Analysis of Composition of Workers in Indian Manufacturing Industries

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Abstract. The Hecksher Ohlin (H-O) theoretical arguments and their further implications drawn by the Stopler-Samuelson model argue that, based on factor cost advantages, the labour surplus developing economies would have comparative advantage in producing and exporting labour intensive products, while the capital abundant developed economies would have comparative advantage in producing and exporting capital intensive products. This in turn would generate demand for less skilled workers in the developing economy and that of more skilled workers in the developed economies. However, contrary to the H-O trade theoretic predictions of rising relative demand for sector specific unskilled or less skilled employment in developing economies, empirical evidence for India suggests a different picture across different industries in Indian manufacturing sector.

Key Words*:* Composition of workers, Production workers (P), Non-production workers (NP), Skill intensity, Pre-reform, Post-reform, Manufacturing industry, Average, Coefficient of variation (CV), Compound annual growth rate (CAGR).

1 Introduction

The Hecksher Ohlin (H-O) – Stopler-Samuelson model argue that, a labour surplus developing economy would have comparative advantage in producing and exporting labour intensive products, while the capital abundant developed economy would have comparative advantage in producing and exporting capital intensive products. This in turn would generate demand for less skilled workers in the developing economy and that of more skilled workers in the developed economies. However, contrary to the H-O trade theoretic predictions empirical evidence suggest a globally pervasive skill bias in the earnings and employment composition of workforce (Berman and Machin, 2000; Abraham, 2010).

In case of Indian registered manufacturing sector the scholars have expressed divergent views about the degree and dimension of the changing relative demand for the skilled workers. Nagraj, (2002) has stated that after a decade of stagnation (1980s) employment growth in Indian registered manufacturing turned around which was associated with decline in earnings per

Journal of Business Management and Information Systems©2014 QTanalytics
2394-3130 electronic ISSN

worker. This growth in employment was mainly because of investment boom, which was not accompanied by growth in earnings despite growth in employment across industries. Nagaraj has further stated that it is difficult to say whether this increase in employment is biased towards particular categories of labour.

On the contrary, scholars like Berman, Somanathan and Tan (2005) have stated in their study that Indian manufacturing was unusual in the 1980s in the falling *proportion of non-manual (relatively skilled) workers* in employment, bucking a worldwide trend which was associated with skill-biased technological change. The 1990s were however, different according to the scholars in the sense that the proportion of non-manual workers in employment increased as did the non-manual share of the wage bill. It has also been argued that this phenomenon took place probably due to various economic reform measures taken during the 1990s and acceleration of investment and productivity. However, these scholars are also uncertain as Nagaraj, about the role of skill-biased technological change for the increased use of skilled workers in the Indian manufacturing sector after the adoption of the new policy regime.

Seth and Aggarwal (2004) have observed that the *ratio of non-production to production workers (NP/P ratio)* in the Indian organised industries has remained stable from 1960 to 1970, increased slightly during 1970-1980 and accelerated further after the 1990s. The increase in NP/P ratio during the earlier period has been attributed to the decline in relative wages of non-production to production workers and during the later period it has been attributed to the increasing professionalism in the Indian industries by the scholars.

Ramaswamy (2008) and Singh (2010) have also observed that the relative share of non-manual employees (non-production workers) in the Indian organised manufacturing has increased in the post liberalisation period.

This paper discusses the distribution of workers in different manufacturing industries at 2-digit level broadly for two time periods viz. pre-reform period (1973-74 to 1990-91) and post-reform period (1991-92 to 2005-06) against the backdrop of such contradictory observations and the issues raised in the Hecksher-Ohlin-Stopler-Samuelson dispensation. The purpose of the present paper is to examine the composition and distribution of workers in terms of *non-production and production workers (Skill intensity/Skill composition)* in different manufacturing industries in India. This study has been done broadly for two time periods viz. before and after

the period of economic reforms. Such a composition of manpower in Indian manufacturing industry has been discussed both at the aggregate as well as disaggregated (2-digit) level.

2. Data, Sources and Research Methodology

In some earlier studies (Delehanty, 1968; Gujarati and Dars, 1972; Goldar and Seth, 1975; Seth and Bhasin, 1978; Ramaswamy, 2008 and Singh, 2010) the ratio of non-production to production workers (NP/P) has been used to capture the skill based restructuring of manpower in manufacturing industries. In case of Indian manufacturing industry, the number of non-production workers (NP), production workers (P) and the ratio of Non- Production to Production workers (NP/P) were computed from EPW data Series, Vol. II – 2007of Annual Survey of Industries (ASI) by Singh (2010).

In ASI framework, data on production and non-production workers has been reported under the nomenclature of *workers* and *other than workers*. The workers in ASI framework consist of directly employed workers including men, women and children and workers employed through contractors. The other than workers in the ASI framework consists of supervisors, managers and other employees which may refer to technocrats and other support staff related to sale, purchase, credit, finance, store, security, cafeteria, legal, medical and R&D facilities. In order to capture skill-based restructuring of manpower in the Indian manufacturing industries the present paper has computed ratio of non-production to production workers (NP/P) as an indicator of skill intensity.

3. DATA ANALYSIS

An Industry Level Analysis of Composition of Employees for Aggregate Time Period

The present sub-section would deal with inter-industry changes in the employment of above categories of the employees for two time periods viz. 1973-74 to 1990-91 and 1991-92 to 2005-06.

Table – 1: Descriptive Statistics of Employees in Different Industries during Pre-reform Period

Industry (NIC Code)	Total employee		Non-production workers		Production workers	
	Average	**CV (%)**	**Average**	**CV (%)**	**Average**	**CV (%)**
Food Products & Beverages (15)	1098670	13.67	239042	16.92	859628	13.07
Tobacco products (16)	339735	23.14	24107	36.18	315628	25.40
Textiles (17)	1368248	6.15	169364	6.29	1198885	6.42
Wearing apparel; dressing & dyeing of fur (18)	57557	42.45	9584	41.47	47973	42.70
Tanning & dressing of leather, footwear etc. (19)	73308	24.96	12701	26.26	60607	25.64
Wood and Wood Products (20)	66643	5.85	13052	18.15	53592	5.55
Paper and Paper Products (21)	121167	13.37	26950	17.26	94216	12.39
Publishing, printing & recorded media (22)	150326	5.53	37338	5.74	112988	6.27
Coke, refined petroleum & nuclear fuel (23)	43801	28.50	12436	24.62	31364	33.12
Chemical and Chemical Products (24)	477071	16.63	141899	19.28	335172	15.64
Rubber and Plastic Products (25)	122480	21.77	29794	25.59	92686	20.92
Non-Metallic Mineral Products (26)	369179	16.12	64684	17.71	304495	16.37
Basic Metals (27)	565566	11.91	138570	10.84	426996	12.92
Fabricated Metals except machinery (28)	198246	9.12	48931	10.53	149315	8.91
Machinery and equipment n.e.c. (29)	417779	9.78	121758	14.20	296022	8.57
Office, Accounting & Computing Machinery (30)	24549	29.67	9832	41.01	14717	24.40
Electrical Machinery & Apparatus n.e.c. (31)	185746	12.93	62361	15.52	123385	11.82
Radio, Television & Communication Equipments (32)	77931	26.87	24312	37.92	53619	22.26
Medical, Precision & Optical Instruments, watches & clocks (33)	41265	16.71	12194	21.50	29072	15.15
Motor vehicles & Trailers etc. (34)	168322	15.50	48099	16.43	120222	15.22
Other Transport Equipment (35)	287398	14.42	61746	14.79	225653	14.80
Furniture & Manufacturing n.e.c. (36)	52423	7.65	10983	7.83	41441	8.27
All Manufacturing industry	6307410	9.17	1319734	11.23	4987676	8.75

Table – 1[1] shows industry wise average number of total employees, non-production workers and the production workers for the period 1973-74 to 1990-91. The above table also depicts CV in the employment of those workers in each industry over time.

- **Average and CV of Total Employees:** It is evident from the above table that during the pre-reform era the industry related to *textiles* was the highest employer of the workers (1,368,248) including all categories showing CV of 6.15 per cent, followed by the industry group *food products and beverages* (1,098,670) showing CV of 13.67 per cent. The industry related to *office, accounting and computing machinery* was the least employer of workers (24,549) having CV 29.67 per cent followed by the industry related to *medical precision and optical instruments; watches and clocks* (41,265) with CV 16.71 per cent.
- **Average and CV of Non-production Workers:** As far as employment of non-production workers is concerned, the industry group belonging to *food products and beverages* hired the highest number of such workers (239,042), followed by *textiles* (169,364). The CV of their employment was 16.92 per cent and 6.29 per cent respectively. *Wearing apparel; dressing and dyeing of fur* employed the least number of such workers with 41.47 per cent as its CV which the highest figure in all manufacturing industries. Thus, the industries which employ very large number of non-production workers have low value of CV and vice-versa.
- **Average and CV of Production Workers:** Like total employees, the production workers also had the highest employment in *textiles* industry (1,198,885) with reasonable degree of consistency showing CV of 6.42 per cent. This was followed by *food products and beverages* industry (859,628) with CV 13.07 per cent. *Office, accounting and computing machinery* industry was again the least employment provider to the production workers (14,717) followed by *medical precision and optical instruments; watches and clocks* (29,072). The employment fluctuation in *wearing apparel; dressing and dyeing of fur* was the highest (42.70 per cent) followed by *coke, refined petroleum and nuclear fuel* (33.12 per cent).

[1] In table – 1 the average number of total employees in each industry group has been computed by summing together the number of employees in that industry from 1973-74 to 1990-91and dividing this aggregate by the total number of years (18 in this case). Similar exercise has been done for getting average of the non-production and production workers. Coefficient of variation (CV) for total employees, non-production workers and production workers in each industry shows the variation of employment of that particular category of employees in that particular industry over different years. This exercise facilitates industry wise study of average employment of a particular category of employee and variation in it over time during the pre reform era.

Post-reform Period (1991-92 to 2005-06)

Table – 2: Descriptive Statistics of Employees in Different Industries during Post-reform Period

Industry (NIC Code)	Total employee		Non-production workers		Production workers	
	Average	**CV (%)**	**Average**	**CV (%)**	**Average**	**CV (%)**
Food Products & Beverages (15)	1290736	5.25	283004	6.72	1007732	5.36
Tobacco products (16)	483380	5.09	24168	11.65	459212	5.31
Textiles (17)	1280663	5.86	187976	8.35	1092686	5.62
Wearing apparel; dressing & dyeing of fur (18)	297952	35.32	43033	30.03	254919	36.30
Tanning & dressing of leather, footwear etc. (19)	133094	12.30	23188	7.96	109906	13.77
Wood and Wood Products (20)	56406	14.91	11128	8.76	45278	16.75
Paper and Paper Products (21)	169458	6.43	37402	7.83	132056	6.43
Publishing, printing & recorded media (22)	135754	15.68	44504	10.37	91250	20.84
Coke, refined petroleum & nuclear fuel (23)	71290	8.72	19001	9.21	52289	10.55
Chemical and Chemical Products (24)	753054	8.65	237298	10.40	515756	8.10
Rubber and Plastic Products (25)	252324	15.59	64753	16.77	187571	16.63
Non-Metallic Mineral Products (26)	472420	10.17	89863	4.87	382558	12.32
Basic Metals (27)	614511	9.40	152159	8.70	462352	9.71
Fabricated Metals except machinery (28)	279419	12.42	71276	8.23	208142	14.88
Machinery and equipment n.e.c. (29)	472854	18.46	164641	37.99	308214	10.69
Office, Accounting & Computing Machinery (30)	23053	23.49	9985	34.19	13068	21.20
Electrical Machinery & Apparatus n.e.c. (31)	247565	7.19	79527	11.69	168037	7.33
Radio, Television & Communication Equipments (32)	120679	13.39	43011	14.55	77668	14.01
Medical, Precision & Optical Instruments, watches & clocks (33)	63578	11.71	21098	19.06	42480	9.55
Motor vehicles & Trailers etc. (34)	265967	16.04	72143	11.54	193824	18.55
Other Transport Equipment (35)	279759	36.22	63703	33.15	216056	37.23
Furniture & Manufacturing n.e.c. (36)	114512	32.36	25079	32.50	89433	32.45
All Manufacturing Industry	7878428	6.19	1767941	8.28	6110487	6.25

Table – 2[2] shows pattern of employment of different categories of workers in different industries in the overall post-reform era. The table also shows CV of employment of different categories of workers in different industries.

- **Average and CV of Total Employees:** Table 4.7 depicts that the *food products and beverages* industry has generated the highest number of jobs (1,290,736) in the Indian organised manufacturing sector during the post-reform era. This industry is closely followed by the *textile sector* which has generated 1,280,663 average numbers of jobs during this period. These two industries are also among the most consistent generator of employment in the manufacturing sector. Their respective values of CV are 5.25 and 5.09 per cent. *Office, accounting and computing machinery* has generated the least number of jobs (23,053) followed by *wood and wood products* industry which has created 56,406 average numbers of jobs during the post-reform period. The CV of these two industry groups are 23.49 and 14.91 per cent respectively.
- **Average and CV of Non-production Workers:** So far as the use of non-production workers during the post-reform period is concerned, it may be observed from table 4.7 that like the pre-reform period, the use of such workers is the highest in the industry group belonging to *food products and beverages* (283,004), followed by *chemical and chemical products* industry (237,298). The CV of these two industries is 6.72 and 10.40 per cent respectively which point towards their inter-temporal consistency in generation of employment for the NP workers. Industries like o*ffice, accounting and computing machinery; and wood and wood products* have been reported to use very less number of non-production workers as compared to other manufacturing industries. The average number of the NP workers in these two industries is 9,985 and 11,128 respectively. Their respective CV is 34.19 and 8.76 per cent during the post-reform period.
- **Average and CV of Production Workers:** For production workers, *textile* industry is again the most prominent sector (like pre-reform era) followed by *food products and beverages*. These two groups of industries are also among the most consistent providers of

[2] In table – 2 the average number of total employees in each industry group has been computed by summing together the number of employees in that industry from 1991-92 to 2005-2006 and then dividing this aggregate by the total number of years (15 in this case). Coefficient of variation for each industry shows the variation in employment in that industry over different years of post reform era. Similar exercise has been done for getting average number and CV of the Non-production workers and production workers. This exercise facilitates industry wise study of average of a particular category of workers and its CV over the given period of time.

employment in the post-reform era. The number of production workers in the above two industries were 1,092,686 and 1,007,732 respectively. The respective CVs were 5.62 and 5.36. The industry groups belonging to o*ffice, accounting and computing machinery* followed by *medical precision and optical instruments; watches and clocks* provide the least number of employment to the production workers. The CV of employment of production workers in these two industries were 21.20 and 9.55 per cent respectively over the given period of time.

From the above discussion it becomes clear that:

i. During both the periods of analysis i.e. pre and post-reform periods; industries related to (a) *Textiles,(b) Food products and beverages* were the dominant providers of employment to all categories of workers; the only exception being the *chemical and chemical products* industry which turned out to be the highest employer of the non-production workers during the post-reform era.

ii. The contribution of industry related to *office, accounting and computing machinery* in the creation of employment to all categories of workers was the least; the only exception being the *wearing apparel; dressing and dyeing of fur* industry which provided the least number of jobs to the non-production workers during the pre-reform period.

iii. The industries in which the size of employment was large, exhibited a low value of inter-temporal CV and vice-versa.

Table – 3: Degree of Skill Intensity (NP/P) in Different Industries Relative to the Aggregate Manufacturing Industry

Industry/NIC Code	**NP/P Pre-reform**	**NP/P Post-reform**	**Change in NP/P (Pre to Post-reform period)**
Food Products & Beverages (15)	High	Low	Constant
Tobacco products (16)	Low	Low	Decreased
Textiles (17)	Low	Low	Increased
Wearing apparel; dressing & dyeing of fur (18)	Low	Low	Decreased
Tanning & dressing of leather, footwear etc. (19)	Low	Low	Constant
Wood and Wood Products (20)	Low	Low	Increased
Paper and Paper Products (21)*	High	Low	Constant
Publishing, printing & recorded media (22)	High	High	Increased

Coke, refined petroleum & nuclear fuel (23)*	High	High	Decreased
Chemical and Chemical Products (24)*	High	High	Increased
Rubber and Plastic Products (25)*	High	High	Increased
Non-Metallic Mineral Products (26)*	Low	Low	Increased
Basic Metals (27)*	High	High	Constant
Fabricated Metals except machinery (28)	High	High	Increased
Machinery and equipment n.e.c. (29)	High	High	Increased
Office, Accounting & Computing Machinery (30)*	High	High	Increased
Electrical Machinery & Apparatus n.e.c. (31)	High	High	Decreased
Radio, Television & Communication Equipments (32)*	High	High	Increased
Medical, Precision & Optical Instruments, watches & clocks (33)	High	High	Increased
Motor vehicles & Trailers etc. (34)*	High	High	Decreased
Other Transport Equipment (35)	High	High	Increased
Furniture & Manufacturing n.e.c. (36)	High	High	Increased
All Manufacturing industry	0.26	0.29	Increased

* These industries are mainly capital-intensive industries.[3]

Note: For pre-reform period the industries which depict the value of NP/P > 0.26 (coefficient for the aggregate manufacturing industry) have been graded High, NP/P = 0.26 Medium and NP/P < 0.26 have been graded Low degree of skill intensity. For the post-reform period the bench mark value for grading High, Medium or Low skill intensity is 0.29.

A perusal at table – 3 reveals that during pre-reform period, 16 out of 22 industries depicted the coefficient of NP/P higher than the coefficient of the *aggregate manufacturing industry*. During post-reform period this number was 14. This shows that most of the individual industries witnessed greater skill intensity than observed in case of the *aggregate manufacturing industry*. The above discussion of the inter-industry ratio analysis of non-production to production workers has been summarised up as follows:

i. During pre-reform period relative employment of non-production workers was the highest in industry group belonging to *(a) Office, accounting and computing machinery;*

[3] If the K/L in an industry is greater than K/L of the aggregate manufacturing industry it has been treated as capital-intensive industry for our study.

followed by *(b) Electrical machinery and apparatus n.e.c.;* and *(c) Radio, television and communication equipments.*

ii. During the post-reform period also the above industries have maintained their dominance as regards the relative employment of the non-production workers. *Machinery and equipment n.e.c.; Publishing, printing and recorded media; and Medical, precision & optical instruments and watches and clocks* have emerged as further important industries where the relative employment of non-production workers has become very high.

iii. On the basis of results of the NP/P and CV, there does not appear to be any definite association between the NP/P ratio in an industry and the CV of that industry during pre-reform period. However, during the post-reform period, a definite positive association has been observed between the two variables.

iv. During the pre-reform period, 16 industries depicted greater skill intensity than that observed in case of the *aggregate manufacturing industry*. During post-reform period 14 industries had higher degree of skill intensity than the *aggregate manufacturing industry*.

v. From pre to post-reform period, 13 out of 22 industries increased their proportion of NP workers, then for 5 it decreased and for 4 it remained constant. The *aggregate manufacturing industry* increased its proportion of NP workers from pre to post-reform period.

vi. It is to be further noted that 7 out 14 industries which had high relative content of the skilled workers mainly belong to the capital-intensive industries. The nature of remaining industries is such that these require more relative employment of the skilled workers. Further, the capital-intensity in almost all industries has gone up from pre to post-reform period which may have stimulated the relative demand for the NP workers.

i. Distribution of Different Categories of Workers across Industries

Figures – 1 to 6 show the percentage distribution[4] of total employees, production workers and non-production workers in different industries during the pre and post-reform periods.

[4] The percentage distribution of total employees in different industries during a particular period has been computed by dividing the number of total employees in a particular industry (TWi) by the total numbers of employees in all manufacturing industries (TWt) and multiplying this coefficient by 100 i.e. % share of an industry in total employees = (TWi/TWt)*100. Similar exercise has been done for computing the percentage share of non-production workers and production workers in each industry.

- **Distribution of Total Employees**

It is evident from figure 1 that during the pre-reform period, the share of *textile industry* in total employees was 21.69 per cent, followed by *food products and beverages* (17.42%), *basic metals* (8.97%) and *chemical and chemical products industry* (7.56%). These four industries together constituted about 56 per cent share in the total employment.

It may be observed from figure 2 that the share of *textile* industry in total employees has reduced from 21.69 to 16.26 per cent from pre to post-reform period. The share of *food products and beverages* has also reduced marginally from 17.42 to 16.38 per cent. The share of *basic metals* has also declined marginally from 8.97 to 7.80 per cent and that of *chemical and chemical products industry* has increased from 7.56 to 9.56 per cent. But these four industries are still the most dominant sector for employment generation; though their combined share in total employment has declined from approximately 56 per cent (pre-reform) to 50 per cent (post-reform).

- **Distribution of Non-production Workers**

A cursory glance at figure 3 shows that during pre-reform period the highest share in the distribution of non-production workers is obtained by industries related to *food products and beverages* (18.11%) followed by *textile industry* (12.83%), *chemical and chemical products industry* (10.75%) and *basic metals* (10.5%). These four industries alone constituted about 52 per cent share of the non-production workers in the manufacturing sector during pre-reform period.

During the post-reform period, figure 4 shows that the highest share in the distribution of non-production workers is obtained by industries related to *food products and beverages* (16%) followed by *chemical and chemical products industry* (13.42%); *textile industry* (10.63%) and *basic metals* (8.61%). These four industries alone constituted about 49 per cent share of the non-production workers in the manufacturing sector during the post-reform period. However, the share of these four industries has marginally declined during this period. Machinery and equipments n.e.c. was another important share holder (9 per cent approximately) in the non-production workers during both the periods.

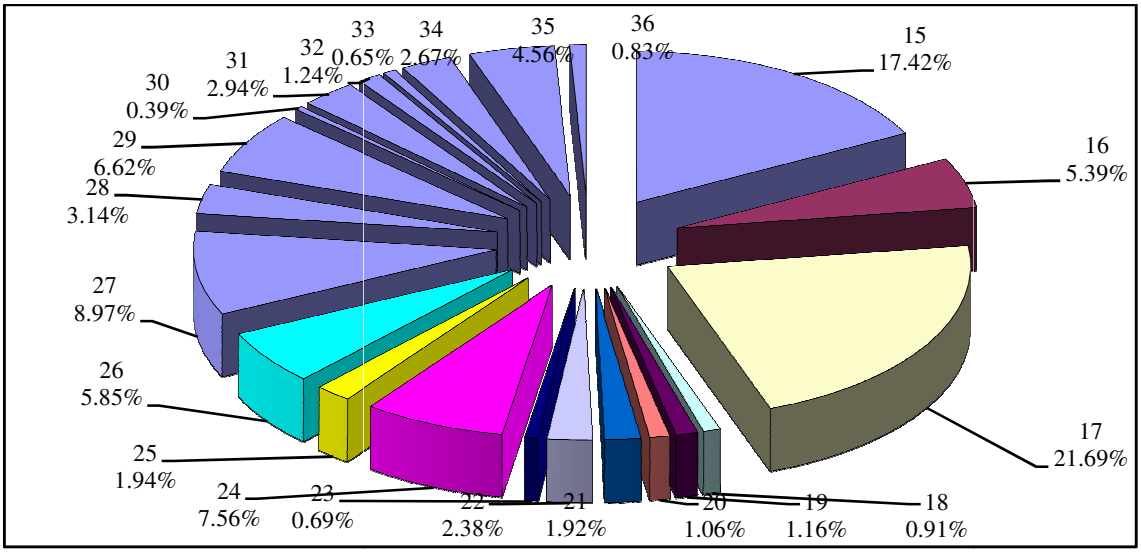
- **Distribution of Production Workers**

The distribution pattern of production workers in different industries is not significantly different from the pattern observed for the total employees during both the periods. It can be observed from figure 5 that the leading industries showing very high proportion of the production workers are again the same as that for the total employees. The share of *textile industry* is the highest (24%) followed by *food products and beverages industry* (17.24%); *basic metals* (8.56%); and *chemical and chemical products industry* (6.72%). These four industries together constituted about 57 per cent of the production workers.

Figure 6 shows that during post-reform period the share of *textile industry* declined from 24 to 17.88 per cent which is again followed by *food products and beverages* (16.49%); *chemical and chemical products industry* (8.44%) and *basic metals* also (7.57%). These four industries together constitute about 50 per cent of total production workers during the post-reform period. The *tobacco products industry* has emerged an important source of employment for the production workers during the post-reform period. Its share has increased from 6.33 per cent (pre- reform) to 7.52 per cent (post-reform).

An important observation regarding the distribution of different categories of workers during both the periods is that the four industries viz. *Textiles; food products and beverages; basic metals*; and *chemical and chemical products industry* are the most prominent industries providing employment to both the non-production as well as the production workers.

Figure – 1: Distribution of Total Employees across Industries during Pre-reform Period



Journal of Business Management and Information Systems©2014 QTanalytics
2394-3130 electronic ISSN

Figure – 2: Distribution of Total Employees across Industries during Post-reform Period

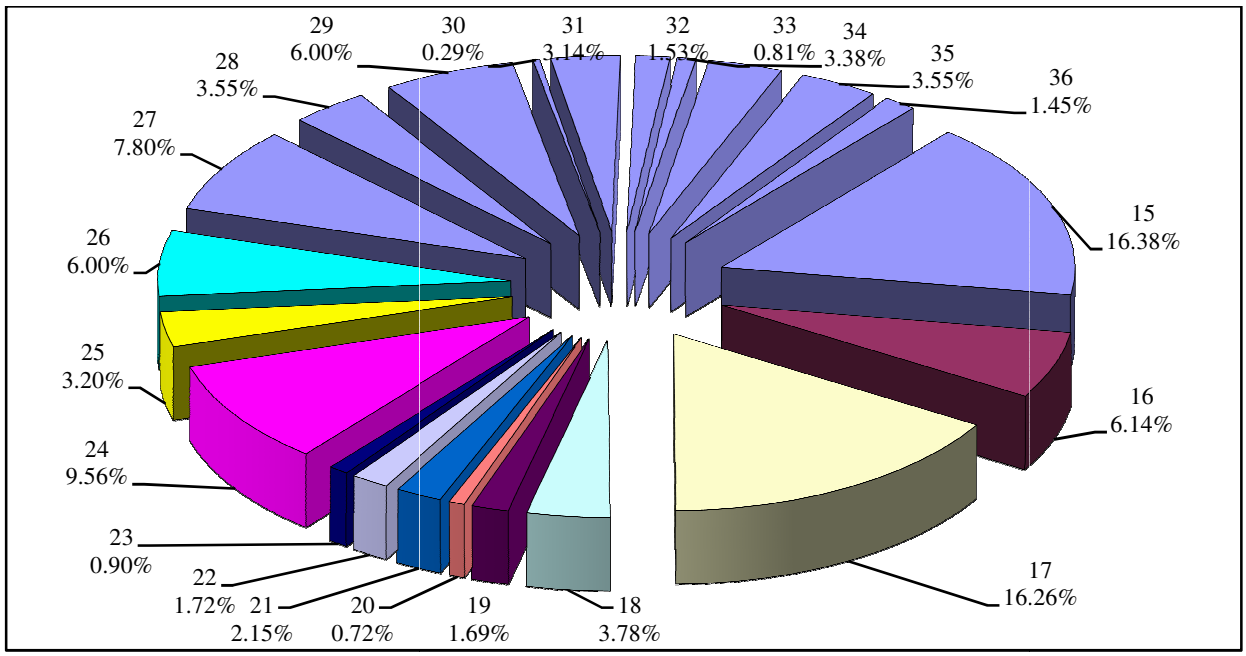


Figure – 3: Distribution of NP Workers across Industries during Pre-reform Period

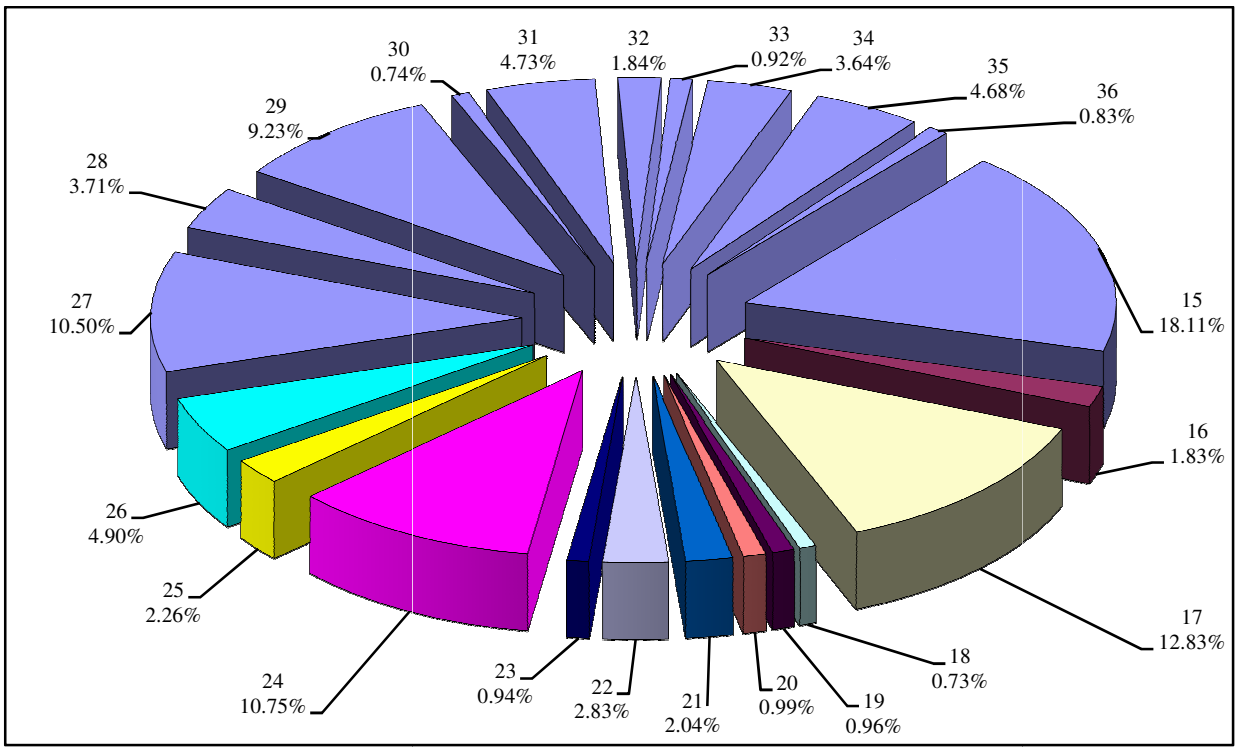


Figure – 4: Distribution of NP Workers across Industries during Post-reform Period

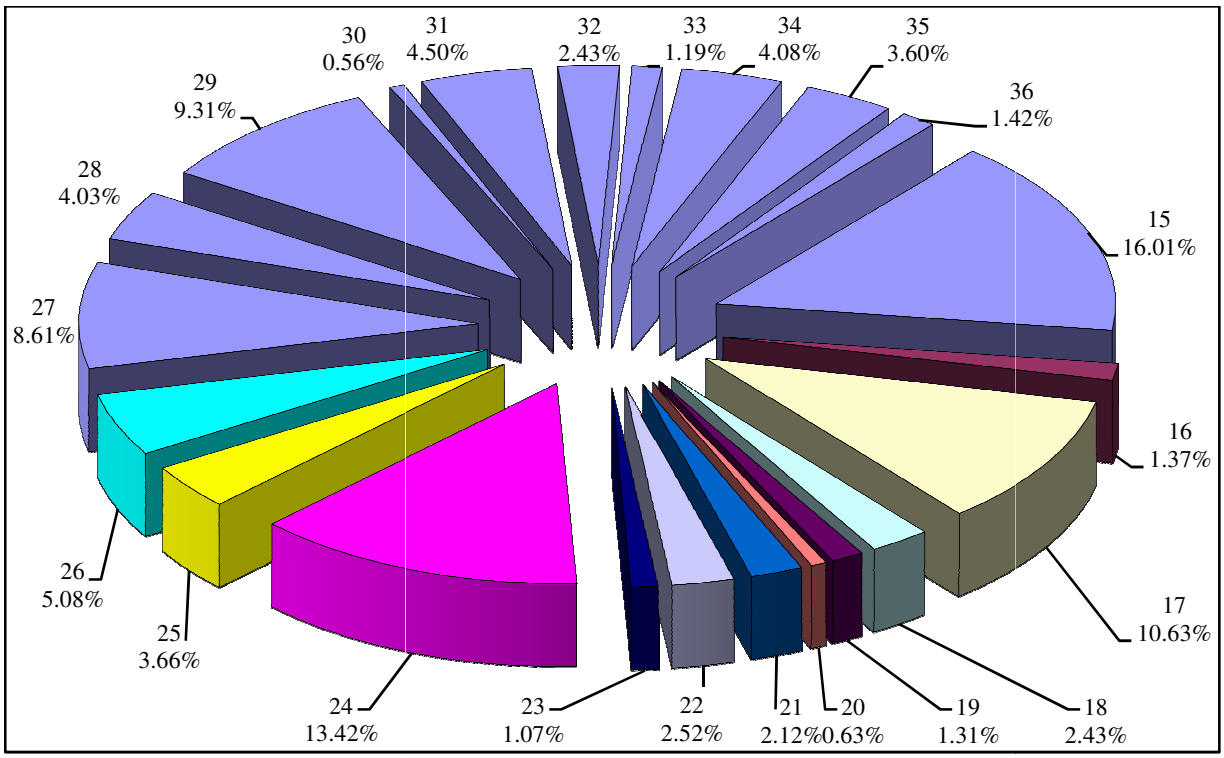


Figure – 5: Distribution of P Workers across Industries during Pre-reform Period

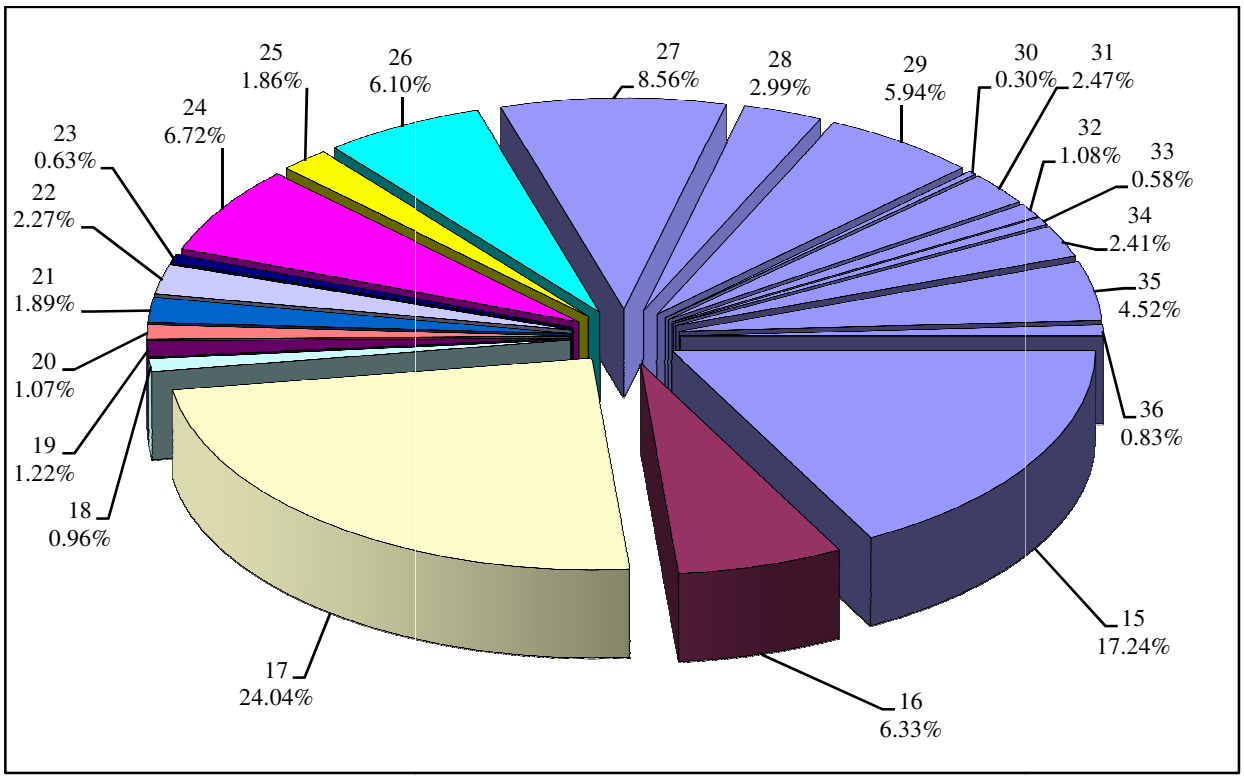


Figure – 6: Distribution of P Workers across Industries during Post-reform Period

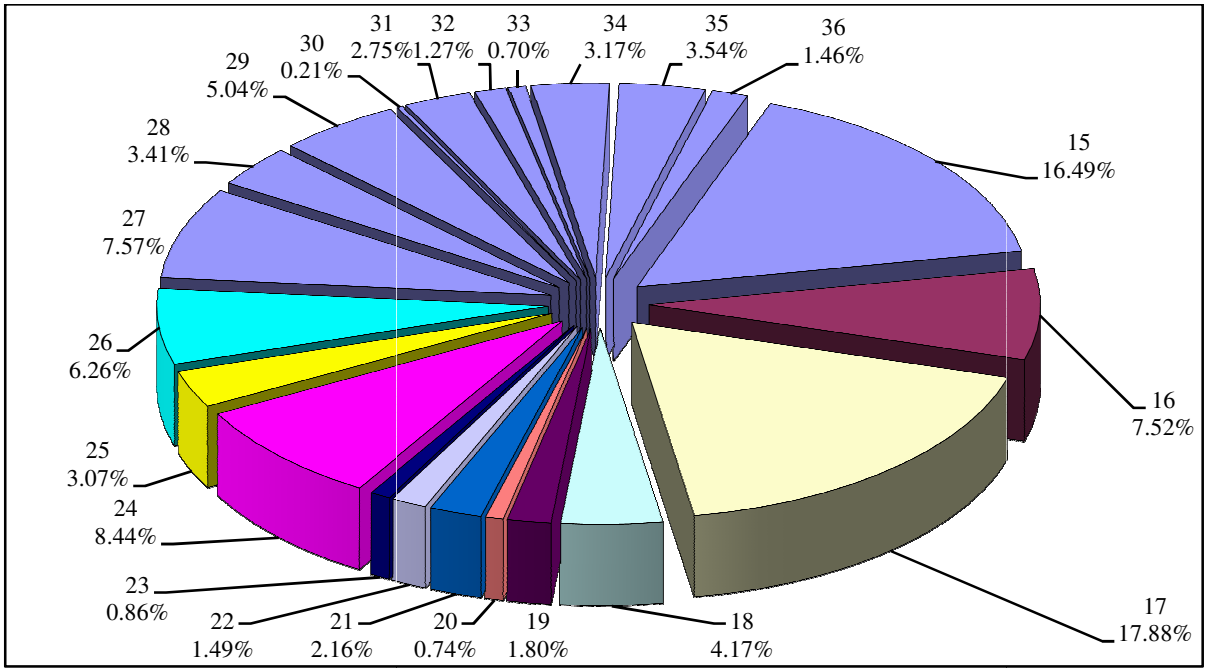


Table – 4 shows the distributive status of different industries in the total employment of NP workers. It is evident that during the pre-reform period eight industries have depicted higher than average percentage share in the employment of NP workers. During the post-reform period six industries have depicted the same.

Table – 4: Distributive Status of Different Industries with regard to NP Workers

S. No.	Industries	% Share of NP Workers Pre-reform	% Share of NP Workers Post-reform
1.	Food Products & Beverages (15)	High	High
2.	Tobacco products (16)	Low	Low
3.	Textiles (17)	High	High
4.	Wearing apparel; dressing & dyeing of fur (18)	Low	Low
5.	Tanning & dressing of leather, footwear etc. (19)	Low	Low
6.	Wood and Wood Products (20)	Low	Low
7.	Paper and Paper Products (21)	Low	Low
8.	Publishing, printing & recorded media (22)	Low	Low
9.	Coke, refined petroleum & nuclear fuel (23)	Low	Low
10.	Chemical and Chemical Products (24)	High	High
11.	Rubber and Plastic Products (25)	Low	Low

12.	Non-Metallic Mineral Products (26)	High	High
13.	Basic Metals (27)	High	High
14.	Fabricated Metals except machinery (28)	Low	Low
15.	Machinery and equipment n.e.c. (29)	High	High
16.	Office, Accounting & Computing Machinery (30)	Low	Low
17.	Electrical Machinery & Apparatus n.e.c. (31)	High	Medium
18.	Radio, Television & Communication Equipments (32)	Low	Low
19.	Medical, Precision & Optical Instruments, watches & clocks (33)	Low	Low
20.	Motor vehicles & Trailers etc. (34)	Low	Low
21.	Other Transport Equipment (35)	High	Low
22.	Furniture & Manufacturing n.e.c. (36)	Low	Low

Note: The industries which depict the percentage share of NP > 4.5% have been graded High, = 4.5% have been graded Medium and NP/P < 4.5% have been graded Low degree of skill intensity. Since average skill intensity in an industry in terms of its distributive share in the total employment of the NP workers should be 100/No. of industries, which is 100/22 = 4.5% in the present case.

Table – 5 shows the net change in the share of different industries of all three categories of workers from pre to post-reform period. From pre to post-reform period, 14 industries were net gainers and 8 out of 22 industries were net losers of their share in total employment. With respect to non-production workers, 13 industries increased while 9 industries decreased their share. For production workers, 14 industries increased while 8 decreased their share during post-reform period. The industry related to *chemical and chemical products* was the highest gainer (2.67%) while *textiles industry* was the highest looser (-2.2%) of NP workers from the pre to post-reform period.

Table – 5: Change in the Share of Total Employees, NP Workers and P Workers for Different Industries (Pre to Post-reform period)

S. No.	**Industries**	**Δ (%) Total Emp.**	**Δ(%) NP**	**Δ(%) P**
1.	Food Products & Beverages(15)	Decreased (-1.04)	Decreased (-2.11)	Decreased (-0.74)
2.	Tobacco products(16)	Increased (0.75)	Decreased (-0.46)	Increased (1.19)
3.	Textiles(17)	Decreased (-5.44)	Decreased (-2.20)	Decreased (-6.15)
4.	Wearing apparel; dressing & dyeing of fur(18)	Increased (2.87)	Increased (1.71)	Increased (3.21)
5.	Tanning & dressing of leather, footwear etc.(19)	Increased (0.53)	Increased (0.35)	Increased (0.58)

6.	Wood and Wood Products(20)	Decreased (-0.34)	Decreased (-0.36)	Decreased (-0.33)
7.	Paper and Paper Products(21)	Increased (0.23)	Increased (0.07)	Increased (0.27)
8.	Publishing, printing & recorded media(22)	Decreased (-0.66)	Decreased (-0.31)	Decreased (-0.77)
9.	Coke, refined petroleum & nuclear fuel(23)	Increased (0.21)	Increased (0.13)	Increased(0.23)
10.	Chemical and Chemical Products(24)	Increased (1.99)	Increased (2.67)	Increased (1.72)
11.	Rubber and Plastic Products(25)	Increased (1.26)	Increased (1.41)	Increased (1.21)
12.	Non-Metallic Mineral Products(26)	Increased (0.14)	Increased (0.18)	Increased (0.16)
13.	Basic Metals(27)	Decreased (-1.17)	Decreased (-1.89)	Decreased (-0.99)
14.	Fabricated Metals except machinery(28)	Increased (0.40)	Increased (0.32)	Increased (0.41)
15.	Machinery and equipment n.e.c.(29)	Decreased (-0.62)	Increased (0.09)	Decreased (-0.89)
16.	Office, Accounting & Computing Machinery(30)	Decreased (-0.10)	Decreased (-0.18)	Decreased (-0.08)
17.	Electrical Machinery & Apparatus n.e.c.(31)	Increased (0.20)	Decreased (-0.23)	Increased(0.28)
18.	Radio, Television & Communication Equipments(32)	Increased (0.30)	Increased (0.59)	Increased (0.20)
19.	Medical, Precision & Optical Instruments, watches & clocks(33)	Increased (0.15)	Increased (0.27)	Increased (0.11)
20.	Motor vehicles & Trailers etc.(34)	Increased (0.71)	Increased (0.44)	Increased (0.76)
21.	Other Transport Equipment(35)	Decreased (-1.01)	Decreased (-1.08)	Decreased (-0.99)
22.	Furniture & Manufacturing n.e.c.(36)	Increased (0.62)	Increased (0.59)	Increased (0.63)

Note: Figures in parentheses indicate the magnitude of change from pre to post-reform period

From the foregoing analysis of the distribution of different category of workers in different industries it may be concluded that:

i. During the pre-reform period, there were four industries out of twenty two namely; (a) *Textiles* (b) *Food products and beverages* (c) *Basic metals and (d) Chemical and chemical products* which together employed about 56 per cent of total employees, 52 per cent of non-production workers and 57 per cent of production workers.

ii. During the post-reform period, these four industries employed about 50 per cent of total employees, 49 per cent of non-production workers and 50 per cent of the production workers.

iii. From pre to post-reform period, 13 industries increased their share in the NP workers while 9 industries decreased the same.

4. CONCLUSION

Contrary to the H-O trade theoretic predictions of rising relative demand for sector specific unskilled or less skilled employment in developing economies, empirical evidences suggest a globally pervasive skill bias in the earnings and employment composition of manpower. However, in case of Indian registered manufacturing sector the scholars are not unanimous about the degree and dimension of the changing composition for the skilled workers.

From the above analysis it is obvious that during both the period of analysis i.e. pre-reform as well post-reform period the average number of all three categories of employees has shown an increasing trend. The CAGR of non-production workers has remained higher than the CAGR of other two categories of employees till 2001-02. Since then, the CAGR of production workers has taken the leading position.

During pre-reform period the CV of all three groups has also declined. Further, the CV of non-production workers has always remained lower than the CV of total employees and production workers. However, the CV of total employees and production workers has declined during the post-reform period, these are still higher than the CV of non-production workers (except during the year 1998-99 when the situation was reversed).

A perusal at industry level analysis of composition of employees for aggregate time period shows that during both the periods of analysis i.e. pre and post-reform periods; industries related to (a) *Textiles,(b) Food products and beverages* were the dominant provider of employment to all categories of workers. The only exception was the *chemical and chemical products* industry which turned out to be the highest employer of the non-production workers during the post-reform era. The contribution of industry related to *office, accounting and computing machinery* in the creation of employment to all categories of workers was very small. The only exception being the *wearing apparel; dressing and dyeing of fur* industry which provided the least number of jobs to the non-production workers during the pre-reform period. The industries in which the size of employment was large exhibited a low value of inter-temporal CV and vice-versa.

The pie chart showing distribution of different categories of workers across industries shows that during the pre-reform period, there were four industries out of twenty two namely, (a) *Textiles,* (b) *Food products and beverages,* (c) *Basic metals and (d) Chemical and chemical products* which together employed about 56 per cent of total employees, 52 per cent of non-production workers and 57 per cent of production workers. During the post-reform period these four industries employed about 50 per cent of total employees, 49 per cent of non-production workers and 50 per cent of the production workers. From pre to post-reform period, 14 out of 22 industries increased, while 8 industries decreased their share in total employment. For non-production workers 13 industries increased, while 9 industries decreased their share from the pre to post-reform period.

A careful observation of the behaviour of NP/P and the distribution of NP workers across different industries reveals a very interesting feature of the changes in the skill intensity in the Indian manufacturing industry. It shows that there is improvement in skill intensity *within an industry* and also there is redistribution of skilled workers *among different industries*. .

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