

TRENDS AND PATTERNS OF EMPLOYMENT IN TECHNOLOGY- INTENSIVE INDIAN MANUFACTURING:AN INDUSTRY-WISE EXPLORATION

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ABSTRACT

The paper explores employment trends and patterns differently based on the industry's technological classifications. This research suggests that a high-technology-intensive industry increases employment growth rates. Similarly, low-technology-intensive and medium workers gap have widened after the trade liberalization. It is found that major industry groups have witnessed slightly increasing employment growth during the 1989-1990 to 1999-2000. Then declined during the period 2000-01 to 2005-06. This study examines shifts in employment generation potential of different sectors of manufacturing industry.

Keywords: Elasticity, Employment Growth, High-Medium-Low-Tech; skill-intensive, trade liberalization, Value Added.

INTRODUCTION

In the recent decades, technology is known to substitute the workers. Skill based technology in labour-scarce country increases demand for skilled workers (Acemoglu, 2002; Berman, Bound and Machin, 1998; Berman and Machin, 2000). The skilled based technological change and trade liberalisation is by-product of the process of globalization. In the recent decades, export-led growth has become a dominant factor in employment growth in high technology-intensive industries, whereas import penetration adversely affect the employment growth in low technology-industries (Gera and Masse, 1996). In the Indian context, technological change in manufacturing sector has been skill-based since trade liberalisation policies were

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introduced. This has precipitated increased demand for skilled workers (Uma and Rani, 2005; Banga, 2005 and Pradhan; 2006).

There exists a huge literature on trade liberalisation and employment growth mainly in Indian organised manufacturing. There are only few studies which have systematically analysed the technology- intensive industries and the unorganised Indian manufacturing sector. The paper tries to fill this gap by analysing the technological classification and both organised and unorganised Indian manufacturing. However, present study is more detailed in terms of the level of aggregation of industries and also in the coverage of time period as it is extended to recent years. The coverage of a longer time span in the post 1990s period helps for a better assessment to understand the trends and patterns of various types of labour composition.

RESEARCH METHODOLOGY, DATA OVERVIEW AND ISSUES

This study seeks to contribute to the contemporary policy discussion about factors constraining India's manufacturing employment performance in order to make industry- level policy suggestions. It presents the trends and patterns of India's employment dynamics since 1990s against the backdrop of the growing 'jobless' employment growth. The focus is on the changing performance of manufacturing employment at the NIC-1998 at 3-digit level.

For this analysis, the various datasets are used such as: Annual Survey of Industries (ASI), National Sample Survey Organization (NSSO) by Central Statistical Office. The comprehensive data of ASI provides classification at different digits which provides detailed specifications of industries. This study used 55 industries at 3-digit level groups, covering the period from 1989-90 to 2005-06.

The data collection of organised manufacturing sector is covered under the Central Rules 1959, framed under the 1953 Act provided for comprehensive data by ASI. The organized manufacturing sector data is abstracted from the ASI, undertaken by the CSO, which is an annual census-cum-sample survey of all the organized manufacturing units for all the industries across all the states. It covers all factories under sections 2m (i) and 2m (ii) of the factories act, 1948. It collects data from those factories employing 10 or more workers, using the power and those employing 20 or more workers without using power.

The unit-level data for the unorganised manufacturing sector is obtained from the quinquennial surveys conducted by NSSO, Central Statistical Organisation (CSO) for 1994-1995 (51st round), 2000-2001 (56th round) and 2005-2006 (62nd round). Data of available rounds of ASI and NSSO have been used at different NICs. The present study confines the mapping of industrial classifications into the NIC-1998 at 3 digit level. Technology-based classification of industries is followed as per the Organisation for Economic Cooperation and Development to identify technological-intensive industries in Indian manufacturing (OECD, 2007).

TECHNOLOGY-INTENSIVE INDUSTRIES

This study deals with employment growth rates and its share in technology-intensive industries for the period 1989-1990 to 2005-06. We depict the data of 55 three-digit industries, reclassified into three technology-intensive subgroup namely, High-Tech (HT), Medium-Tech

(MT) and Low-Tech (LT) in Indian manufacturing. This exercise is done according to the technology-based classification provided by OECD (2007).

In aggregate Indian manufacturing data, the MT-intensive industries have registered highest growth in value added during 2001-06 (Table 1.1). Whereas, the HT and LT-intensive industries had a satisfactory growth rate registered in value added during the same period. By contrast, The HT-intensive industries have registered highest employment growth rate during the same period. While, MT industries have registered 3.08 per cent and LT industries registered its negative growth rate (Table 1.1).

The changing trends and patterns of employment in Indian organised manufacturing respective to 55 industries and technology-intensive sub-group for the different periods 1989-90 to 2005-06 in NIC-98 at 3-digit group is presented in Table 2. In the initial period of liberalisation during early 1990s, value added in the organised manufacturing grew at 8.36 per cent, with growth of employment at 2 per cent (Table 1.2).

In the unorganised manufacturing, the manufacturing value added has registered a negative growth rate (-1.94 per cent) and employment also registered negative growth rate (-2.39) during the 1989-1990. The HT industries have registered higher growth rate in value added, whereas the HT industries had registered highest growth rate in employment. As in the organised manufacturing, this fastest growing sector (HT, LT and MT) industry is value added. Some analysts have argued that the reason for high growth rate in these value added industries has been caused by the high effective rates of protection that these industries enjoyed. It has been compared with organised manufacturing to unorganised manufacturing, that had a negative growth rate in value addition (Uma and Rani, 2004).

Despite, the high growth rate of value addition, employment grew very slowly in the organised manufacturing and in the context of unorganised manufacturing there is a declining growth rate. The slow growth rates in employment in the organised manufacturing have been termed as the period of 'jobless' growth (Nagaraj, 2000). In the organised manufacturing, employment growth was comparatively higher in HT industries in comparison with others. By contrast, in the unorganised manufacturing; employment in the LT industries had a negative growth rate while MT industries shows positive growth rate. The employment elasticity for Indian manufacturing was (-0.09) during 1989-95 and it slightly increased during the period of 1995-2001 (Table 1.1) and declined again (0.13) during 2001-2006. The low absorption of labour in the Indian manufacturing, some have argued, is due to inappropriate technological choices and product composition.

In the period of 1994-95 to 2005-06, the growth of value added is almost stagnant. At the same time, growth rates of employment have decreased by two times over the last two periods of 2000-01 to 2005-06. Table 1.2 documents the growth rates of value added and employment for each sector. These growth rates of value added reveal the similar cyclical pattern over the period of time. The HT industries expanded rapidly during the early 1990s when the India economy witnessed the early globalisation. It shows that HT industries grew faster (3.85 to 6.19 per cent) than the MT industries (3.52 to 3.08 per cent) over the period of 1994-95 to 2005-06.

At the same time, aggregate employment growth rate decreased from 2.9 per cent to 1.2 per cent during the same period of time. The performance of employment patterns in the LT has slightly decreased whereas the HT and MT industries had increased growth rates and other industries registered almost negative growth rates in Indian manufacturing. Therefore, the evidence does not suggest any clear trend in the employment elasticity in Indian manufacturing. In the case of HT and MT industries, the employment elasticity has though increased (Table 1.1).

Table 1.2 shows that across the industry groups, leather (16.5 per cent), footwear products (12 per cent) and chemical products (7.4 per cent) had a high growth rates in value addition. Further, growth rate was observed higher for petroleum products and fuel, non-ferrous metal, general purpose machinery, special purpose machinery and TV, radio, video and tubes during the same period of time. Undoubtedly, during this period consumer goods industry dominated the manufacturing sector. In this connection, metal based and machinery industries had a comparatively better growth rates than the earlier periods in the Indian organised manufacturing.

Table 1.1: Aggregate Growth Rates and Employment Elasticity of Indian Manufacturing

Industry Group	Growth Rates Value Added (CAGR)		
	1989-95	1995-2001	2001-2006
High Tech	7.34	8.68	8.03
Low Tech	3.57	5.77	8.32
Medium Tech	7.59	8.09	12.60
Total Manufacturing	5.81	7.41	9.47
Growth Rates Employment (CAGR)			
High Tech	-0.65	3.85	6.19
Low Tech	-1.98	2.65	-3.38
Medium Tech	-0.08	3.52	3.08
Total Manufacturing	-1.57	2.90	1.24
Employment Elasticity			
High Tech	-0.09	0.44	0.77
Low Tech	-0.55	0.46	-0.41
Medium Tech	-0.01	0.44	0.24
Total Manufacturing	-0.27	0.39	0.13

Source: Calculated by Author from Unit-Level NSS rounds, Annual Survey of Industries

Note: *The employment elasticity is estimated by dividing the rate of growth of employment by the rate of growth value added.

Similarly, In case of employment across the industry groups of knitted and crocheted, leather products, refined petroleum and chemical industries; employment growth rates were higher among the HT-industries. Likewise, employment growth has been registered higher in TV, radio, video, machinery, optical instruments, and photography equipment after economic reforms.

Further, HT and MT industries are performing well with regards to employment growth in Indian organised manufacturing. Table 1.2 indicates that across the manufacturing industries HT industries has registered rapidly rising employment growth rates over the period 1989-90 and 2005-06 compared to the MT and LT industrial groups. In the early 1990s, across the manufacturing sectors, LT industries have registered negative employment growth; after that it has increased slightly over the second period and again decreased in the third phase of this study. The rate of employment growth in Indian manufacturing has marginally slowed down from 2.9 per cent in 1994-2001 to 1.2 per cent in 2005-06. This slowing down trend in employment generation has led to a general concern in India about the impact of trade liberalisation on employment.

HOLISTIC PICTURE OF EMPLOYMENT IN MANUFACTURING INDUSTRIES

We estimate the employment growth rates and share of employment in total Indian manufacturing (Table 1.3). Some important results emerge in HT industries. Trend of employment growth rates is as follow: -0.65 per cent in 1990s and around 6.40 per cent in early 2000s. Thus higher growth rates were registered during the last decade compared to previous decades. Across the HT industries which saw a drastic fall in the employment trend; growth rate in man-made fibres, watches and clocks, aircraft and spacecraft, TV and radio transmitters, TV and radio receivers and bodies for motor vehicle; there was sharp decline. This sharp fall can be attributed to the lack of investment in R&D in the wake of a high competitive environment of 1990s (Mehta, 2011).

Similarly, in case of employment across the industry groups of knitted and crocheted, leather products, refined petroleum and chemical industries employment growth rates are higher among the HT-industries. Likewise, employment growth has been registered higher in TV, radio, video, machinery, optical instruments-photograph equipment after economic reforms. Further, HT and MT industries performed well with regard to employment growth in Indian organised manufacturing. Table 1.2 indicates that across the manufacturing industries HT industries registered rapidly rising employment growth rates over the period 1989-90 and 2005-06 compared to the MT and LT industrial groups. In the early 1990s, across the manufacturing sectors, LT industries registered negative employment growth. After that it has increased slightly over the second period and again decreased in the third phase of this study. The rate of employment growth in Indian manufacturing has marginally slowed down from 2.9 per cent in 1994-01 to 1.2 per cent in 2005-06. This slowdown trend in employment generation led to a general concern in India about the impact of trade liberalisation on employment.

However, among HT industries, only few industries have shown an increasing trend of employment growth rates in the post-reform era. These are the office, accounting and computer machinery, medical appliances, general purpose machinery, electronics motors, etc,

Table 1.2 :Growth Rates in Employment and Value Added of Indian Manufacturing by NIC-1998 at 3-Digit

Industry Group	Organised Manufacturing		Unorganised Manufacturing		Organised Manufacturing		Unorganised Manufacturing					
	Value Added(CAGR)		Value added(CAGR)		Employment(CAGR)		Employment(CAGR)					
	1989-95	1995-01	1989-95	2001-06	1989-95	2001-06	1989-95	2001-06				
High Tech (HT)												
242	7.90	13.29	7.41	-21.23	10.57	12.82	3.17	5.85	1.89	-12.94	11.40	3.70
291	5.05	15.51	14.20	-20.94	31.70	5.28	1.53	12.61	0.78	-11.67	29.94	27.02
292	5.05	-1.05	13.66	-1.60	9.08	9.21	0.36	-8.75	-0.03	0.88	4.71	6.21
321	7.51	25.81	12.00	-4.91	18.45	-2.12	8.02	4.97	7.29	4.91	11.78	7.47
322	5.37	-0.90	5.46	-38.30	62.73	0.09	4.02	-12.34	-3.87	-26.38	34.06	2.41
323	21.71	-1.66	1.77	5.98	-7.29	14.01	-1.95	0.45	-6.14	1.82	-8.96	0.73
332	24.88	15.89	4.56	27.75	-13.09	1.57	51.26	7.30	3.08	7.99	-11.95	13.24
241	12.25	10.22	7.56	-20.87	11.03	-1.51	3.36	1.31	-4.10	10.55	-6.85	27.78
243	2.40	-0.34	-14.32	-30.76	15.10	24.46	10.77	-5.31	0.09	-31.74	4.88	59.50
300	10.67	-12.29	34.03	19.91	-63.76	-0.94	-1.57	-6.12	4.21	5.91	-36.92	17.00
319	4.61	18.79	19.96	19.70	53.86	19.44	-5.92	12.76	9.01	10.58	48.53	5.04
331	13.95	15.34	16.96	-25.31	12.53	-4.74	5.39	4.54	3.17	-15.03	12.70	22.42
333	0.76	-0.18	23.34	14.84	-29.95	-36.48	-0.93	0.01	-7.78	4.29	-31.48	4.59
351	15.48	3.85	16.94	-27.13	38.47	10.82	-0.21	-0.70	-2.59	-36.06	27.75	14.88
353	14.13	20.51	-17.41	80.86	18.97	19.35	4.67	-8.57	-10.19	-34.43	23.64	3.57
293	13.39	17.91	-1.26	-31.57	10.46	2.42	4.65	10.02	-5.67	-14.98	8.18	5.83
311	9.63	1.36	6.42	-22.75	17.30	4.56	3.75	-3.52	2.08	-13.14	22.06	23.45
313	13.09	7.54	-5.00	-6.16	4.44	8.38	0.95	2.90	-2.91	-15.12	7.79	33.37

314	4.75	12.41	6.16	4.14	11.75	0.51	3.32	2.95	1.88	6.34	6.37	4.09
315	8.97	12.48	-2.55	-24.53	13.14	-12.08	1.77	-1.81	3.71	-5.14	8.20	17.07
341	11.31	11.74	8.78	-6.24	-57.07	-1.01	1.28	-4.77	0.72	-9.91	-53.99	25.48
342	6.83	-47.25	5.95	-14.05	18.04	-3.48	5.80	-28.05	-4.36	3.98	11.38	4.22
343	12.14	61.15	2.05	21.59	28.78	-1.28	3.61	47.12	6.90	11.62	19.36	10.08
352	-8.10	-13.65	13.70	-17.68	1.12	0.65	2.72	-34.98	-5.70	-24.48	7.22	3.60
359	16.76	9.15	4.68	-0.97	1.32	0.82	1.33	3.24	3.89	-4.55	-2.89	18.42
Total HT	8.87	8.39	8.01	-11.73	14.04	8.49	2.51	0.48	1.12	-6.36	9.86	11.70
Low Tech (LT)												
173	10.34	16.30	-1.41	5.11	4.30	8.90	10.73	4.65	20.46	-17.52	7.63	-0.79
191	6.77	-1.17	16.56	11.95	11.01	2.03	0.32	-5.01	7.93	4.99	3.06	9.96
192	15.61	10.79	12.04	7.42	-0.96	1.03	7.15	6.06	6.71	-3.20	-5.28	-8.88
151	9.84	1.73	13.04	4.22	5.20	2.58	2.19	0.32	2.36	-3.02	9.84	-6.14
152	-5.16	13.84	18.75	7.90	7.46	-2.18	4.62	2.68	0.74	8.75	6.11	-19.27
153	13.04	6.95	13.16	-3.97	9.98	-3.49	2.12	4.88	1.49	-2.64	6.49	-8.70
154	3.83	2.42	11.95	-1.68	14.50	5.95	-0.90	7.80	-0.84	0.90	1.08	-1.21
155	8.51	14.07	10.15	-3.31	17.12	5.19	3.43	2.08	6.29	9.34	3.61	-15.79
160	7.18	7.72	17.50	-4.30	6.04	9.23	2.10	-1.86	0.05	-8.80	9.27	-37.53
171	6.02	1.47	6.34	-5.67	5.17	-12.53	-0.82	-0.63	-1.93	-4.93	-0.74	-21.03
172	8.90	16.86	17.51	3.21	12.15	8.98	2.79	11.87	8.96	1.42	0.21	-15.28
181	27.00	2.29	14.13	6.18	17.84	-9.03	17.35	3.77	12.12	0.67	18.22	20.98
182	21.95	-14.39	5.78	7.94	28.30	-7.38	12.67	-2.59	-1.12	2.24	-2.65	1.29
201	-12.12	4.58	-11.58	7.29	-9.46	1.39	-2.59	-27.04	15.43	4.99	-4.04	2.41
202	-1.86	-4.15	25.54	-10.62	4.15	0.75	0.75	-2.96	3.02	-4.34	3.21	6.03

210	3.56	-0.88	15.99	-3.95	13.09	12.31	3.57	1.75	0.22	-1.13	6.87	3.05
221	10.85	3.19	16.49	-6.04	7.16	1.36	2.66	-6.43	3.28	-2.16	4.79	3.82
361	30.00	16.65	9.31	1.41	5.68	7.91	4.73	6.87	5.08	-7.46	-4.79	2.11
369	20.61	20.24	11.52	7.05	6.09	4.03	9.65	10.60	8.33	5.42	-3.92	-8.51
Total LT	7.50	4.56	11.90	-1.64	7.65	1.71	1.77	1.84	2.33	-2.51	2.78	-4.41
Medium Tech (MT)												
232	8.96	-1.44	-0.60	-5.10	-11.04	1.50	6.97	3.59	4.43	-1.57	-25.59	-1.30
231	12.35	-1.07	14.08	-9.99	6.43	14.91	4.03	-4.55	1.74	-12.97	7.23	7.47
272	5.53	13.92	13.79	-2.08	11.14	12.63	-8.75	16.49	-1.49	13.20	2.08	9.28
251	10.49	6.89	2.11	3.87	-8.53	1.75	4.02	2.56	-1.79	6.02	-1.22	12.04
252	9.57	14.42	11.80	5.56	4.78	4.20	6.80	6.71	6.68	5.55	3.69	9.20
261	-0.30	7.79	10.69	-15.93	10.40	2.15	-1.09	-1.21	1.73	-16.15	0.83	-1.92
269	4.97	12.34	10.39	2.59	16.34	4.71	0.65	0.50	5.37	-1.03	3.30	2.74
271	11.82	5.17	19.83	-6.53	0.30	0.57	1.58	-1.02	0.02	-12.83	-0.36	8.35
273	3.28	9.81	13.41	-17.50	17.28	5.83	-0.46	0.40	3.18	-6.15	0.77	22.36
281	12.32	24.17	20.94	5.01	28.90	1.95	3.43	14.01	4.15	2.07	25.39	6.53
289	5.72	5.15	14.61	3.98	4.91	6.59	1.65	-0.78	6.65	0.39	2.12	-1.82
Total MT	8.61	7.41	13.86	2.40	11.72	5.11	1.46	1.70	3.17	-0.63	4.16	3.05
Total Man-ufacturing	8.36	6.98	10.92	-1.94	9.00	3.21	1.92	1.42	2.18	-2.39	3.28	1.01

Source: Calculated by author from various rounds NSS (unit-level) and Annual Survey of Industries

*Bold print indicates organised/unorganised manufacturing industries at aggregate level

electronic lamps, etc and transport equipment etc. Within the HT industries, remaining other industries have stagnant trends towards employment growth rates. Higher skill premia among the HT industries are more strongly associated with R&D and training rather than with exports (Berman *et al.* 1998). To narrow this gap, skilled labour must be reallocated from production to imitation (R&D, reverse engineering). This shift towards HT-intensive (more skill-intensive) activities raises the relative earning of skill labour but only temporarily (Connor and Lunati, 1999). Trade liberalisation would significantly raise R&D expenditure, and growth rates of those industries would fall since R&D remains a relatively unimportant activity.

Within the subgroup of MT industries, a steep fall is seen in the trend of employment growth rate of basic and non-ferrous metal, glass and glass products and fabricated metal, etc. There are, though, few industries which have shown increased trends of employment growth rates in the post-reform era. These are refined petroleum products, coke-oven products, plastic products, basic iron ore and steel, casting of metals and structural metal, etc. By contrast, only industrial subgroup of MT industries which witnessed an overall rise in the employment growth in post trade liberalisation. This was basically due to the rise in trend in growth of core industry like basic iron-ore and steel. India is fourth largest producer of these products in the world (Mehta, 2011).

The lowest employment growth position was registered under the subgroup of technology-intensive industries namely, LT-intensive industries. Across these industries only few industries have raised employment growth like wearing apparel, wood, cork and straw, publishing and furnishing. Remaining other industries have seen fall in the employment growth rates. Thus, the analysis shows that amongst three subgroup of technology-intensive industry, HT and MT industries registered rise in employment growth whereas LT industries registered 'jobless' growth in the Indian manufacturing in the post-reform period. At the LT industries level, significant slowdown occurred only after the adoption of the structural adjustment programme.

Table 1.3 Aggregate Industry-wise Employment Compound Annual Growth Rates and Shares (at NIC-1990, 3-Digit)

NIC-1998 3-Digit Group	Industries Description	Trends Growth Rates			Employment Share			
		1989 to 1995	1995 to 2001	2001 to 2006	1989 to 1990	1994 to 1995	2000 to 2001	2005 to 2006
High-Tech (HT)								
242	Other Chemical Products	-5.30	8.41	2.80	2.41	2.00	2.64	3.71
241	Basic Chemicals	4.47	0.08	3.96	0.59	0.80	0.69	1.03
243	Man-made fibres	9.55	5.19	4.73	0.06	0.10	0.07	0.10
300	Office, accounting and computing machinery	-0.22	9.71	17.70	0.08	0.09	0.05	0.14

319	Other electrical equipment n.e.c.	-0.30	5.83	5.80	0.05	0.06	0.29	0.48
331	Medical appliances	-1.12	6.61	10.95	0.12	0.13	0.15	0.32
333	Watches & Clocks	0.83	-6.88	-6.02	0.08	0.09	0.05	0.05
351	Building and repair of ships & boats	-5.70	2.93	2.73	0.10	0.08	0.08	0.12
353	Aircraft and spacecraft	3.81	-8.00	-9.51	0.02	0.03	0.02	0.01
291	General purpose machinery	-1.89	17.47	14.73	0.40	0.40	0.83	2.11
292	Special purpose machinery	0.59	-1.76	3.95	1.50	1.67	1.32	1.97
321	Electronic valves and tubes	7.35	6.55	7.34	0.07	0.11	0.14	0.24
322	TV and Radio Transmitters	1.46	-6.35	-1.86	0.16	0.18	0.12	0.13
323	TV and Radio Receivers	-0.73	-2.33	-4.21	0.16	0.17	0.13	0.13
332	Optical instruments	10.96	-7.45	10.46	0.04	0.07	0.04	0.08
293	Domestic appliances	-7.84	9.08	0.86	0.21	0.15	0.21	0.27
311	Electronic motors, generators, transformers and distribution & control apparatus	-0.03	3.31	13.45	0.52	0.56	0.57	1.36
313	Insulated wire and cable	-2.44	3.71	10.35	0.13	0.13	0.13	0.27
314	Accumulators, cells and batteries	4.95	4.93	9.76	0.07	0.10	0.11	0.22
315	Electric lamps and lighting equipment	-1.27	2.79	11.76	0.12	0.12	0.12	0.27
341	Motor vehicles	-0.44	-7.09	1.27	0.32	0.34	0.20	0.26

342	Bodies for motor vehicle, coach work	5.52	-14.96	0.87	0.26	0.37	0.15	0.19
343	Parts for Vehicles	8.15	4.73	7.86	0.08	0.13	0.62	1.11
352	Railway and tramways, etc	2.08	3.42	3.96	0.39	0.47	0.08	0.11
359	Transport equipment n.e.c.	-1.05	1.19	9.48	0.46	0.47	0.44	0.85
Total of HT		-0.65	3.85	6.40	8.42	8.82	9.25	15.55
Medium-Technology (MT)								
232	Refined Petroleum Products	5.22	0.77	9.66	0.09	0.13	0.11	0.22
231	Coke-oven products	-2.37	-0.48	4.31	0.15	0.14	0.12	0.18
272	Basic precious and non-ferrous metals	3.14	8.01	4.61	0.26	0.33	0.43	0.66
251	Rubber products	4.80	1.12	4.31	0.40	0.54	0.50	0.75
252	Plastic products	5.94	4.70	8.35	0.62	0.90	0.99	1.83
261	Glass and Glass Products	-11.40	0.04	-0.47	0.62	0.38	0.33	0.39
269	Non-metallic mineral products	-0.81	2.95	3.07	7.94	8.25	8.27	11.77
271	Basic iron and steel	0.46	-0.98	3.94	1.23	1.36	1.12	1.66
273	Casting of metals	-1.37	0.45	7.36	0.36	0.37	0.32	0.57
281	Structural Metal Products	2.44	2.77	6.12	0.44	0.54	1.45	2.41
289	Other Fabricated metal products	0.57	1.70	-0.44	2.99	3.32	3.13	3.74
Total of MT		-0.08	3.52	3.34	15.09	16.26	16.76	24.20
Low-Technology (LT)								
173	Knitted and crocheted fabrics	-11.51	6.66	8.45	0.68	0.41	0.50	0.92
191	Leather	3.29	0.69	9.47	0.34	0.43	0.38	0.75

192	Footwear	-2.02	-3.23	-4.16	1.24	1.22	0.90	0.89
151	Production and process of meat	-1.81	7.80	-4.35	1.73	1.71	2.18	2.14
152	Dairy Products	7.88	5.49	-14.17	0.69	1.11	1.26	0.76
153	Grain mill products	-2.22	6.34	-7.55	7.43	7.19	8.53	7.15
154	Other food products	0.38	3.22	-1.07	4.45	4.90	4.98	5.76
155	Beverages	8.38	3.40	-11.01	0.79	1.29	1.33	0.93
160	Tobacco products	-7.09	7.54	-27.21	9.96	7.56	9.53	2.99
171	Spinning, Weaving, Finishing of Textiles	-4.00	-0.72	-14.40	15.37	13.61	11.36	6.75
172	Other Textiles	1.44	0.49	-13.84	6.27	7.29	6.46	3.95
181	Wearing apparel except fur	5.13	14.21	19.42	1.40	1.96	3.45	11.13
182	Dressing and dyeing of fur	2.97	-2.64	1.09	0.05	0.06	0.05	0.06
201	Saw milling of wood	4.44	-4.88	2.78	0.62	0.84	0.57	0.80
202	Wood, cork and straw	-4.29	3.16	5.16	13.98	12.20	12.36	4.29
210	Paper and paper products	0.96	4.61	1.93	0.85	0.96	1.05	1.41
221	Publishing, Printing, Reprod recorded media	-0.86	2.08	3.72	1.47	1.52	1.46	2.15
361	Furniture	-7.29	-4.49	2.21	3.55	2.66	1.84	2.51
369	Manufacturing n.e.c	5.50	-3.46	-7.39	5.61	7.99	5.81	4.91
Total of LT		-1.98	2.65	-0.03	76.48	74.92	73.99	60.25
Total Manufacturing		-1.57	2.90	1.24	100.00	100.00	100.00	100.00

Source: Calculated by author from Unit Level NSS rounds and ASI

Note: Technology-Based Intensive Classification by OECD.

CONCLUSION

This paper makes preliminary examination of technological orientation of industries and employment linkages in Indian manufacturing since 1990s. The key questions examined in the study are: what are the employment trends and patterns in Indian manufacturing based on technological classifications? To answer this question, trends in employment in Indian manufacturing sector and major industry groups have been analysed since 1990s. The technological based classification in Indian manufacturing shows that trade openness stimulates the employment growth in high-tech-intensive industries, which contributes around 16 per cent share in total employment. On the other hand, low-tech intensive industries contribute 60 per cent share but has reported almost negative growth rate during the last period of study. The medium-tech industries contribute around 24 per cent and have reported constant growth rates over the last decade in terms of employment.

In the post-reform era, increasing trends of employment growth in high-tech industries is strongly associated with rising R&D expenditure in Indian manufacturing. In the post-reform era India has witnessed the so-called 'jobless growth' where output increased and employment decreased. This study explores further this phenomenon and finds that employment has reported highest growth rates in high technology industries; whereas medium industries have also reported positive but marginal growth rates.

Table 1.4: Technological Classification of Individual Industries

Classifications	Industries Codes NIC-1998 at 3-Digit
HT	242+241+243+300+319+331+333+351+353+291+292+321+322+323+ 332+293+311+313+314+315+341+342+343+352+359
MT	232+231+272+251+252+261+269+271+273+281+289
LT	173+191+192+151+152+153+154+155+160+171+172+181+182+201+202+210+221+361+369

Source: Author's Compilation

Note: HT = High Tech; MT= Medium Tech and LT = Low Tech.

* Names of NIC'1998 codes industries are presented in Table 1.3

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