-12, India faced some difficulties regarding slowdown in investment, which led to a decline in the gross capital formation as a portion of country's GDP, by 6 per cent during 2012-13 and 2016-17. The ASI data suggests that the growth in the value added and the employment decelerated from 2011-12. It revived somewhat during 2014-16 but again fell after 2016-17.

Although the above figure and the discussions are about the employment pattern in the Indian economy as a whole, the country comprises diversified regions that show disparity in employment generation, across the states. The extreme disparity in the manufacturing performance had been mentioned in the study by Papola et al, (2001), as referred in Kapoor (2014), in the post reform period and also by Kathuria (2010). These studies referred that the states like Maharashtra, Gujarat and Tamil Nadu are highly industrialised while Bihar, Uttar Pradesh and Madhya Pradesh have been lagging behind. Besley and Burgess (2004), as was referred by D'Souza (2008), found that states with more 'pro-worker legislation' and stringent labour laws have lower levels of employment in registered manufacturing. There also remains a paradox, as some study label Maharashtra and Gujarat as pro-worker states while other studies find these states to be least over-manned. From the study by Kapoor (2014) we come across the disparity in the employment share across the states. Here, Tamil Nadu, Maharashtra, Gujarat, Andhra Pradesh, the highly industrialized states are found to generate highest share of employment in the organised manufacturing industries while Bihar is with the lowest share. Hence, employment generation is found to be high in case of highly industrialized states and lower for the states that lag behind industrially.

Thus, how the employment pattern changed with the change in output and productivity in manufacturing in a transitional economy, like India with so much disparity in the employment generation across the regions, is an empirical issue. This study looks into this issue with time series data from Annual Survey of Industry (ASI) in India. We have analysed the trend behaviour of the relevant variables incorporated into the labour demand function across different industry groups to come across the heterogeneous behaviour of each industry in employing different types of workers. Labour demand is a derived demand and it depends on the level of output, product prices, factor prices and technology of production. Here, we assume that labour demand in manufacturing industries depends on the levels of factory output, gross value added, plant size (in terms of fixed capital), production technology (measured by working capital to output ratio) by taking into account the unobserved heterogeneity across different industries. The neoclassical production theory suggests output as a function of labour and capital, keeping other factors the same. In this study we estimate the inverse production function by taking labour as a dependent variable and the rest as independent variables. This study analyses how the level of employment is related to the level of gross value added after controlling for plant size and capital-output ratio.

There are some studies on industrial growth in India providing different observations on employment growth. Das (2007), for example, observed by analysing ASI data from 1970-71 to 2003-04 that the manufacturing sector, particularly in the registered sector, in India did not

play a significant role in generating employment. The industrial growth in India is driven mainly by the capital intensive and skill intensive sectors showing limited contribution to employment generation (Kapoor, 2014). The employment of the high skilled workers has increased at the cost of the poorly skilled workers through the process of creative destruction. In a transitional developing economy like India, the technical innovation and the capital intensive investments have created the phenomenon of job destruction of the unskilled workers (Das and Sengupta, 2015).

This study re-examines the issue by extending the data up to 2014-15 and by taking different types of employment. We have examined the growth pattern separately for ordinary workers and supervisors by incorporating unobserved heterogeneity across different industries at 2 digit NIC level. The main focus is on the demand side analysis of labour employment.

We use here the time series data from annual reports of ASI (2000-01 to 2014-15). By calculating the percentage share of workers and supervisors across the industry groups, we find that in 2000-01 manufacturing of textile employed the highest percentage of workers while in 2014-15 it came down to the 2nd position, below the manufacturing of food and beverages, employing 12.88% of workers. The fall in the share of workers employed is highest in manufacturing of textile over the period. For the supervisors, in 2000-01 the percentage share of employment was highest in the manufacturing of food and beverage (16.11%) which dropped in the year 2014-15, making the manufacturing of chemicals the highest absorber of the supervisors (15.29%) in 2014-15. Analysing the trend behaviour, of employment level of different types of workers we find that at the all Industry level the total persons engaged and workers show a rising trend while numbers of supervisors remains almost same over the period, but when we analyse the same across different industries, the number of both workers and supervisors employed have shown wide variation thus revealing the heterogeneity across industries. Manufacturing of food and beverages and manufacturing of textile is found to employ maximum number of workers while manufacturing of coke and electrical machinery absorb the least. In case of absorption of supervisors, along with manufacture of food, the chemical industries have also shown high trend of growth in their absorption over time. To capture the heterogeneities across industries we have considered the summary statistics of few structural parameters like total ex-factory output, gross value added, production technology and plant size, on which the employment structure of an industry depend. To get the significant causal factor behind the pattern of employment across industry groups over time we estimate fixed effect panel data regression model separately for workers and supervisors. Result claims that while gross value added has a significant positive effect on the employment of workers; it has an employment reducing effect for the supervisors. Production technology has an employment reducing effect for both workers and supervisors, while the plant size is found to have a significant positive effect on employment for both workers and the supervisors.

The paper is organised in a way that, it puts an introduction to the matter concerned in the first section. In section 2, we discuss few literatures those have previously dealt with the trend in the employment and other related parameters in Indian manufacturing sector. Description of data used and methodology applied is explained in the consecutive sections, 3

and 4. Section 5, explains some observed facts in terms of share of each type of employment by industries and the trend in employment level of the manufacturing industries, broken into the categories workers, supervisors; over the period of time (2000-01 to 2014-15) and across the industries at a 2-digit level to find how the level of employment has changed over time. Along with employment level, in this section we have also interpreted the mean level and the standard deviation of the structural parameters of labour demand (total output, gross value added, working capital to output ratio and plant size) over the same period of time. In section 6, we estimate the employment structure by applying fixed effect panel data regression model to find how the level of employment across different industries at a 2-digit level is influenced by the different variables considered. Finally, in section 7 we summarise the results that we have found through this analysis and conclude.

2. Literature review

There are several literatures in the field of manufacturing employment in India. The effect of economic reforms on the employment situation had been studied in the papers by Mundle (1992, 1993), Deshphande (1992), Bhattacharya and Mitra (1993), Mitra (1993), Aggarwal and Goldar (1995), Kundu (1997), as mentioned in the paper by Goldar (2000), which are more pessimistic regarding the employment growth post-reform. According to some popular study (as referred in Goldar, 2000), the main cause of 'jobless growth' was considered to be the job security regulation, 'The Industrial Dispute Act', which was revised once in 1976 and again it was made even stronger in 1982, making the enterprises less motivated to employ workers. But the acceleration in employment growth in the organized sector in the 1990s as studied by Goldar (2000) proved the above impression wrong. Whether job regulation is the main cause of stagnation in employment was the common enquiry by Papola (1994), Ghose (1994). Nagaraj (1994) and Bhalotra (1998) offer an alternate explanation for the stagnation in employment in 1980s. The two main reasons for this stagnation are considered as; (i) change in industrial composition and (ii) increase in actual hours of working. Nagaraj (1994) indicated in his study that fresh employment is restricted in the large factories so that the existing workforce could be used more intensively, thus declining the employment rate. Goldar (2000) focussed on employment growth in industries in public and private sector for 1973-74 to 1997-98, and observed a declining trend in different sub-periods in both the sectors. Agarwal (2002) analysed the employment growth by taking separately the production and non-production workers, and observed that the employment growth declined during the post-reforms period.

Although some studies (e.g. World Bank, 1989) blame wages growth for the low employment growth level, Bhalotra (1998) found the weight of the product wage to be relatively small. Even in his study, Nagaraj (1994) pointed out that deceleration in employment growth took place due to sharp rise in the wage rate in the 1980s which led the firms to substitute capital for labour. While Goldar (2000) found that, the revival of employment since 1990s was mainly due to the decline in the growth rate of real wage, which shows a significant negative sign. In his econometric model he considered the employment growth as the dependent variable and the explanatory variables he considered were growth rate of output, real wages and man days per employee. In his result he found that the coefficient of growth rate of

output and real wages were statistically significant with expected signs, positive and negative respectively, while mandays per employee was not significant.

A pre and post reform period comparison conducted by Kannan and Raveendran (2009) examined employment pattern across industry groups at NIC 2-digit level by calculating employment elasticities during the pre- and post-reform period. In the pre-reform period, 16 out of 22 industries showed positive employment elasticity, with values as high as 0.53 in Leather tanning and dressing and as low as 0.10 in Basic metals. Employment elasticity is found to be increasing in capital intensification at the cost of employment creation. Sen and Das (2014) while studying the puzzling feature of the post-reform era employment in Indian manufacturing reports that the employment elasticity decreases from 0.27 in the period from 1990-91 to 1999-00 to 0.05 in the period 2000-01 to 2009-10. Authors have also reported a decline in the labour intensity from 1.45 in 1980s to 0.33 in 2000s. The main cause of worry is that the decline has taken place in the labour intensive industries as well. While Mathur and Mishra (2007) establish the fact of the prevalence of jobless growth, Kannan and Raveendran (2009) points out that the growth in the organised manufacturing is due to rise in labour productivity and the jobless growth is not uniform throughout the period. Bhandari and Heshmati (2007), by estimating the Labour requirement function concluded that the own price labour demand become more elastic in the post reform period, which explains the growing in formalisation of the workforce. The speed of adjustment that measures the flexibility in labour recruitment is found to be marginally higher in the post-reform period than in the pre-reform period, while the labour size is close to the optimal level of labour requirement in both the periods, thus there is no problem of labour efficiency as such.

Goldar (2009) finds that employment in organised sector declined by 0.7 million between 1998-99 and 2003-04 due to trade openness. The manufacturing of basic metals, metal products and machinery and transport equipment groups have shown the largest drop in employment, due to a fall in labour intensity. An increase in export positively impacted employment, in the manufacturing of food products, beverages, tobacco products, wood, paper and printing group, chemical, refinery, rubber and plastic product group and metal products and machinery group but the net impact of trade on employment is negative. As per the study by Bhandari and Heshmati (2007), trade liberalisation requires the production cost and production structure to be adjusted. They found that many export oriented industries expanded while others, especially the heavy industries, contracted. Mehrotra et al, (2014) by analysing national sample survey unit level data of various rounds finds that in 1999-2000 and 2004-05 there had been an increase in the labour force by 61 million, but in 2004-05 to 2009-10 only two million people joined the labour force, mainly due to the demographic profile change of young population. As the labour absorption rate in the non-farm sector increased, showing large fluctuation in the labour intensive sectors like wearing apparel, textiles, furniture, non-metallic mineral products and wood products, the share of output for these sector in total manufacturing value added has remained stagnant.

The available studies, as mentioned above, mostly analysed the trend in the employment level in the manufacturing sector in the context of the economic reform in 1990s. As the reform brought about liberalization and globalization, their impacts through the introduction or

relaxation of different labour laws and opening up trade through reducing tariff barriers have been examined, for the aggregate manufacturing sector. Few studies also dealt with inter-industry changes. But there is a dearth of study analysing the pattern of employment and its determining factors by taking certain industry specific characteristics (in terms of gross value added, plant size and production technology) at NIC 2-digit industry level. This study fills the gap by looking into the variation in the distribution of employment at NIC 2-digit industry level, and considers the different industry specific heterogeneity to search for the cause of the variation in the employment level across the different industry groups, as different industry employ different number of workers. Not only number of overall workers but also variation in each type of workers (ordinary workers and supervisors and managers) has been studied.

3. Data

This study uses time series data from Annual Survey of Industries (ASI), the principal source of industrial statistics in India, from the survey year 2000-01 to 2014-15 at 2-digit NIC 2008 at the national level. The ASI reports for different years provide employment information in the form of total persons engaged and number of workers. We have calculated the number of supervisors by subtracting the number of workers from the total persons engaged. Although the figures for supervisors are provided in the ASI reports since 2008-09, to make the derived figures comparable, we follow the same method for the whole period under study. We agree that some approximation is present in the methodology used in this study. The figures obtained in this manner include some persons like working proprietors, their family members and clerical staff who are actively engaged but not directly involved in manufacturing process. But, the share of such persons to total employee is not so significant. So, the number of supervisors and managers obtained in this study by taking the difference between total persons and total workers may be the close approximation to the actual figure. If we use the average ratio from the current year report, there would be some approximation as well. This is because the ratio may not be time invariant. The proportion of supervisors to total employee in 2001 is significantly different from the proportion in 2014. Thus, in analysing employment behaviour in registered manufacturing by using long time series from ASI reports, we have to bear this kind of data limitation.

While working with the ASI data, in the present study, we find that in the report many variables are missing from the period 2000-01 to 2007-08, thus comparing the performance of manufacturing industries in terms of those variables, with recent year data is impossible. Employment type is also not segregated into male, female or regular, contractual as is done from 2008-09 onwards, which again prevents us from analysing the employment trend for these types of employment.

4. Econometric methodology

In our study we have estimated labour demand function by applying the fixed effect panel data regression model. Here, the NIC 2 digit industry groups in the manufacturing sector are treated as cross-section units and years from 2000-01 to 2014-15 are the time series dimension. The fixed effect model is selected on the basis of Hausman (1978) test. As panel

data is used to deal with heterogeneity among the cross sectional unit, here it means that each 2-digit industry group is different from one another, due to the presence of industry-specific heterogeneities which is created by a number of unobserved explanatory variables. If we leave out such variables it would cause biased estimation of unknown parameter of model. In our estimation framework, industry specific variables that have possible effects on employment level include, gross value added, plant size (measured by level of fixed capital) and the production technology (measured by the ratio of working capital to output). Omitted time series variables also influence the cross-sectional behaviour differently at each time point. Panel data can correct such omitted variable problems, as the model takes care of heterogeneity among the cross-sectional unit (Kennedy, 2008). Panel data also enhances both quantity and quality of data. It also creates more variability in the data, less collinearity among variables and more degrees of freedom. Hence, estimation of unknown parameters can be done more efficiently. The model taken in this case is of the form,

$$y_{it} = \beta_0 + x_{it}\,\beta_i + \epsilon_{it} \qquad (1)$$

$$\epsilon_{it} = \mu_i + u_{it} \qquad (2)$$

Here, y_{it} denotes the log of employment (for total persons engaged, workers and supervisors estimated separately) in industry i and time point t. x_{tj} is the vector of regressors relating to industry i in time t as mentioned above. As in the micro-economic theory, we find the output is a function of labour and capital, here we shall estimate the inverse production function by taking labour/ employment as the dependent variable and total output, gross value added, production technology (measured by capital-output ratio) and size of plant (measured by the fixed capital) as independent variables. ϵ_{it} is the disturbance term. The error term for the classical linear regression model is decomposed into two components. The component μ_i represent all unobserved factors that vary across units but are constant over time. These are the industry specific components which remain constant over the periods such as the factor intensity in the production process, availability of raw materials, requirement of labourers with special skills etc. While the component u_{it} represent all unobserved factors that vary both across unit as well as across time. These parameters are called unobserved effects and represent unobserved heterogeneity.

5. Observed facts of manufacturing employment and related variables

5.1 Changes in manufacturing employment by industry group

Before analysing the trend pattern of the employment level across different 2-digit industries over the given period of time, we simply calculate the percentage share of total persons engaged, workers and supervisors for two time points 2000-01 and 2014-15, across the 2-digit industries in order to look into the fact of the changing pattern of employment level across the industries within the organised segment of the manufacturing sector. We find that in 2000-01 manufacturing of textile employed the highest percentage of workers while in 2014-15 it came down to the 2nd position, below the manufacturing of food and beverages, employing 12.88% of workers. The fall in the share of workers employed is highest in

manufacturing of textile over the period, while manufacturing of fabricated metals is found to show the highest rise in the employment of workers. The reason for the fall in the share of workers' employment in textile industry could be many, yet we can mention the 'stiff competition', 'slowdown' and the 'discontinuation of the export incentives' which has made the textile export to fall. The export by the apparel industry has also been hit hard by the low-cost products from other countries like, Bangladesh.[5] For the supervisors, in 2000-01 the percentage share of employment was highest in the manufacturing of food and beverage (16.11%) which dropped in the year 2014-15, making the manufacturing of chemicals the highest absorber of the supervisors (15.29%) in 2014-15. Since the chemical industry demands especially skilled workers for the purpose of the production of chemicals and pharmaceuticals, a growth in this industry raises its demand for managerial staffs or non-manufacturing workers more than the manufacturing workers. Unlike in the case of employment of workers, manufacturing of fabricated metals shows the highest drop in the share of employment of supervisors, while their employment rose by highest percentage in manufacturing of motor vehicles. But from the figures it is clear that rise in level of workers is much higher than that of the level of supervisors.

Another aspect which is quite prominent, from the following table, is the transformation or shift in employment towards the heavy industries (non-agro based) from the traditionally labour-intensive agro-based industries. As we have reported the fall in the share of total persons and workers over time in the agro-based industries like manufacture of food products and beverages, manufacture of textiles, manufacture of tobacco products, manufacture of wood and wood products and manufacture of paper and paper products, there has been a rise in the labour share evident in the heavy metal and capital based industries like, manufacture of coke and refined petroleum products, manufacture of rubber and plastic products, manufacture of non-metallic mineral products, manufacture of basic metals, manufacture of fabricated metal products, manufacture of computer, electronic and optical products, manufacture of electrical equipment and manufacture of motor vehicles. Thus, as was evident from the UK economy based study by Fothergrill and Gore (2013), in India also we witness a shift in employment from the 'low-value low-productivity' manufacturing jobs towards the 'high-value low-employment jobs'. Thus manufacturing sector in order to become more knowledge based, capital intensive and competitive, has been showing such a shift in its employment structure. The more lucrative, highly productive jobs in the capital based, highly mechanised industries is attracting boththe types of workers from the traditional labour intensive agro-based industries like textile, and food products.The table for the share of employment is given below:

[5]Chakraborty, S. (2019, June 01, 23:47 IST).Textile Continue to gasp for growth with sliding production, low exports, Business Standard, retrieved from https://www.business-standard.com/article/economy-policy/textiles-continue-to-gasp-for-growth-with-sliding-production-low-exports-119060101311_1.html

Table 1: Changes in percentage share of manufacturing employment by industry groups

Industry groups	Total Person		Workers		Supervisors	
	2000-01	2014-15	2000-01	2014-15	2000-01	2014-15
Manufacture of food products and beverages	17.48	13.73	17.96	13.63	16.11	14.09
Manufacture of Tobacco products	6.34	3.39	8.00	4.16	1.49	0.68
Manufacture of Textiles	16.91	11.90	19.29	12.88	9.97	8.46
Manufacture of wearing apparel	4.34	7.65	4.98	8.39	2.50	5.05
Manufacture of Leather products and related goods	1.81	2.53	2.02	2.77	1.22	1.71
Manufacture of wood and wood products	0.65	0.66	0.66	0.65	0.63	0.73
Manufacture of paper and paper products	2.36	1.87	2.46	1.87	2.06	1.85
Printing and reproduction of recorded media	1.55	1.33	1.30	1.08	2.26	2.21
Manufacture of coke and refined petroleum products	0.89	0.95	0.83	0.89	1.07	1.15
Manufacture of chemicals and chemical products	10.49	10.24	9.57	8.82	13.17	15.29
Manufacture of rubber and plastic products	3.31	4.62	3.30	4.57	3.34	4.78
Manufacture of non-metallic mineral products	5.82	7.71	6.12	8.11	4.98	6.31
Manufacture of basic metals	7.40	7.77	7.41	7.87	7.36	7.45
Manufacture of fabricated metal products	3.87	4.86	0.39	4.79	14.05	5.11
Manufacture of computer, electronic and optical products	0.85	1.65	0.74	1.43	1.16	2.41
Manufacture of electrical equipment	3.04	3.92	2.81	3.75	3.72	4.50
Manufacture of machinery and equipment	5.60	5.51	4.89	4.73	7.67	8.25
Manufacture of motor vehicles	3.38	6.91	3.29	6.86	3.51	7.11
Manufacture of other transport	2.41	2.34	2.42	2.36	2.40	2.28
Manufacture of Furniture	1.50	0.44	1.56	0.41	1.33	0.57
all industry	100.00	100.00	100.00	100.00	100.00	100.00

Source: Authors' calculation from the ASI report, 2000-01 and 2014-15

In order to study the pattern of employment distribution in the manufacturing sector to come across the fact of how has the manufacturing sector in India played a role in employment generation, we try to observe the trend in the pattern of total persons engaged over a period of fifteen years, since 2000-01 to 2014-15. From Figure 2 (appendix), we find that the number of total persons engaged in this sector, as a whole taking all the industries together, has been increasing overtime. The employment level is found to be stagnant till 2003-04. Goldar (2009) in his paper had mentioned that the period from 1995-96 to 2003-04 is a period of 'jobless growth' as the employment trend growth rate was found to be -0.5 per cent per annum. Thereafter, it showed a rise till 2006-07 when the number of persons engaged became almost constant for the next year and then from 2008-09 it again grew up to 2011-12. In 2012-13, the number dropped slightly which again showed a rise in its level in the later period.

Now, if we break the total person engaged into its two broad components of poorly skilled manufacturing workers and supervisors and managerial staff, we see that the supervisors and managerial staff, who possess high skill and high level of human capital, has not risen much and remained almost same over the mentioned period, with a slight rise in 2006-07. Kannan and Raveendran (2009) have also found that during the period of their study (1981-82 to 2004-05) the share of managerial staffs to the total employee almost remained constant at 22 per cent to 23 per cent. After 2006-07 the growth in the employment of the supervisors, as seen from the figure 2, is very low. Thus, the rise in the total number of persons engaged is mainly due to rise in the number of workers absorbed by the firms. The number of workers shows a high growth rate from 2003-04 to 2011-12 before whichit remained stagnant. The graph of number of workers is almost parallel to that of the total number of person, thus explaining the stagnant behaviour of the number of supervisors and managerial staffs.

As our main focus is to analyse the industry specific heterogeneity in employment pattern, we investigate the nature of absorption of each type of workers by each industry at a two-digit NIC level, in the sector. First, we plot the total number of persons engaged across the different industries over the period from 2000-01 to 2014-15 (Figure 3, appendix). The manufacture of food and beverage shows the highest absorption of total persons among all the industries over the whole period as mentioned. Next, comes the manufacture of textile, where number of total persons engaged grew slowly till 2005-06, then showed a sharp spike in 2006-07 which again fell in the next year. This industry also shows a very high level of absorption of the workers among the other industries, next to food and beverage industry. The absorption of workers in manufacture of textile remains higher than the manufacture of food and beverage up to 2007-08, thereafter the absorption of workers in manufacture of textile fell below manufacture of food and beverage (Figure 4, appendix). While in the case of employment of supervisors and managerial staffs, it does not employ high number of managerial staffs. In 2006-07 we find a sudden hike in the number of supervisors, but after that it again fell back to its previous level (Figure 5, appendix). Thus, we can conclude that manufacture of textile although shows high employment level overtime, it mainly depends on the workers. In this industry, managerial staffs are not much in demand. Manufacture of food

and beverage, on the other hand, being the top employer, show high demand for both workers as well as supervisors.

In Manufacture of chemicals, the absorption of supervisors grew at a much higher rate than any other industries and became almost double in 2013-14. Thus, we can state that the chemical industry is mainly depending on the high skilled workers appointed for the white collar jobs. The absorption rate of workers is also not low here, but not as high as that of supervisors. Manufacture of tobacco, non-metallic products, machinery and equipment start from the same level of employment but among the three industries, manufacture of non-metallic products grew at a higher rate over time while manufacture of tobacco show a drop in its level of employing workers and manufacture of machinery and equipment, showing a hike in its level of employment in 2008-09, remained almost flat. Manufacture of Motor vehicles and wearing apparel, on the other hand grew to almost four times of its employment level from 2000-01 to 2014-15. Other industries show a much stagnant level with much low level of employment of total persons (figure 3, appendix).

5.2 Summary statistics of factors for employment structure

Employment structure as shown in Table 1 varies across industry groups largely because industry groups are heterogeneous in major structural parameters. In this study, we have taken ex-factory value of output, gross value added, plant size and production technology as the explanatory factors for variation of employment in manufacturing sector across industry groups. The summary statistics of these factors are displayed in Table 2a and Table 2b. It is observed that the mean values of total output and gross value added are the lowest for the manufacture of wood and wood products, while manufacture of coke and refined petroleum products shows the highest average total output over the period and the mean value of gross value added over the period is highest for the chemical industry. However, the manufacture of wood and wood products does not show much fluctuation in its output and gross value added over the period. The manufacture of coke and chemical industry show the highest standard deviation for output and gross value added respectively along with their highest mean value, which means that the industry shows wide variation in the values over time. The most significant trend in the level of total output is shown by the manufacture of coke. It increased from Rs. 78,564.62 crores in 2009-10 to Rs. 11,14,471.33 crores in 2013-14. Manufacturing of basic metals, on the other hand, exhibits the highest level of fixed capital on average along with highest fluctuations as shown by standard deviation, while manufacturing of wood and wood product shows the lowest level of fixed capital on an average and manufacture of furniture shows the least deviation over time.

Table 2a: Summary statistics of determinants of labour demand (Output and GVA)[6]

Industry groups	Output (Rs. crores)		GVA (Rs. crores)	
	Mean	s.d	Mean	s.d
Manufacture of Food and beverages	393285	272022.1	44182	27014.58
Manufacture of Tobacco Products	19204	9846.26	7434	3631.89
Manufacture of Textiles	181738	105523.9	31140	16322.49
Manufacture of wearing apparel	47146	35593.21	10281	7471.57
Manufacture of Leather and related products	22906	14328.53	3762	2616.8
Manufacture of Wood and products of wood	8806	6953.92	1265	1041.31
Manufacture of paper and paper products	39570	25643.72	7324	3903.92
Printing and reproduction of recorded media	20035	10602.49	5626	2837.53
Manufacture of coke and refined petroleum products	456651	373274.1	57944	43710.47
Manufacture of chemicals and chemical products	355946	223463	84605	49595.75
Manufacture of rubber and plastics products	97603	72827.27	18404	13701.48
Manufacture of non-metallic mineral products	98324	69017.21	29158	19124.38
Manufacture of basic metals	401059	288629.6	69102	41045.12
Manufacture of fabricated metal products	85297	62765.88	17838	13243.46
Manufacture of computer, electrical and optical products	49211	50419.15	19802	2017.51
Manufacture of electrical equipment	109301	80339.87	21239	14132.67
Manufacture of machinery & equipment	134143	86769.49	32059	21454.15
Manufacture of motor vehicles, trailers and semi-trailers	188722	147108.5	33196	24895.84
Manufacture of other transport	68288	45674.06	13855	8584.91
Manufacture of Furniture	22350	16232.55	3220	1556.11

Source: Authors' calculation from the ASI report, 2000-01 and 2014-15

Manufacture of basic metal in this case has shown a phenomenal growth in its fixed capital investment since 2004-05, before which the growth rate was very low. In 2011-12 the growth rate became almost zero which again geared up from the next period. The next industry that needs to be mentioned is the chemical industry. This also shows a rise in growth in 2004-05 but not as phenomenal as the manufacture of Basic metals, thus, by 2007-08 we find a wide gap arising between the two industries. In case of production technology measured by the ratio of working capital to total output, the average over the period is highest in manufacture of furniture while manufacture of coke shows the least mean value, due to its very high level

[6] In the tables 2a and 2b, the mean calculated, is the simple arithmetic mean. The formula is given as, $\bar{x} = \frac{1}{n}\sum_1^n x_i$.
And the standard deviation is calculated by,
s.d = $\sqrt{\frac{1}{n}\sum_1^n (x_i - \bar{x})^2}$.

of output over time. The manufacturing of furniture finds prominence here. The value remained same from 2000-01 to 2002-03 then it fell till 2005-06 which increased slightly but again dropped up to 2010-11 thereafter it showed extreme fluctuation and in 2013-14 it shows a sudden high spike which again dropped in the next period. Manufacture of computers and electronics shows a rise in the value of capital-output ratio since 2004-05 to 2007-08 then it fell and again jumped high in 2009-10 showing highest value among the industries. Now, manufacture of coke, which showed an extremely high level of output growth, is as obvious, found to show a decline trend in the capital-output ratio. The decline is smooth since 2010-11 and it became negative in 2013-14.

Table 2b: Summary statistics of determinants of labour demand (Fixed Capital and Working Capital per Output)

Industry groups	Fixed Capital (Rs. crores)		Working Capital-Output ratio	
	Mean	s.d	Mean	s.d
Manufacture of Food and beverages	81024	55556.32	0.086	0.015
Manufacture of Tobacco Products	2718	1613	0.151	0.036
Manufacture of Textiles	80555	44418.65	0.095	0.029
Manufacture of wearing apparel	10065	7334.45	0.171	0.039
Manufacture of Leather and related products	4315	2557.44	0.139	0.051
Manufacture of Wood and products of wood	2371	1785.31	0.169	0.019
Manufacture of paper and paper products	24212	13612.71	0.109	0.027
Printing and reproduction of recorded media	8435	4660.94	0.127	0.086
Manufacture of coke and refined petroleum products	96870	66298.19	0.049	0.037
Manufacture of chemicals and chemical products	138514	63487.51	0.14	0.024
Manufacture of rubber and plastics products	32639	22178.33	0.131	0.018
Manufacture of non-metallic mineral products	76196	56108.63	0.128	0.084
Manufacture of basic metals	229043	182149.6	0.103	0.047
Manufacture of fabricated metal products	22997	18453.96	0.15	0.022
Manufacture of computer, electrical and optical products	11537	12054.57	0.209	0.046
Manufacture of electrical equipment	22627	15908.48	0.181	0.026
Manufacture of machinery & equipment	32373	21685.51	0.168	0.022

Manufacture of motor vehicles, trailers and semi-trailers	60338	46992.81	0.045	0.048
Manufacture of other transport	16671	13131.76	0.061	0.041
Manufacture of Furniture	3186	1335.68	0.236	0.133

Source: Authors' calculation from the ASI report, 2000-01 and 2014-15

6. Analysis of employment structure

In analysing the employment pattern across industry groups as discussed in section 5, we have estimated a panel regression model by taking level of employment as a dependant variable, and gross value added, production technology (measured by capital-output ratio) and plant size (measured by Fixed capital) are taken as the explanatory variables for explaining the employment level of different types of workers by applying one way error component fixed effect model. The basic advantage of panel regression is that it can capture unobserved heterogeneity across industry groups. The regression model described in equations (1) and (2) can be written in its decomposed form as,

$$ln(L_{it}) = \beta_0 + \mu_i + \beta_1 ln(GVA_{it}) + \beta_2 ln(Plant_{it}) + \beta_3 ln(Tech_{it}) + u_{it} \qquad (3)$$

Here, the dependent variable L_{it} representing labour employment (both workers and supervisors) in i^{th} industry group at t^{th} time with explanatory variables GVA_{it} the gross value added in i^{th} industry group at t^{th} time, $Plant_{it}$ the plant size measured in terms of fixed capital in i^{th} industry group at t^{th} time and $Tech_{it}$ the production technology measured in terms of ratio of working capital to total output in i^{th} industry group at t^{th} time. β_0 is the intercept term, μ_i and u_{it} are already explained in section 4.

The estimated results are given in Table 3. The values of F-statistics, R^2 that are used to test the overall significance of the estimated model, the joint test by using F-statistic suggests that the estimated model is highly significant for all types of workers. The value of σ_μ, σ_u and ρ suggests the presence of unobserved heterogeneity among the industries, as we have already got a glimpse of it in the previous sections while computing and explaining the summary statistics of the chosen structural parameters across the 2-digit industries. Thus the panel data regression analysis has taken care of the industry specific heterogeneity, which would otherwise give an inefficient estimator when estimated through OLS method.

Table 3: Estimated coefficients of labour demand function

Regression Coefficient		
Explanatory variables	**Workers**	**Supervisors**
Intercept	8.54***	7.94***
GVA	0.06*	-0.04
Tech	-0.41*	-0.09
Plant	0.34***	0.38***
Number of Observation	340	340
σ_μ	0.74	0.63
σ_u	0.18	0.19
P	0.94	0.91
F(k, n-k)	257.35	160.66
Prob>F	0.00	0.00
R^2	0.40	0.57

Note: *** is 1 percent level of significance, ** is 5 percent level of significance, * is the 10 percent level of significance

Source: Authors' estimation by using ASI data

By estimating the fixed effect panel data regression model, in order to find the relation between the related variables mentioned and the level of employment of each types, we find that the manufacturing workers are more significantly determined by the chosen explanatory variables while the managerial staffs are rather having insignificant coefficients. For manufacturing workers the coefficient of gross value added is positive and significant at 10 percent level, thus the increase in value addition created by the labourers is in favour of them and more significantly it creates employment for the workers, while for the supervisors it has a negative effect although not statistically significant, which means value addition in the industry actually has no impact, neither positive nor negative, on the level of employment of the managerial staffs. The production technology, measured by the ratio of working capital to ex-factory output has negative coefficient for all types of employment but significant at 10 percent level for workers only. Thus, we can say that if the working capital required per unit output rises, i.e., the technique of production becomes more capital intensive or more technology based it significantly reduces the demand for the manufacturing workers while for supervisors the reduction is not statistically significant. Thus we can claim on this basis that the demand for the managerial staffs is not actually affected by the capital intensity and the value added created. There must be other industry specific factor that has an impact on the employment of the supervisors. The plant size, measured in terms of level of fixed capital, is positively significant at 1 percent level for all types of employment, explaining the fact that as the size of industry increases in terms of its fixed capitals more workers as well as supervisors and managerial staffs are employed. A recent paper by Sharma (2018)[7]working on the effect of industry level FDI has also concluded in her study that "larger plants

[7]See Sharma. (2018)

experience a differential increase in total employment as well as average wage paid out to both skilled and unskilled workers relative to average-sized a small plants". Thus, expansion in the industry can have a positive impact on the employment generation of both the types of workers.

7. Conclusion:

The paper revolves around the objective to analyse the pattern of the employment of both the types of workers, manufacturing as well as the non-manufacturing, across the 2-digit industries of the organised segment of the manufacturing sector in India and also focuses on to locate the factors that influence the labour demand by each industry. Although several studies have claimed that manufacturing has never been 'the engine of growth', at least in India, here we have re-examined the issue by extending the data up to 2014-15 and by taking different types of employment. We mainly studied the pattern of employment within the manufacturing sector across the industries, at 2-digit NIC (2008) levels and analysed the change in this pattern over one and a half decade from 2000-01 to 2014-15 using Annual report data of ASI. The major labour absorbing industries are found to be the manufacturing of food products, manufacture of textile, manufacture of wearing apparel, manufacture of basic metals, manufacture of non-metallic mineral products and manufacture of motor vehicles. These six industries have been studied in detail. In both food industry and textile industry the share of workers and supervisors fell in the final period (2014-15) than the initial period (2000-01), still these industries remained the two largest labour absorbing ones, leading to employment generation in the economy. This is because, these mentioned industries are labour intensive and the products produced need significant human labour involvement. The fall in the share workers employed is highest in manufacturing of textile over the period. We have already mentioned that the 'stiff competition', 'slowdown' and the 'discontinuation of the export incentives' creating poor export performance of the textile industry in India must have been a cause for such drop in the workers' share. From the summary statistics of the chosen variables, total output, gross value added, production technology (measured by capital-output ratio) and plant size (measured by Fixed capital), we reported the mean value and the standard deviation. It shows the heterogeneity in performance of the difference 2-digit level industries over the time period chosen. Manufacturing of coke and manufacturing of chemical show highest average level of total output and gross value added respectively along with highest level of dispersion, thus proving the prevalence of a wide range of fluctuation in the industries while the worst performance, in terms of both the variables, is shown by the manufacturing of wood and wood products along with the least variation over the period. Manufacturing of Basic metal on the other hand shows the highest mean value of fixed capital but with high fluctuation in its value. In case of production technology measured by the ratio of working capital to total output, the average level, over the period is the highest in manufacturing of furniture while manufacture of coke shows the least mean value, due to its very high level of output over time. Hence we come across the industry specific heterogeneity which we explain by using the summary statistics of some industry specific structural parameters (total output, gross value added, plant size and production technology). It shows the overall fluctuation found in a particular firm and also

the overall position of the particular industry on the basis of the overtime mean value, which shows how the industry performed over the period, on an average. This also explains the heterogeneous behaviour of the industries. Since our main focus is the demand side of the labour, we have estimated the inverse production function.

The estimation of the fixed effect panel data regression model, in order to find the relation between the related variables mentioned and the level of employment of each type, shows that employment of workers are more significantly related to the structural parameters, while supervisors are not except for the plant size, which is employment generating in nature for both workers and supervisors. Since, supervisors are not involved directly into the manufacturing/ production process they are not much affected by other parameters chosen for explaining the variation in employment. Gross value added, and plant size are significantly employment generating in nature while the production technology measured by the working capital per output ratio is found to be labour displacing. Thus, if firms are allowed to expand in their size, it increases the demand for both types of workers, manufacturing and non-manufacturing.

Thus, to wrap up the story, through these estimation and through the discussion regarding the industries demanding labour we find that there is a strong impact of the industry specific heterogeneity. A highly mechanised large firm might employ lesser workers than a labour intensive micro unit. Thus, besides the scale effect, it is more important to deal with the industry specific factors that influence the labour demand. Also, we note here, as claimed in previous literatures, firms are to be allowed to expand organically in absence of the strict labour laws prevailing, which ultimately end up contractualizing employment. Thus, in order to generate employment in India, focus has to be made on those major labour absorbing industry groups and is also needed to be allowed to expand. To exploit the potential of the sector, the Government of India has already introduced the *make in India programme*. The study can be further extended in several arenas. We can consider several other industry specific characteristics, which can explain the structure of absorption of non-manufacturing workers better. As we have already come across in the literature that the concentration of employment in unorganized part of the sector, incorporating this part of the sector along with the organized part would further develop the study. A state level analysis can also be done to capture the state specific characteristics that also significantly play role in employment generation.

Acknowledgement
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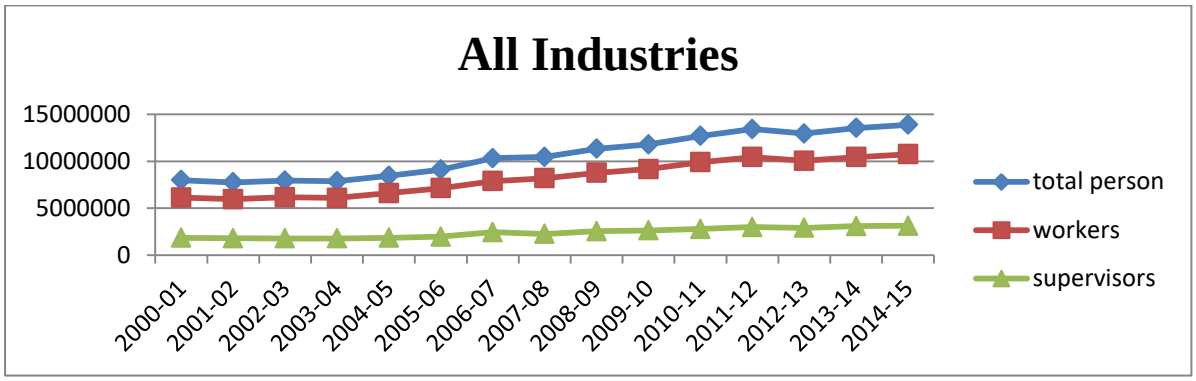
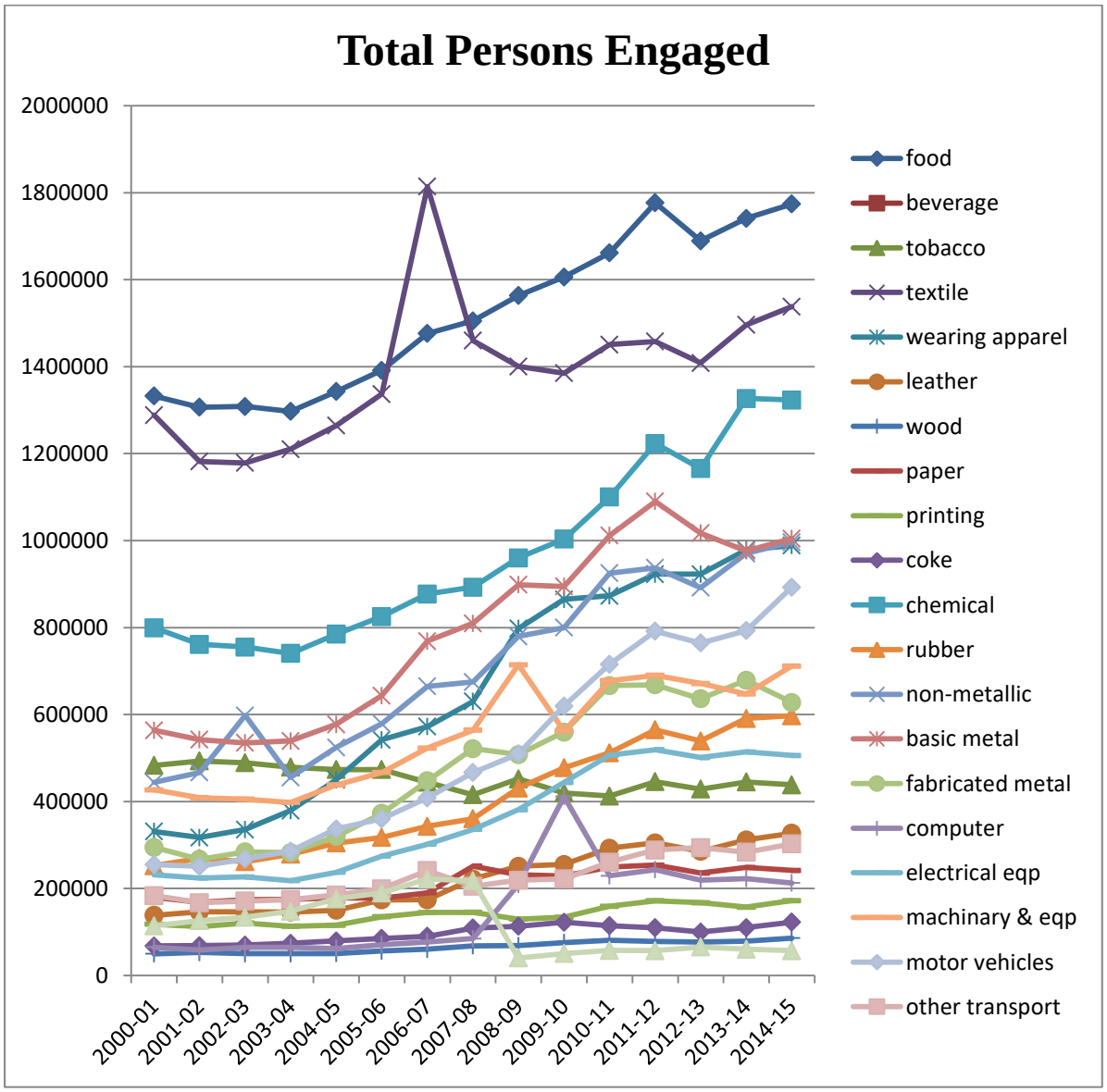
Appendix:

Figure 2:



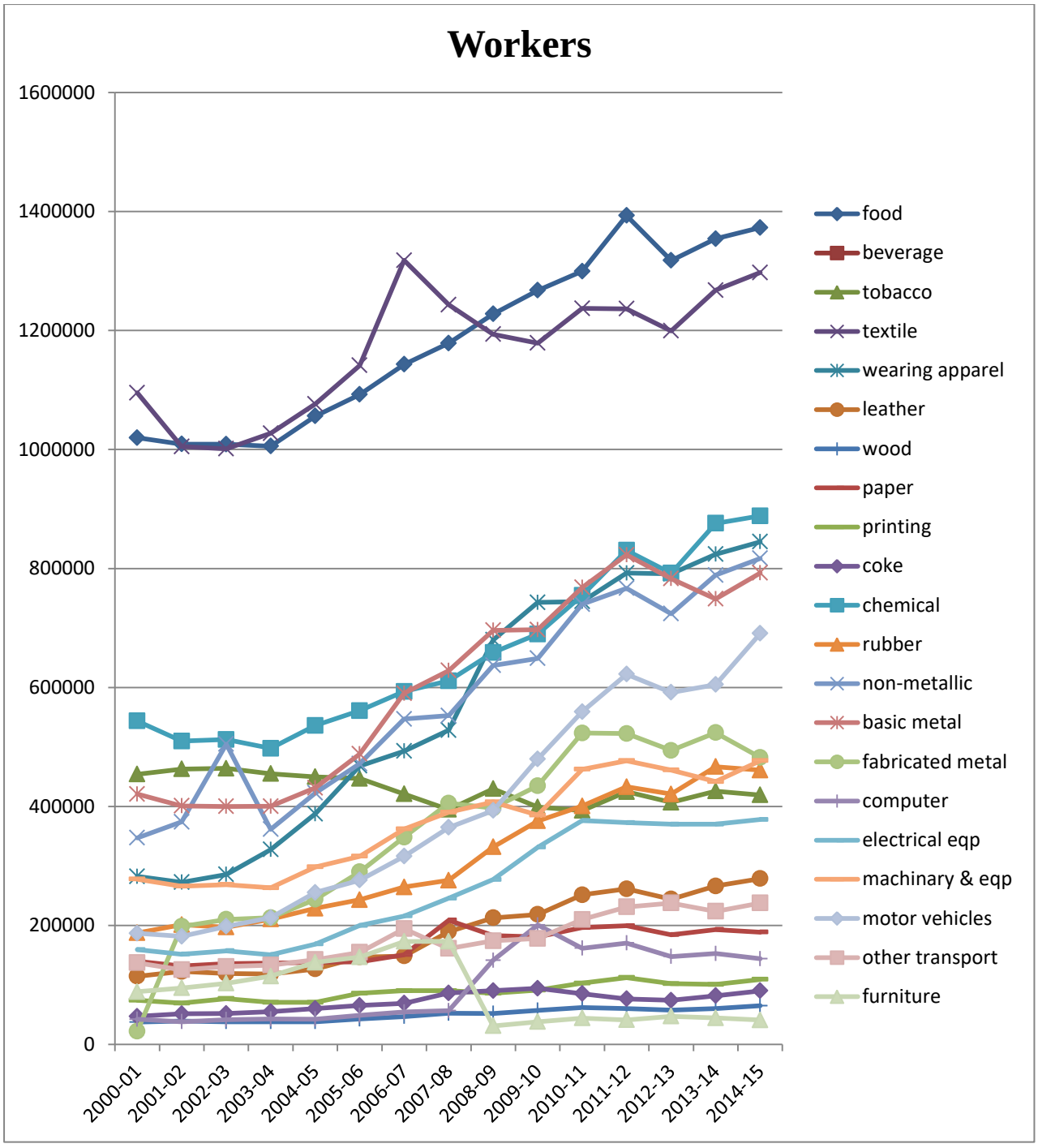
Source: Authors' estimation by using ASI data

Figure 3:



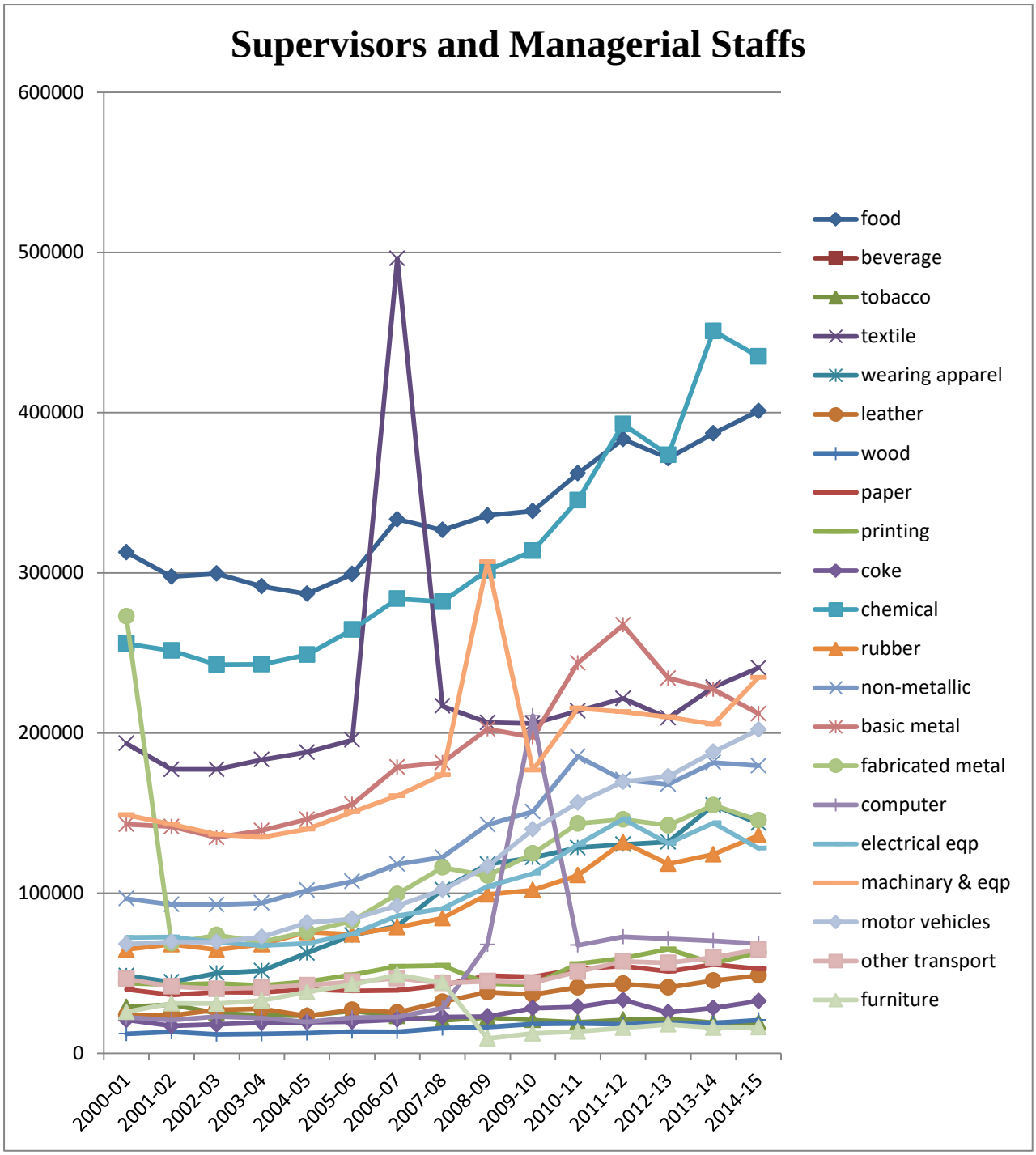
Source: Authors' estimation by using ASI data

Figure 4:



Source: Authors' estimation by using ASI data

Figure 5:



Source: Authors' estimation by using ASI data

Productivity Dispersion and Firm size: An inquiry with Indian Manufacturing firms

Debarati Chatterjee (Ray)

Abstract

This study focuses on the prevalence of productivity differential among firms with different scales of production across manufacturing industries in India. We hypothesise that manufacturing firms are heterogeneous in technology and their structure, even within a narrowly defined sector, but they are expected to be homogeneous within a particular firm size. To analyse the existence of productivity dispersion across different firm sizes for the manufacturing sector, this study uses factory level data from the Annual Survey of Industries (ASI), the primary data source for registered manufacturing in India, for the period 2009-2012. We have grouped the factory units of similar industries by their firm size into four categories (micro, small, medium and large) at the 2 digit level of NIC (2008) by following the definitions provided in MSME Act 2006. The study found that the productivity dispersion is a deeply rooted problem as Total factor productivity (TFP) of the firms is not only widespread within an industry but even within a firm size of a specific industry.

Key Words: Productivity differential, Indian Manufacturing Sector, Annual Survey of Industries, MSME Act 2006, Levinsohn and Petrin.
JEL Codes: L60, L25;

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1. Introduction

The slow rate of technological progress in the manufacturing sectors, perhaps, is one of the major indicators of economic backwardness in India. The low level of total factor productivity (TFP) coupled with productivity differential among firms presents the real deterrence of achieving desired performance for the manufacturing sector. Productivity differential persists not only between industry groups but also between firms within a particular industry. In India, the predominance of smaller firm sizes (Coad and Tamvada, 2012), is considered traditionally as one of the reasons for low productivity in the manufacturing sector. However, the technical efficiency of small firms may be higher as a result of their being exposed to more competition than larger firms. On the contrary, many researchers argued that larger firms are more efficient than smaller ones. Jovanovic (1982) concluded that the higher efficiency of larger firms is the result of a selection process where efficient firms grow and survive, while inefficient firms stagnate or exit the industry.

There are many studies on the prevalence of productivity dispersion within a narrowly defined industry (Bartelsman and Doms 2000, Ito and Lechevalier 2009, Martin 2008, Orr 2018). The persistence of productivity differential indicates that technology or knowledge is not being diffused across different firms coexisting in the same sector. Bailey, Hulten and Campbell (1992) showed that productivity level in an industry may change because of the changes in market shares of firms with different productivity levels, even when the individual firms' productivity level remains unchanged. Most of the studies on productivity differential at firm level focused on technological explanations, such as R and D expenditure, as a reason for these differences, but Syverson (2004) argued by proposing that demand-side features also play a role in creating the observed productivity variation. He argued that in a relatively dense clustered and therefore competitive market consumers can switch between producers more easily and as a result, relatively inefficient producers find it more difficult to operate profitably. As inefficient firms leave, the minimum level of productivity as well as the average level of productivity increases and thus resulting in the changes in the productivity distribution of that sector. The degree of competition in a particular sector has a greater implication on productivity dispersion.

Most of these studies on productivity dispersion, both on the Indian economy and other economies, treat firms within the manufacturing sector as homogeneous one. But a closer look reveals the significant heterogeneity even within an industry group. The same products are being produced by firms of different sizes using related but different technologies which ultimately affect the TFP dispersion within a sector. Thus, each scale of production of the same industry shows a unique set of industrial dynamics within itself. Given this argument, one may expect a certain amount of homogeneity within a particular firm size of a sector. As pointed out by Schumpeter (1942), a firm enters a market with new technology and competes with incumbents that use conventional technology. If the new innovator firm can cope with the competition, the entrants will be able to replace the incumbents. If not, they will fail to survive and exit from the market. In the process of creative destruction, only successful firms can survive in the market, and resources are transferred from less productive firms to more productive firms. Thus, segregation by turnover of the firms is also expected to facilitate a

certain amount of uniformity among existing firms within a narrowly defined sector with respect to TFP. Following this argument for a segregated industrial sector one may expect a fairly homogeneous distribution of TFP within a firm size.

In India, a large number of studies have been carried out to understand the changes and attributes of productivity, more specifically manufacturing productivity. But a very few studies look into the productivity differential even within a particular industry group by taking into account the scale of production or firm size. The objective of this study is to examine the prevalence dispersion of TFP for firms of different sizes in an industry in the Indian manufacturing sector. High level of productivity dispersion within a narrowly defined sector is a sign that knowledge or technology is not being diffused across different firms' co-existing and competing in a relatively same environment.

2. Firm size and manufacturing sector: The case of India

Given the relatively small size of many manufacturing firms, India is reaping far smaller gains from scale economies than many other countries (Dougherty, et.al, 2009). But many researchers advocated promotions of small scale industries, mainly from the equality and welfare aspects. It is argued that small scale industries could counter the unemployment problems as they are expected to use more labour intensive techniques. Apart from addressing the unemployment issue small-firms are also expected to reduce unequal income distribution and thus resulting in more efficient resource allocation. But some studies also found that larger firms experience learning-by-doing effects which make these firms more efficient as a result of their growing stock of experience (Malerba, 1992).

Again in India, the definition of Small Scale units (SSI) has undergone multiple changes over time. In 1955 for the first time the official criterion has been set to identify the SSI – units having an investment of Rs. 5 lakh and employing less than 50 persons when not using power. Over the years this investment limits as well as employment and energy usage criteria has changed and finally in 2006, the Government of India introduced a comprehensive Act (MSME Act, 2006)[1] to set the limits for different sizes of units.

3. The data and construction of variables

To study the existence of productivity dispersion across different sizes of firms for the Indian manufacturing sector, we have taken firm level data provided by the Central Statistics Office (CSO) in the form of Annual Survey of Industries (ASI) for the period 2009-2012. Using the firm level panel data, we have calculated total factor productivity for each firm by taking real Gross Value Added (GVA) of the factory unit. Although the double deflation method is a more accurate one, for this study real GVA has been calculated following single deflation method as input details, required to apply double inflation method are not provided in the ASI data for all years.

[1] See Appendix for details.

The firm-level data set includes descriptive data and firm-specific characteristics, such as state, the output produced, input usage, number of workers and industry. The dataset only considers the period between 2009 and 2012 the period starts immediately after the beginning of the financial and economic crisis of 2008. For the present study, the cleaning of data was an important step as improper data set could impact the result of the model significantly. Apart from considering all working firms, we pursue some specific data cleaning to exclude outliers and firms whose values of several variables were not correctly plotted. To construct the data for empirical analysis we took up few cleansing methods. In the first step, we considered only working units followed by plotting each relevant variable to identify outliers for each firm sizes separately. We have also omitted observations for which valid information were missing related to relevant variables.

Although firms with less than 10 employees are not required to register in India still around 16 per cent to 20 per cent of the registered firms in the ASI dataset for different years are found to have less than equal to 10 employees (Bedi and Banerjee, 2007). For this study, we excluded firms that are reported to be closed, but retained firms in that have fewer than 10 employees. The ASI provides multipliers for each firm, which are derived as inverse of sampling probability. We estimated aggregates and averages of numbers of firms and GVA for industry-groups by weighting firm-level observations by the multipliers.

To look into the disparity among firms producing similar products we have grouped the firms following the classification of NIC 2-digit classification (2008). By using the concordance table provided by the CSO we matched industries at NIC 3-digit classification for other years. Once we classify industries as per NIC 2-digit of 2008, we grouped firms of similar industries according to firm size. Four sizes of firms have been considered following MSME Act 2006 - micro, small, medium and large firms. The argument for grouping similar firms, according to firm size is based on the fact that the technology used by similar firms largely depends on the firm size of the operation. A small size firm follows a set of technology, which differs from the set of technology used by a large firm, producing similar or related products. Again the legal, financial and other related environments for carrying out production process is widely different for firms of different firm sizes in India (Singh and Wasdani 2016; Beck, Kunt and Maksimovic 2005; Hasan and Jandoc 2010). Therefore, it seems logical and necessary to categorise the firms, according to firm sizes to get a true insight into the existence of productivity dispersion among Indian manufacturing industries.

4. Measurement of productivity

To calculate the total factor productivity (TFP) at the firm-level and for each of the considered years we have relied on the Levpet algorithm (LP) introduced by Levinsohn and Petrin (2003)[2]. The production technology assumed by LP method is based on the Cobb-Douglas Production Function. Following the OLS method, the estimation of coefficients of

[2] Many alternative techniques are there in the available works of literature. Within-group fixed effects (WG), Least squares models, GMM system model (Blundell and Bond, 1998); frontier models and semi-parametric models like Olley and Pakes (1996) are also broadly used.

labour and capital implicitly assume exogenous input choices while input choices could be endogenous also and therefore the estimation of coefficients using OLS may lead to biased parameter estimates. Thus we employ the LP methodology which corrects for the potential simultaneity bias that generates from such time-varying unobservable. The choice of LP algorithm over Olley and Pakes (1996) to estimate TFP is that the ASI data does not provide information on investment accurate enough to be considered a proxy for unobserved productivity. To prepare the dataset we choose to keep all the viable firms instead of creating a balanced panel because Levinsohn and Petrin (2003) did not focus on selection issue as Olley and Pakes (1996) show little difference on the TFP estimates between unbalanced and balanced panels. Van Beveren (2007) too, argues that using an unbalanced panel avoids the problem of selection bias.

The Levpet algorithm (LP) developed in Levinsohn and Petrin (2003) is used to calculate total factor productivity (TFP) at the firm-level. In the LP method, production technology follows the Cobb-Douglus production function:

$$Y_{it} = A_{it} K_{it}^{\beta_K} L_{it}^{\beta_L} M_{it}^{\beta_M} \qquad (1)$$

Where Y_{it}= physical output of the ith firm in period t.

K_{it}= capital input measured by total fixed assets of firm i in period t.

L_{it}= labour input measured by manufacturing man days

M_{it}= material and energy used as input.

A_{it}= Hicks neutral production technology

Taking log of equation (1) we get

$$y_{it} = \beta_0 + \beta_K k_{it} + \beta_L l_{it} + \beta_M m_{it} + \varepsilon_{it} \qquad (2)$$

Here $log(A_{it}) = \beta_0 + \varepsilon_{it}$, where β_0 means productivity irrespective of inputs used and ε_{it} is the random error measuring deviation from that mean.

The error term is decomposed into two parts:

$$\varepsilon_{it} = \omega_{it} + \gamma_{it} \qquad (3)$$

Here, ω_{it} represents transmitted productivity component which is related to a firm's input choice decision, whereas γ_{it} is independent of input use. Now, given this statement regarding ω_{it}, it seems leading to the simultaneity problem. Thus ignoring the correlation between inputs and this ω_{it} will give inconsistent results. To overcome this problem the LP model assumes an intermediate input demand function, i.e.

$$M_{it} = M_{it}(\omega_{it}, K_{it}) \qquad (4)$$

which is monotonically increasing in ω_{it}, thus allowing inversion of intermediate demand function. Hence we can write –

$$\omega_{it} = \omega_t(M_{it}, K_{it}) \qquad (5)$$

Therefore unobservable productivity ω_{it} is now solely determined by two sets of observed inputs $M_t and\ K_t$. Following the identification problem as mentioned by Olley and Pakes (1996), LP also assumed that productivity is governed by a first order Markov process-

$$\omega_t = E[\omega_t/\omega_{t-1}] + \xi_t \qquad (6)$$

Where ξ_t is an innovation to productivity that is uncorrelated to K_t but not necessarily with L_t. In this study, total factor productivity (TFP) has been used to ascertain the performance of the manufacturing sector of different unit sizes[3].

5. Some stylized facts

Indian manufacturing industries have been dominated by micro units (Table 1). But, the share of micro units declined while the shares of small, medium and large scale units showed a rising trend during the period 2009-2012. The share of large scale units increased at a higher rate than the shares of medium and small scale units during this period. The micro sector is more volatile in nature as long as entry and exit of firms are concerned. Apart from frequent entry and exit, the micro sector firms are also susceptible to temporary closure due to various reasons. These characteristics of the micro sector could be the possible reasons for showing an unclear trend in the numbers of functioning firms for the period under considerations.

Table 1: Percentage distribution of number of different size-categories of firms.

Year	Share of manufacturing units			
	Micro	**Small**	**Medium**	**Large**
2009-10	57.54	32.33	3.83	6.30
2010-11	55.19	33.90	3.86	7.05
2011-12	53.52	34.88	4.11	7.50
2012-13	50.97	36.25	4.60	8.17

Source: Author's calculation with ASI unit level data for 2009, 2010, 2011, 2012.

Table (2) shows the average gross value added, manufacturing mandays and total fixed capital by different sized firms between 2009 and 2012. Real gross value series was constructed by deflating the nominal data series by wholesale price index (WPIs) which is obtained from the Office of the Economic Adviser (OEA), the Ministry of Commerce & Industry of India. Real fixed capital is constructed by deflating gross fixed assets by WPI for machine and machinery tools. Apart from Micro units, all three firm sizes show a dip in the GVA particularly after 2010 and the more consistently in total mandays all through the period. On the contrary, we find a rising level of fixed capital for all the four size-categories of firms in the same period. We observe a sharp decline in the average gross value added by the medium as well as large scale units from 2011 to 2012. At the same time, average mandays worked per unit for these two categories have also declined considerably. But for the same period, we have noticed an increase in the average GVA per unit for micro industries and also a marginal increase in the average mandays for the same. The average

[3] Here 'unit' size is defined following the MSME Act 2006.

fixed capital per unit increased significantly for micro units as well as for medium scale units between 2010 and 2011. The average level of fixed capital has increased for all the four size-categories of the manufacturing industries but for micro units, this witnessed an increase of more than 50 per cent, whereas for large scale units the increment stood at around 20 per cent for the same period. The increase in the average level of fixed capital is the lowest, around 2.5 per cent of the medium scale industries whereas for small scale industries it is 9 per cent during the period between 2009 and 2012.

Table 2: Changes of average GVA, mandays and fixed Capital for different size categories of firms (2009-2012).

Firm size	Year	GVA*	Mandays#	Fixed capital@
Micro	2009-10	36.44	8.00	13.05
	2010-11	37.90	7.52	13.26
	2011-12	40.84	6.99	20.45
	2012-13	42.90	7.20	20.63
Small	2009-10	234	19.47	188
	2010-11	239	19.63	190
	2011-12	236	18.00	201
	2012-13	233	17.00	206
Medium	2009-10	774	51.89	936
	2010-11	860	52.58	911
	2011-12	822	49.01	953
	2012-13	756	45.84	960
Large	2009-10	5680	172.08	11200
	2010-11	5660	164.28	12300
	2011-12	5620	158.79	12500
	2012-13	5160	147.06	13500

Note: *GVA is measured in Rs. Lakh # total mandays are measured in thousands. @ Fixed capital is measured in value (Rs. Lakh). All values are calculated in real term (in 2004-05 prices in two digits following NIC-08)
Source: As for Table 1

Table 3 presents the changes in structural ratios like labour productivity, capital output ratio and outstanding loan to asset ratio. We define labour productivity as GVA per unit mandays and the following table shows that labour productivity in Indian manufacturing increases between 2009 and 2012 as we move on to higher firm sizes. The contribution of labour measured in terms of labour productivity exhibits a rising trend irrespective of firm sizes. The movement of capital intensity, measured by fixed capital per mandays, shows a similar pattern as that of labour productivity across firm sizes over time. Another interesting factor to look at is the loan-asset ratio, which is the ratio of the outstanding loan to total fixed capital of different size-categories of firms. This particular ratio is highest for the micro units, although it is found to be declining steadily over the period under consideration for almost all the four size-categories of industries. But most importantly the loan-asset ratio is declining with the unit size itself with the figure standing at less than one for two larger scales of industries.

Table 3: Labour productivity, capital intensity and loan asset ratio for four different size-categories of firms (2009-2012).

Firm size	Year	Labour productivity (Rs.)	Capital Intensity (Rs.)	Loan-asset ratio
Micro	2009-10	597.35	297.84	657.40
	2010-11	637.17	369.89	765.81
	2011-12	707.84	461.20	478.41
	2012-13	726.28	590.91	487.57
Small	2009-10	1493.77	1882.32	1.30
	2010-11	1591.58	2133.80	1.36
	2011-12	1637.87	2253.16	1.36
	2012-13	1721.51	2472.47	1.47
Medium	2009-10	2016.34	4021.11	0.83
	2010-11	2242.00	5783.91	0.83
	2011-12	2499.09	6515.31	0.78
	2012-13	2434.38	6496.23	0.75
Large	2009-10	2985.14	9777.94	0.67
	2010-11	3204.47	8735.30	0.63
	2011-12	3238.13	10693.68	0.70
	2012-13	3108.65	12703.59	0.65

Source: As for Table 1

6. Empirical findings

The Partial factor productivity approach fails to capture the contribution of other inputs in the production process. A rapid growth in partial factor productivity could be due to a significant increase in the other inputs or factors (Diewart and Nakamura 2003). Therefore, the understanding of the differences in the inherent structure of four different firm sizes of Indian manufacturing could remain incomplete without discussing TFP separately for all the four size-categories. The TFP not only gives an insight into the impact of technical progress but also of the enhanced skill of existing labour, learning-by-doing and better utilization of existing capacity (Ahluwalia 1991).

In this study, we have estimated TFP using a production function approach following the LP method of estimation for different sized firms for Indian registered manufacturing sector for a panel data for four years (2009-2012). The production function analysis also provides estimates of the output elasticity of labour and capital. Table 4 shows that the estimated elasticity of labour and capital is significantly different from zero for all the four size-categories of firms.

The estimated production function shows that the elasticity of labour is significantly higher than the elasticity of capital for micro and small scale industries. But, for medium and large scale, elasticity of capital becomes higher than that of labour. This result implies the higher role of labour in the lower firm sizes. The role of capital is more important than the role of

labour for medium scale industries as well as large scale units. This is, however, corroborated by the previous finding of lower capital intensity in lower firm sizes.

Table 4: Output elasticity of labour and capital

Firm size	Labour	Capital
Micro	.71 (.010)	.20 (.014)
Small	.55 (.011)	.33 (.019)
Medium	.45 (.027)	.55 (.067)
Large	.44 (.026)	.47 (.041)

Note: All values are statistically significant at 5% level. Figures in the parenthesis are standard errors.
Source: As for Table 1

In the next step of LP method we estimated the productivity (ω) for 23 two digit industries separately for four different firm sizes. Table 5 shows the variation in estimated productivity achieved by four different firm sizes for 23, 2-digit industries (NIC-08) by firm sizes. The table depicts the deviation from 'industry average productivity' for each size of firms calculated by the percentage of 'industry average productivity' attained by the particular size. Therefore, the corresponding value of less than 100 indicates that the particular firm size is attaining less TFP than the industry average and vice versa. For example, in Table 5, for 'Manufacturing of Textile' industry Micro and Large units have attained more than the industry average, which is 167.6% and 192.2% respectively, whereas Small and Medium units have attained only 29.2% and 10.8% respectively. This implies that for 'Manufacturing of Textile' both Large and Micro units are more productive than Small and Medium sizes, with Medium units being the worst performer in terms of productivity. Following the same explanation we find that there exists a significant difference in the productivity of the same product produced in different firm sizes. Smaller firms seem to attain higher productivity mainly in the traditional sectors such as food, beverages, leather, wood, and paper products. The mean productivity is around 172 percentage of the average productivity of the sector for small scale units for manufacturing of furniture also. For rubber and related products this figure stands around average industry productivity for small scale units. Mean productivity of Micro units too are in or around the industry average for traditional sectors like tobacco, textiles, leather, wood and paper. The mean productivity for both Micro and small scale units are much less than the industry average for most of the modern sectors. Medium scale units seem more productive for particularly two sectors- Manufacture of coke and refined petroleum products and Manufacture of pharmaceuticals. Apart from these two sectors printing, chemical products, basic metal and apparel are the sectors where medium scale units performed well in terms of attaining average industry productivity. Manufacturing of wearing apparels is the only sector where three different firm sizes attained above average industry productivity. Large-scale units are more productive in most industries except few such as printing, pharmaceuticals, coke and petroleum products, etc. For Manufacture of chemicals and chemical products, rubber and plastics products, electrical equipment and machinery and equipment – large scale units have attained more than double the industry average, while triple for other non-metallic mineral products and fabricated metal products.

Table 5: Percentage of average productivity (/mean productivity) achieved by four different scale sizes for 23 two digit industries (2009-12).

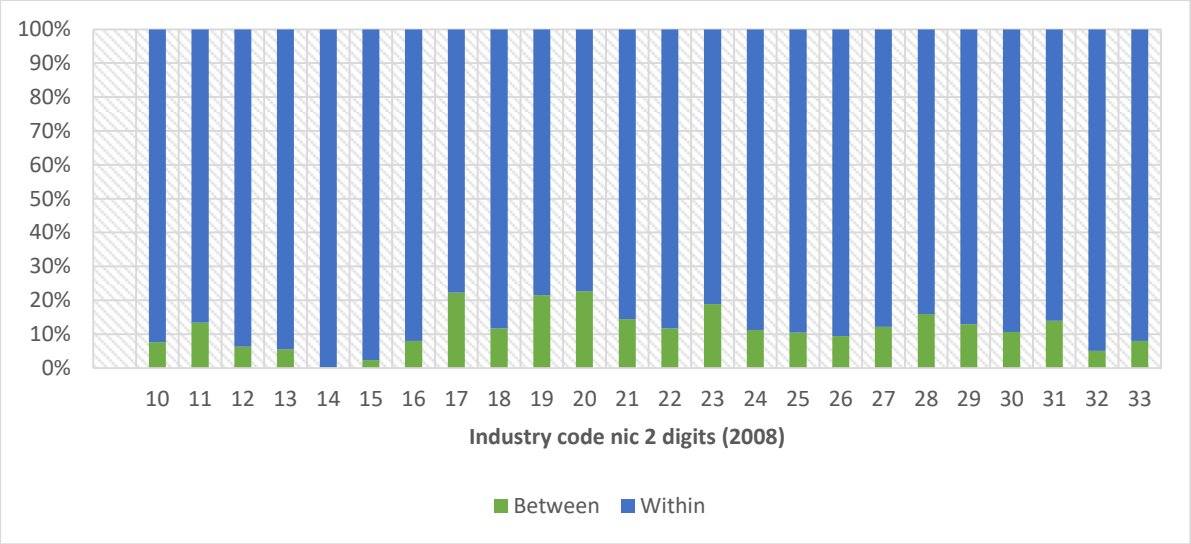
Industries	NIC2008 (2digit industry code)	Micro	Small	Medium	Large
Manufacture of food products	10	56.9	90.8	42.9	150.6
Manufacture of beverages	11	15.6	220.3	18.6	145.4
Manufacture of tobacco products	12	161.5	36.4	58.6	143.6
Manufacture of textiles	13	167.6	29.2	10.8	192.4
Manufacture of wearing apparels	14	115.3	17.9	110.6	156.2
Manufacture of leather and related products	15	97.7	127.5	90.9	84.0
Manufacture of wood and products	16	85.7	146.9	72.4	94.9
Manufacture of paper and paper products	17	82.2	111.4	80.1	126.3
Printing and reproduction of recorded media	18	31.1	212.9	116.8	39.2
Manufacture of coke and refined petroleum products	19	2.8	96.3	276.0	24.8
Manufacture of chemicals and chemical products	20	10.3	16.8	125.0	247.9
Manufacture of pharmaceuticals	21	NA*	16.3	241.9	41.8
Manufacture of rubber and plastics products	22	37.4	99.5	52.4	210.6
Manufacture of other non-metallic mineral products	23	7.4	13.0	23.0	356.6
Manufacture of basic metals	24	49.6	52.6	157.4	140.4
Manufacture of fabricated metal products	25	11.4	27.3	13.8	347.5
Manufacture of computer, electronic etc.	26	19.4	68.2	31.7	280.7
Manufacture of electrical equipment	27	NA*	8.8	38.3	252.9
Manufacture of machinery and equipment	28	61.2	34.4	60.9	243.5
Manufacture of other transport equipment	30	59.5	199.6	55.4	85.5
Manufacture of furniture	31	44.4	172.8	96.0	86.8
Other manufacturing	32	143.9	24.3	205.1	26.7
Repair and installation of machinery and equipment	33	47.8	163.3	69.0	119.9

*numbers of units are negligible for these firm sizes. 'Manufacturing of motor vehicles' is not included as most of units mainly come under large scale units only.

The TFP for different firm sizes are significantly different for most of the industries. But even within a firm size the TFP is not uniform for most of the industry sectors. To assess the productivity dispersion at the aggregate level, we first consider the analysis of variance for each manufacturing sector. Figure 1 shows the decomposition of TFP dispersion between the four firm sizes and within firm sizes. For almost all the industries the major source of dispersion is the dispersion within a particular scale than the dispersion between scales.

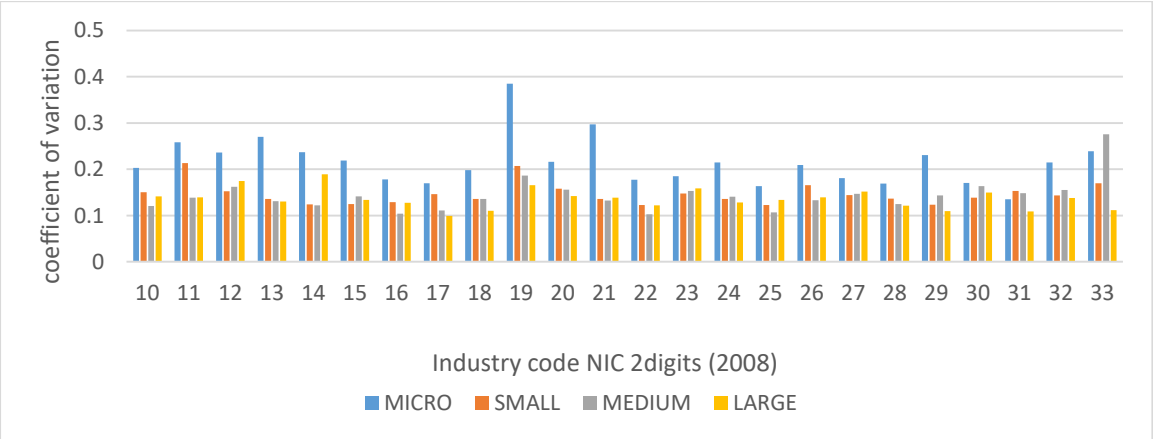
Except few industries such as 17, 19, 20 and 23, for all other industries the dispersion between scale is less than 20 percent.

Figure 1: Decomposition of TFP dispersion among four firm sizes for manufacturing industries (2009-2012).



Now for individual industries the coefficient of variation is significantly higher for all major industries except 31 (Figure 2). For industry 33 the coefficient of variation is highest for medium scale units. Not only the micro units of production, but for small scale units too, is 'the coefficient of variation' much greater than higher scales of production except on few occasions. The prevalence of high degree of variation in the total factor productivity, particularly among tiny units is more apparent for traditional sectors.

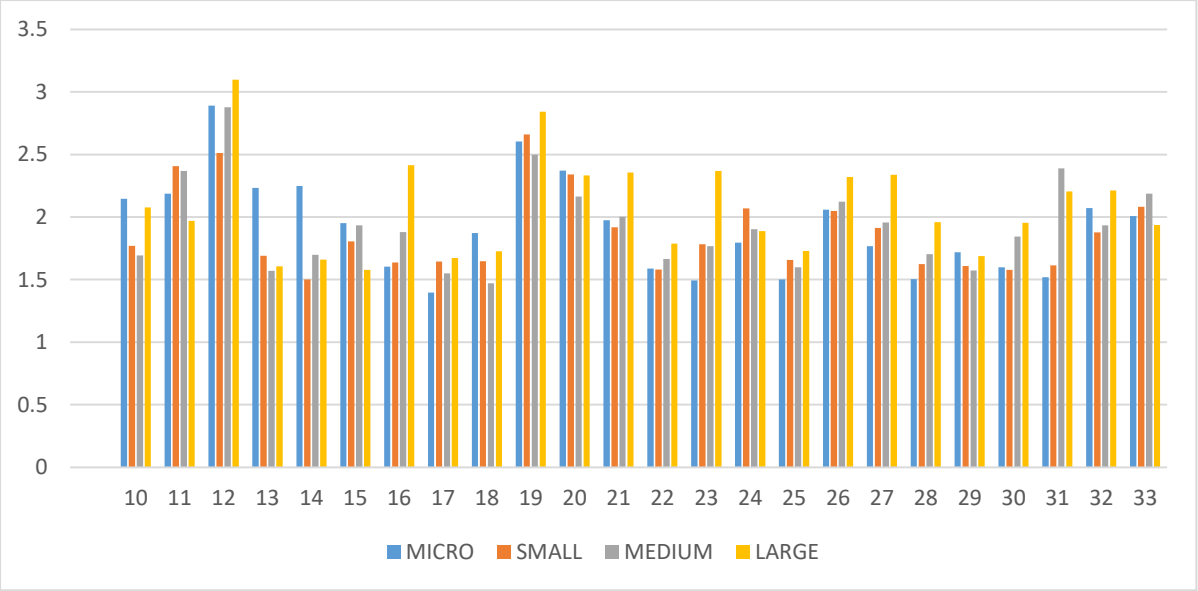
Figure 2: Coefficient of Variation in TFP for different sizes of firms (2009-2012).



But, we observe a completely opposite picture when we consider the log difference between 90th percentile and 10th percentile (Figure 3). The dispersion is more pronounced for large scale units compared to smaller units. This observation on larger units is more prominent for firms operating in the modern sectors. Now when we look into the details of productivity dispersion, we find for the performance of the 10th percentile is very similar to the

performance of the median particularly for modern sectors and thus the greater dispersion of larger scale units is essentially due to the better performance of the 90th percentile.

Figure 3: Log difference (in TFP) between 90th percentile and 10th percentile for different firm sizes industry wise (2009-2012).



7. Conclusions

This study analysed the productivity performance of different sizes of firms of the Indian manufacturing sector for a period (2009-12). In doing so, the study also examined the differences in the productivity for 23 two-digit industry sectors. Both partial and total factor productivity was employed to compute productivity levels of respective firm sizes. Labour productivity is the partial factor productivity measure used in the study while a Cobb-Douglus production function following LP method is employed to estimate TFP. To correct the endogeneity bias associated with the production function estimation, we employed LP method of productivity estimation. The analysis reveals that, although labour productivity and capital intensity for all firm sizes increases for the period under consideration, the gap among firm sizes for the same remained statistically significant. The study also found the declining role of labour as one moves to higher firm sizes. This finding is an interesting one as each unit of larger firm size provides more mandays on average. The sector-wise analysis of productivity reveals that the performance of different firm sizes is not uniform across industries with respect to mean productivity, while smaller firm sizes are performing better than their larger counterpart in some traditional sectors and the larger firm sizes in both traditional as well as modern sectors but more prominently in modern sectors.

Regarding dispersion of TFP among different firm sizes - TFP dispersion is greater for firms in the lower end of the size distribution of firms if one observes the coefficient of variation. But the log difference of the 90th and 10th percentile is largest for the “large scale” firms in modern sectors as well as few traditional sectors. In the absence of this linear relationship, we

would expect that differential pattern of TFP growth could explain the divergence too. Productivity dispersion within narrowly defined sectors is a sign that technology or knowledge is not being diffused across different firms coexisting in the relatively same environment. This could be a result of the difficulties of transferring knowledge, intensified with poor labour mobility or lack of competition.

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Appendix I

MSME Act 2006: (source: https://msme.gov.in/know-about-msme)

Definitions of Micro, Small and Medium Enterprises In accordance with the provision of Micro, Small and Medium Enterprises Development (MSMED) Act, 2006 the Micro, Small and Medium Enterprises (MSME) are classified in two Classes:

1. Manufacturing Enterprises-the enterprises engaged in the manufacture or production of goods pertaining to any industry specified in the first schedule to the industries (Development and regulation) Act, 1951) or employing plant and machinery in the process of value addition to the final product having a distinct name or character or use. The Manufacturing Enterprise are defined in terms of investment in Plant and Machinery.

2. Service Enterprises:-The enterprises engaged in providing or rendering of services and are defined in terms of investment in equipment.

1. Manufacturing Sector

Enterprises	Investment in plant and machinery
Micro Enterprises	Does not exceed twenty five lakh rupees
Small Enterprises	More than twenty five lakh rupees but does not exceed five crore rupees
Medium Enterprises	More than five crore rupees but does not exceed ten crore rupees

2. Service Sector

Enterprises	Investment in equipment
Micro Enterprises	Does not exceed ten lakh rupees:
Small Enterprises	More than ten lakh rupees but does not exceed two crore rupees
Medium Enterprises	More than two crore rupees but does not exceed five crore rupees

PART-II

Highlights of Report(s) Released by National Statistical Office (NSO)

(The 'Highlights' are reproduced from related report(s) prepared by Survey Design and Research Division (SDRD) of NSO. For details, the reader may refer to the related Main Report(s))

Highlights of Recent Survey Report(s) Released by NSO
(Report No. 583 and 584)

1. In this part of the Journal, Highlights of the reports based on 76th round (July-December 2018), released after publication of 107th issue of "SARVEKSHANA" are presented.

2. The highlights included in this issue are taken from the from the following reports:

   NSS Report No. 583: Persons with Disabilities in India
   NSS Report No. 584: Drinking Water, Sanitation, Hygiene and Housing Condition in India

`Highlights - Report No. 583: Persons with Disabilities in India

NSS 76th round (July-December 2018)

The highlights are based on the information collected through Survey on Persons with Disabilities in India conducted during NSS 76th round (July – December 2018).The 76th round Survey of Persons with Disabilities was spread over 8,992 FSUs (5,378 FSUs in rural areas and 3,614 FSUs in urban areas) covering 1,18,152 households (81,004 in rural areas and 37,148 in urban areas) and enumerating 5,76,569 persons (4,02,589 in rural areas and 1,73,980 in urban areas). In this survey, total number of persons with disability surveyed was 1,06,894 (74,946 in rural areas and 31,948 in urban areas).

Some of the key findings at the all-India level obtained from this survey are stated below:

A. Prevalence and incidence of disability:

- In India prevalence of disability (percentage of persons with disability in the population) was 2.2 per cent. It was 2.3 per cent in rural areas and 2.0 per cent in the urban areas.

- Prevalence of disability was higher among males than females. Among males, prevalence of disability was 2.4 per cent which was 1.9 per cent among females.

- Incidence of disability in the population, that is the number of persons whose onset of disability (by birth or otherwise) had been during the specified period of 365 days preceding the date of survey per 1,00,000 persons was 86.

B. Education level among persons with disabilities:

- Among persons with disabilities of age 7 years and above, 52.2 per cent were literates.

- Among persons with disabilities of age 15 years and above, 19.3 per cent had highest educational level secondary and above.

- Among persons with disabilities of age 3 to 35 years, 10.1 per cent attended pre-school intervention programme.

- Percentage of persons with disability of age 3 to 35 years who were ever enrolled in ordinary school was 62.9 per cent.

- Percentage of persons of age 3 to 35 years with disability who were ever enrolled in special school among those who were not enrolled in ordinary school or were enrolled in ordinary school but were not currently attending was 4.1 per cent.

C. Living arrangement, care giver, receipt of aid/help, certificate of disability:

- Percentage of persons with disability who were living alone was 3.7 per cent.

- Among persons with disabilities, 62.1 per cent had care giver, for 0.3 per cent of the persons with disabilities caregiver was required but not available and for another 37.7per cent of the persons with disabilities no caregiver was required.

- Percentage of persons with disability who received aid/help from Government was21.8 per cent, 1.8 per cent received aid/help from organisation other than Government and another 76.4 per cent did not receive aid/help.

- Among persons with disability, 28.8 per cent had certificate of disability.

D. Labour Force Participation Rate, Worker Population Ratio in usual status (ps+ss) and Unemployment Rate among persons of age 15 years and above with disabilities:

- Among persons with disabilities of age 15 years and above, Labour Force Participation Rate in usual status (ps+ss) was 23.8 per cent.

- Among persons with disabilities of age 15 years and above, Worker Population Ratio in usual status (ps+ss) was 22.8 per cent.

- Among persons with disabilities of age 15 years and above, Unemployment Rate in usual status (ps+ss) was 4.2 per cent.

Highlights - Report No. 584: Drinking Water, Sanitation, Hygiene and Housing Condition in India

NSS 76th round (July-December 2018)

The highlights are based on the information collected through Survey on 'Drinking Water, Sanitation, Hygiene and Housing Condition' conducted in the 76th round of NSS during July-December 2018. For the central sample, the survey was spread over 8,992 first stage units (5,378 in rural areas and 3,614 in urban areas) covering 1,06,838 households (63,736 in rural areas and 43,102 in urban areas). Some of the key findings of the survey are given below:

- The major source of drinking water of the household was hand pump in the rural areas and piped water into dwelling in the urban areas. About 42.9 percent of the households in the rural areas used hand pump as the principal source of drinking water and about 40.9 percent of the households in the urban areas used piped water into dwelling as the principal source of drinking water.

- About 48.6 percent of the households in the rural areas and about 57.5 percent of the households in the urban areas had exclusive access to principal source of drinking water.

- About 87.6 percent of the households in the rural areas and about 90.9 percent of the households in the urban areas had sufficient drinking water throughout the year from the principal source.

- About 58.2 percent of the households in the rural areas and about 80.7 percent of the households in the urban areas had drinking water facilities within the household premises.

- About 94.5 percent of the households in the rural areas and about 97.4 percent of the households in the urban areas used 'improved source of drinking water'.

- About 51.4 percent of the households in the rural areas and about 72.0 percent of the households in the urban areas used improved source of drinking water located in the household premises which was sufficiently available throughout the year.

- About 56.6 percent of the households in the rural areas and about 91.2 percent of the households in the urban areas had access to bathroom.

- Among the households which had access to bathroom, about 48.4 percent in the rural areas and about 74.8 percent in the urban areas used bathroom attached to the dwelling unit.

- About 71.3 percent of the households in the rural areas and about 96.2 percent of the households in the urban areas had access to latrine. It may be noted that there may be respondent bias in the reporting of access to latrine as question on benefits received by the households from government schemes was asked prior to the question on access of households to latrine.

- The major type of latrine used by the households was flush/pour-flush to septic tank in both rural and urban areas. About 50.9 percent of the households in rural areas and 48.9 percent of the households in urban areas used flush/pour-flush to septic tank type of latrine.

- Among the households which had access to latrine, about 94.7 percent of the males and 95.7 percent of the females in the rural areas used latrine regularly while about 98.0 percent of the males and 98.1 percent of the females in the urban areas used latrine regularly.

- Among the households which had access to latrine, about 93.8 percent of the males and 94.6 percent of the females in the rural areas regularly used improved latrine while about 97.2 percent of both males and females in the urban areas regularly used improved latrine.

- Among the households which had access to latrine, about 85.8 percent of the males and 86.4 percent of the females in the rural areas regularly used improved latrine which was for exclusive use of the household while the corresponding figure was about 82.4 percent for males and 84.7 percent for females in the urban areas.

- Among the households which had access to latrine, about 3.5 percent of the household members in the rural areas and about 1.7 percent of the household members in the urban areas never used latrine.

- Among the households used latrine, about 4.5 percent of the households in the rural areas and about 2.1 percent of the households in the urban areas reported that water was not available in or around the latrine used.

- About 48.0 percent of the households in the rural areas and about 86.1 percent of the households in the urban areas had bathroom and latrine both within household premises.

- About 96.0 percent of the households in the rural areas and about 63.8 percent of the households in the urban areas had own dwelling unit.

- Among the households living in houses, about 96.7 percent of the households in the rural areas and about 91.5 percent of the households in the urban areas used the house for residential purpose only.

- Among the households living in houses, about 89.0 percent of the households in the rural areas and about 56.4 percent of the households in the urban areas had independent house.

- Among the households living in houses, about 76.7 percent of the households in the rural areas and about 96.0 percent of the households in the urban areas had the house of pucca structure.

- Among the households living in houses, average floor area of the dwelling unit was about 46.6 sq. mtr. in the rural areas and about 46.1 sq. mtr. in the urban areas.

- Among the households living in houses, about 93.9 percent of the households in the rural areas and about 99.1 percent of the households in the urban areas had electricity for domestic use.

- Among the households living in houses, about 48.3 percent of the households in the rural areas and about 86.6 percent of the households in the urban areas used LPG as fuel for cooking.

- Among the households living in houses, about 61.1 percent of the households in the rural areas and about 92.0 percent of the households in the urban areas had drainage system in the house for disposal of waste water/liquid waste.

- Among the households living in houses, about 48.1 percent of the households in the rural areas disposed of household waste water without treatment to open low land areas/streets. In the urban areas, about 71.1 percent of the households disposed of household waste water without treatment to drainage system.

- Among the households living in houses, about 72.4 percent of the households in the rural areas disposed of household garbage either in household's individual dumping spot or in a common place other than community dumping spot. In the urban areas, about 70.3 percent of the households disposed of household garbage either in community dumping spot or in a common place other than community dumping spot.

- Among the households living in houses, about 80.4 percent of the households in the rural areas had no arrangement for collection of household garbage. In the urban areas, panchayat/municipality/corporation made arrangement for collection of household garbage for about 74.1 percent of the households.

- Among the households living in houses, about 87.1 percent of the households in the rural areas and about 95.7 percent of the households in the urban areas had the house with direct opening to approach road/lane/constructed path.

खण्ड-III हिंदी

सर्वेक्षण

राष्ट्रीय सांख्यिकी कार्यालय की पत्रिका

भाग- PDOS 57 XXXV सं॰ 3 और 4
अंक संख्या 108वां
जून, 2020

राष्ट्रीय सांख्यिकी कार्यालय
सांख्यिकी और कार्यक्रम कार्यान्वयन मंत्रालय
भारत सरकार
नई दिल्ली

सम्पादकीय सलाहकार बोर्ड

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सम्पादकीय सचिवालय - सर्वेक्षण समन्वय प्रभाग,राष्ट्रीय सांख्यिकी कार्यालय, सांख्यिकी एवं कार्यक्रम कार्यान्वयन मंत्रालय, संख्यिकी भवन, महर्षि वाल्मीकि मार्ग, नईदिल्ली-110032

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एनएसओ द्वारा जारी की गई रिपोर्ट की मुख्य बातें

(मुख्य बातें एनएसओ के एस.डी.आर.डी. प्रभाग द्वारा तैयार की गई सम्बंधित रिपोर्ट से उद्धृतकी गई हैं। विवरण के लिए पाठक सम्बंधित मुख्य रिपोर्ट देख सकते हैं)

मुख्य बातें - रा.प्र.सं रिपोर्ट स. 583 : भारत में दिब्यांगजन

रा.प्र.स. 76वें दौर (जुलाई - दिसम्बर 2018)

यह रिपोर्ट रा.प्र.स. के 76वें दौर (जुलाई - दिसम्बर 2018) के दौरान संचालित, भारत में दिब्यांगजन के सर्वोक्षण पर आधारित है। 76वें दौर के दिब्यांगजनों का सर्वेक्षण 8,992 एफएसयू (5,378 एफएसयू ग्रामीण क्षेत्रों में और 3,614 एफएसयू नगरीय क्षेत्रों में) फैला हुआ था, जिसमें 1,18,152 परिवार (81,004 ग्रामीण क्षेत्रों में और 37,148 नगरीय क्षेत्रों में) सम्मिलित थे, और इसमें 5,76,569 व्यक्तियों (4,02,589 ग्रामीण क्षेत्रों में और 1,73,980 नगरीय क्षेत्रों में) की परिगणना हुई। इस सर्वेक्षण में सर्वेक्षित दिब्यांगजनों की कुल संख्या 1,06,894 (74,946 ग्रामीण क्षेत्रों में और 31,948 नगरीय क्षेत्रों में) था।

अखिल भारतीय स्तर पर इस सर्वेक्षण से प्राप्त कुछ मुख्य निस्कर्ष निम्नलिखित है।

(क) दिव्यांगता की व्यापकता एवं आपतन:

- भारत में दिव्यांगता की व्यापकता (जनसंख्या में दिब्यांगजन का प्रतिशत्) 2.2 प्रतिशत् था । यह ग्रामीण क्षेत्रों में 2.3 प्रतिशत् एवं नगरीय क्षेत्रों में 2.0 प्रतिशत् था ।

- दिव्यांगता की व्यापकता पुरूषों में महिलाओं से अधिक था । पुरूषों में दिव्यांगता का व्यापकता 2.4 प्रतिशत् था, जबकि महिलाओं में 1.9 प्रतिशत् था ।

- जनसंख्या में दिव्यांगता का आपतन (उन दिब्यांगजनों की संख्या जिनके दिव्यांगता का आरंभ, जन्म से या किसी और तरह से, सर्वेक्षण की तिथि से पूर्व के 365 दिनों की विनिर्दिष्ट अवधि के दौरान हुआ) प्रति 1,00,000 व्यक्तियों में 86 था ।

(ख) दिब्यांगजनों में शिक्षा का स्तर :

- 7 वर्ष एवं उससे अधिक उम्र के दिब्यांगजनों में 52.2 प्रतिशत् साक्षर थे।

- 15 वर्ष एवं उससे अधिक उम्र के दिब्यांगजनों में, 19.3 प्रतिशत् का सर्वोच्च शैक्षणिक स्तर माध्यमिक और उससे अधिक था।

- 3 से 35 वर्ष के दिब्यांगजनों में 10.1 प्रतिशत् विद्यालय पूर्व इन्टरवेन्सन कार्यक्रम में उपस्थित हुए।

- 3 से 35 वर्ष के दिब्यांगजनों का प्रतिशत् जो कि साधारण विद्यालय में नामांकित थे, 62.9 प्रतिशत् था।

- 3 से 35 वर्ष के दिब्यांगजन जो कि साधारण विद्यालय में नामांकित नहीं थे या साधारण विद्यालय में नामांकित तो थे किन्तु वर्तमान में उपस्थित नहीं हो रहे थे, उनमे 4.1 प्रतिशत् विशेष विद्यालय में नामांकित थे।

(ग) रहन-सहन की व्यवस्था, देखभाल करने वाला, सहायता/मदद प्राप्ती, दिव्यांगता प्रमाण पत्र :

- दिब्यांगजन का प्रतिशत् जो कि अकेले रह रहे थे, 3.7 प्रतिशत् था।

- दिब्यांगजनों में से 62.1 प्रतिशत् का देखभाल करने वाला था, 0.3 प्रतिशत् दिब्यांगजन को देखभाल करने वालों की आवश्यकता थी किन्तु उपलब्ध नहीं था और अन्य 37.7 प्रतिशत् दिब्यांगजन के लिए कोई भी देखभाल करने वालों की आवश्यकता नहीं थी ।

- दिब्यांगजनों में से 21.8 प्रतिशत् को सरकार से सहायता/मदद प्राप्त हुआ, 1.8 प्रतिशत् को सरकार के अलावे संगठन से सहायता/मदद प्राप्त हुआ और अन्य 76.4 प्रतिशत् दिब्यांगजन को सहायता/मदद प्राप्त नहीं हुआ।

- दिब्यांगजनों में से 28.8 प्रतिशत् के पास दिव्यांगता प्रमाण पत्र था ।

(घ) 15 वर्ष एवं उससे अधिक उम्र के दिब्यांगजनों में से सामान्य स्तर (पीएस + एसएस) में श्रम बल भागीदारी दर, कामगार जनसंख्या अनुपात एवं बेरोजगारी दर:

- 15 वर्ष एवं उससे अधिक उम्र के दिब्यांगजनों में सामान्य स्तर (पीएस + एसएस) में श्रमबल भागीदारी दर 23.8 प्रतिशत् था।

- 15 वर्ष एवं उससे अधिक उम्र के दिब्यांगजनों में सामान्य स्तर (पीएस + एसएस) में कामगार जनसंख्या अनुपात 22.8 प्रतिशत् था।

- 15 वर्ष एवं उससे अधिक उम्र के दिब्यांगजनों में बेरोजगारी दर सामान्य स्तर (पीएस + एसएस) में 4.2 प्रतिशत् था।

मुख्य बातें - रा.प्र.सं रिपोर्ट स. 584 : भारत में संचालित पेयजल, स्वच्छता, आरोग्यता एवं आवासीय स्थिति

रा.प्र.स. 76वें दौर (जुलाई - दिसम्बर 2018)

यह रिपोर्ट रा.प्र.स. के 76वें दौर (जुलाई - दिसम्बर 2018) के दौरान संचालित पेयजल, स्वच्छता, स्वास्थ्य एवं आवासीय स्थिति के सर्वेक्षण पर आधारित है । यह सर्वेक्षण केन्द्रीय प्रतिदर्श के लिए 8,992 प्रथम चरण इकाईयों में (5,378 ग्रामीण क्षेत्र और 3,614 नगरीय क्षेत्र) फैला हुआ था । जिसमें 1,06,838 परिवार (63,736 ग्रामीण क्षेत्रों में और 43,102 नगरीय क्षेत्रों में) सम्मिलित थे । इस सर्वेक्षण के कुछ मुख्य निष्कर्ष निम्नलिखित है :--

- पेयजल का प्रमुख स्रोत ग्रामीण क्षेत्रों में चांपाकल और नगरीय क्षेत्रों के आवास में पानी का पाईप था । ग्रामीण क्षेत्रों में करीब 42.9 प्रतिशत परिवारों ने पेयजल के प्रधान स्रोत के रूप में चांपाकल का उपयोग किया और नगरीय क्षेत्रों में करीब 40.9 प्रतिशत परिवारों ने पेयजल के प्रधान स्रोत के रूप में आवास में पानी के पाईप का उपयोग किया ।

- ग्रामीण क्षेत्रों के परिवारों में करीब 48.6 प्रतिशत और नगरीय क्षेत्रों में करीब 57.5 प्रतिशत परिवारों के पास पेयजल के प्रधान स्रोत तक विशेष पहुँच था ।

- ग्रामीण क्षेत्रों में करीब 87.6 प्रतिशत और नगरीय क्षेत्रों में करीब 90.9 प्रतिशत परिवारों के पास प्रधान स्रोत से पूरे वर्ष तक पर्याप्त पेय जल था ।

- ग्रामीण क्षेत्रों में करीब 58.2 प्रतिशत और नगरीय क्षेत्रों में करीब 80.7 प्रतिशत परिवारों के पास गृह परिसर में पेयजल की सुविधा थी ।

- ग्रामीण क्षेत्रों में करीब 94.5 प्रतिशत और नगरीय क्षेत्रों में 97.4 प्रतिशत परिवारों ने पेयजल के समुन्नत स्रोत का उपयोग किया।

- ग्रामीण क्षेत्रों में करीब 51.4 प्रतिशत और नगरीय क्षेत्रों में करीब 72.0 प्रतिशत परिवारों ने गृह परिसर में पूरे वर्ष तक समुन्नत स्रोत उपलब्ध पर्याप्त पेयजल का उपयोग किया ।

- ग्रामीण क्षेत्रों में करीब 56.6 प्रतिशत और नगरीय क्षेत्रों में करीब 91.2 प्रतिशत परिवारों का स्नानागार तक पहुँच था ।

- ग्रामीण परिवारों में जिनका स्नानागार तक पहुँच था, उन्मेसे करीब 48.4 प्रतिशत परिवारों ने आवास इकाई के साथ संलग्न स्नानागार का उपयोग किया ।नगरीय परिवारों में जिनका स्नानागार तक पहुँच था, उन्मेसे करीब 74.8 प्रतिशत परिवारों ने आवास इकाई के साथ संलग्न स्नानागार का उपयोग किया ।

- ग्रामीण क्षेत्रों में करीब 71.3 प्रतिशत और नगरीय क्षेत्रों में करीब 96.2 प्रतिशत परिवारों का शौचालय तक पहुँच था । यह ध्यान दिया जाए कि शौचालय तक पहुँच के विवरण में प्रतिवादी पूर्वाग्रह हो सकते हैं, क्योंकि सरकारी योजनाओं से घरों को प्राप्त होने वाले लाभों पर प्रश्न, घरों में शौचालय तक पहुँच के प्रश्न से पहले पूछा गया था ।

- ग्रामीण एवं नगरीय दोनों क्षेत्रों में परिवारों द्वारा उपयोग में लाया गया प्रमुख शौचालय सेप्टिक टैंक से फ्लस/पावर फ्लस से युक्त था । ग्रामीण क्षेत्रों में करीब 50.9 प्रतिशत और नगरीय क्षेत्रों में करीब 48.9 प्रतिशत परिवारों ने सेप्टिक टैंक से फ्लस/पावर फ्लस से युक्त शौचालय का उपयोग किया।

- शौचालय तक पहुँच वाले परिवारों में, ग्रामीण क्षेत्रों में, करीब 94.7 प्रतिशत पुरूषों एवं 95.7 प्रतिशत महिलाओं ने नियमित रूप से शौचालय का उपयोग किया, जबकि नगरीय क्षेत्रों में करीब 98.0 प्रतिशत पुरूषों और 98.1 प्रतिशत महिलाओं ने शौचालय का नियमित उपयोग किया ।

- शौचालय तक पहुँच वाले परिवारों में, ग्रामीण क्षेत्रों में, करीब 93.8 प्रतिशत पुरूषों और 94.6 प्रतिशत महिलाओं ने समुन्नत शौचालय का नियमित उपयोग किया, जबकि नगरीय क्षेत्रों में करीब 97.2 प्रतिशत पुरूषों एवं 97.2 प्रतिशत महिलाओं ने समुन्नत शौचालय का नियमित उपयोग किया ।

- शौचालय तक पहुँच वाले परिवारों में, ग्रामीण क्षेत्रों में, करीब 85.8 प्रतिशत पुरूषों एवं 86.4 प्रतिशत महिलाओं ने समुन्नत शौचालय का नियमित उपयोग किया जो कि केवल उस परिवार के उपयोग के लिए था, जबकि नगरीय क्षेत्रों में संगत आँकड़े करीब 82.4 प्रतिशत पुरूषों एवं 84.7 प्रतिशत महिलाओं के लिए थे।

- शौचालय तक पहुँच वाले परिवारों में, ग्रामीण क्षेत्रों में, करीब 3.5 प्रतिशत एवं नगरीय क्षेत्रों में करीब 1.7 प्रतिशत पारिवारिक सदस्यों ने शौचालय का कभी उपयोग नहीं किया ।

- शौचालय उपयोग करने वाले परिवारों में, ग्रामीण क्षेत्रों में, करीब 4.5 प्रतिशत और नगरीय क्षेत्रों में करीब 2.1 प्रतिशत परिवारों ने दर्ज किया कि उपयोग करने वाले शौचालय के आसपास या शौचालय में जल उपलब्ध नहीं था ।

- ग्रामीण क्षेत्रों में करीब 48.0 प्रतिशत और नगरीय क्षेत्रों में करीब 86.1 प्रतिशत परिवारों के पास स्नानागार एवं शौचालय दोनों आवास परिसर में था ।

- ग्रामीण क्षेत्रों में करीब 96.0 प्रतिशत और नगरीय क्षेत्रों में करीब 63.8 प्रतिशत के पास अपनी आवास इकाई थी।

- घरों में रहने वाले परिवारों में, ग्रामीण क्षेत्रों में करीब 96.7 प्रतिशत और नगरीय क्षेत्रों में करीब 91.5 प्रतिशत परिवारों ने घर का उपयोग केवल आवसीय प्रयोजन/उद्देश्य के लिए किया था ।

- घरों में रहने वाले परिवारों में, ग्रामीण क्षेत्रों में करीब 89.0 प्रतिशत एवं नगरीय क्षेत्रों में करीब 56.4 प्रतिशत परिवारों के पास स्वतंत्र घर था ।

- घरों में रहने वाले परिवारों में, ग्रामीण क्षेत्रों में करीब 76.7 प्रतिशत और नगरीय क्षेत्रों में करीब 96.0 प्रतिशत परिवारों के पास पक्के संरचना का घर था ।

- घरों में रहने वाले परिवारों में, आवासीय इकाई का औसत फर्श क्षेत्र, ग्रामीण क्षेत्रों में करीब 46.6 वर्ग मीटर और नगरीय क्षेत्रों में करीब 46.1 वर्ग मीटर था ।

- घरों में रहने वाले परिवारों में, ग्रामीण क्षेत्रों में करीब 93.9 प्रतिशत और नगरीय क्षेत्रों में करीब 99.1 प्रतिशत परिवारों के पास घरेलू उपयोग के लिए बिजली थी ।

- घरों में रहने वाले परिवारों में, ग्रामीण क्षेत्रों के करीब 48.3 प्रतिशत और नगरीय क्षेत्रों के करीब 86.6 प्रतिशत परिवारों ने एल.पी.जी. को खाना बनाने के ईंधन के रूप में प्रयोग किया ।

- घरों में रहने वाले परिवारों में, ग्रामीण क्षेत्रों में करीब 61.1 प्रतिशत और नगरीय क्षेत्रों में करीब 92.0 प्रतिशत के पास गंदा पानी/बेकार तरल पदार्थ के निपटान के लिए घर में जल निकासी व्यवस्था थी ।

- घरों में रहने वाले परिवारों में, ग्रामीण क्षेत्रों के करीब 48.1 प्रतिशत परिवारों ने घरेलू अपशिस्ट जल का निपटान बिना किसी उपाय के खुले कम भूमि क्षेत्रों/गलियों में किया।नगरीय क्षेत्रों में करीब 71.1 प्रतिशत परिवारों ने घरेलू अपशिस्ट जल का निपटानबिना किसी उपाय के निकासीव्यवस्था में किया ।

- घरों में रहने वाले परिवारों में, ग्रामीण क्षेत्रों में करीब 72.4 प्रतिशत परिवारों ने घरेलू कूड़ा-कचरा का निपटान या तो परिवारों के अपने व्यक्तिगत् कचरास्थान पर या सामुदायिक कचड़ा स्थान के अलावा सार्वजनिक स्थान पर किया। नगरीय क्षेत्रों में करीब 70.3 प्रतिशत परिवारों ने घरेलू कूड़ा-कचराका निपटान या तो सामुदायिक कचरा स्थान में या फिर सामुदायिक कचरा स्थान के अलावा सार्वजनिक स्थान पर किया ।

- घरों में रहने वाले परिवारों में, ग्रामीण क्षेत्रों में करीब 80.4 प्रतिशत परिवारों के पास घरेलू कूड़ा-कचरा जमा करने के लिए कोइ व्यवस्था नहीं थी। नगरीय क्षेत्रों में करीब 74.1 प्रतिशत परिवारों के लिए पंचायत/नगरपालिका/नगर-निगम ने घरेलू कूड़ा-कचरा जमा करने के लिए व्यवस्था की ।

- घरों में रहने वाले परिवारों में, ग्रामीण क्षेत्रों में करीब 87.1 प्रतिशत और नगरीय क्षेत्रों में करीब 95.7 प्रतिशत परिवारों के पास रोड/लेन/निर्यात पथ पर सीधे संपर्क वाला घर था ।

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