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IS TECHNOLOGY-DRIVEN STRUCTURAL CHANGE PRESENT IN INDIA? AN ANALYSIS OF INDIAN ORGANISED MANUFACTURING SECTOR

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ABSTRACT

Using aggregated data from ASI and CMIE, we analyzed the output, employment and innovation trends (in terms of R&D) of Indian organized manufacturing sector. It is a widespread argument that high-tech industries are key drivers of economic development. Such argument is based on two factors. One, it is assumed that high-tech industries are high growth industries which led to increases in their share in total output. Thus structural change occurs in favour of high-tech sectors. Second, as price competition rises, low-tech industries are also inclined to increasing their technological intensiveness. This also results to structural shift towards high-tech sectors. The present study has found that the Indian manufacturing sector has also registered such 'high-tech structural change' but its nature is different than assumed in the earlier literature based on developed countries. Technology-driven structural change is present in Indian manufacturing but it is very slow and small. In Indian manufacturing sector,the share of low and medium low-tech industries remains by a substantial share of total output and employment. Thus there is small structural transformation occurs in past three decades. It is also seen that variation in growth rates of low-tech and high-tech industries are very less. This does not support the premise that only high-tech industries are growth generating industries. In Indian manufacturing, R&D intensity is very less which indicating low investment in innovation activities.

KEYWORDS: *Employment, Innovation, Technological Intensiveness, High-tech Structural Change, R&D Intensity*

1. INTRODUCTION

Michael E. Porter published an article in *Harvard Business Review*, 1990 titled as 'The competitive advantage of nations'. He viewed that "national prosperity is created, not inherited. It does not grow out of a country's natural endowments, its labour pool, its interest rates, or its currency's value, as classical economics insists". He answered on consistent innovations and competitive advantage of some enterprises of some nations based on key attributes which he termed as 'diamonds of national advantage'. Such four attributes are (i) factor conditions, (ii) demand conditions, (iii) related and supporting industries, and (iv) firm strategy, structure and revelry. So factors of production i.e. land, labour, capital and entrepreneurship (as per conventional theories) per se have marginal relevance on their own in today's competitive environment. For example, having the large workforce or low labour cost is not considered as competitive advantage unless this workforce is specialized in particular skills that required to an industry. India has to take a look closely and take some lessons from porter's advice about competitive advantage to become manufacturing hub in Asia. In the present era technology has become the competitive advantage for many countries. Most of the economies try to

improve its production system by developing advance innovation system. Developed countries' investment in innovation activities has been increasing. Developing countries are also trying to catch up by importing the existing developed technology from industrialized economies. Increasing technology intensity is becoming the universal phenomenon in the global manufacturing (Rodrik 2012). High penetration of technology use in the production system has changed the structure of the manufacturing sector across the world. This technology-intensive change in a production system is generally referred to as 'High-tech structural change'.

Complementary nature of goods leads to change in demand which further induced to change in a production system. The replacement of labour by technology (capital deepening) increases the share of capital goods. Capital deepening in production structure is seen when machinery use and its share increases in the initial stage, then electrical goods and lastly electronic goods and computers. Due to technology deepening into production, efficiency level increases and share of basic goods i.e. iron and steel, non-ferrous and chemical-intensive goods etc. decreases. A share of other industries such as special purpose machinery, new innovative consumer goods, electrical and electronics products increases. Many industries try to shift their demand curve by different types of innovations in form of product and process innovation, making difference in product specifications and advertisements etc. Kuznet (1959) also hinted about this new approach of structural transformation induced by technology. This type of high-tech structural change have characteristics of long-run growth of high-tech industries, increase in the share of high-tech industries in output, contraction in structural diversity and dominance of economies that primarily based on high-tech production system over the other economies in the world. This paper is an attempt to identify whether there is any sign of high-tech structural change presence in India. Many initiatives1 have been taken to retransform the manufacturing sector in the past decade especially after new manufacturing policy 2011. Therefore it is essential to identify whether the Indian organized manufacturing sector is going through such high-tech structural change, if yes then what is pace of that particular change. While doing the analysis of structural change, we are also interested to see the pattern of technological developments in the Indian organized manufacturing sector. Although there are many ways of technology development in the manufacturing sectors such as by R&D expenditure, design, marketing, tooling-up, royalty payments for technology use, patents & licenses acquisition, and technology imports etc. But we have taken only R&D expenditure to see the trend of investment of manufacturing sector on innovation development. The paper is organized into three sections. Section 2 deals with the role of manufacturing growth in overall economic growth and identification of 'high-tech structural change'. Section 3 analyses the pattern of technological progress in the manufacturing sector. Finally, section 4 concludes the study.

DATA AND METHODOLOGY

OECD sector classification given by Hatzichronoglou (1997) in revised form (ISIC Rev. 3) has been taken for the classification of manufacturing industries (see appendix 1). Two datasets have been used in this study. CMIE's prowess database has been used to get R&D expenditure data, which has been further deflated by GDP deflator. It is important to note that R&D expenditure data is available at the firm level. We have aggregated the firm level data into respective industries. Other variables such as gross value added (GVA) and a total person engaged (TPE) has been taken from the Annual Survey of Industries (ASI) database as output and employment variable respectively.

[1] These initiatives are as 'Indian manufacturing policy' (2011), 'Make in India' programme (2014), 'Skill India' (2015) and 'Invest India' (2015)

To get a sectoral share in economic growth, we have pointed out that growth rate of the economy would be a weighted sum of all sector's growth rates. The weight of the particular sector is its share in output. In economy or in the manufacturing sector as a whole, the growth rate would be as…

$$G = \sum_{i=0}^{n} g_i S_i$$

G = Overall growth rate, gi = Sectoral growth rate (CAGR), Si = Sectoral share in output.

To know the pattern of sectoral growth and how these drive the overall economic growth, we must require knowing the sectoral growth rate and their contribution in total output. The manufacturing share has been calculated in overall economic growth in terms of output in Table 1 and in terms of employment in Table 2. It is also calculated for low-tech (LT), Medium Low-tech (MLT), Medium High-tech (MHT) and High-tech (HT) in Table 3.

Empirical Analysis

2. EXAMINING STRUCTURAL CHANGE IN ORGANISED MANUFACTURING SECTOR IN INDIA

In recent time, many economies primarily depend on their development strategy which is centered on the promotion of their manufacturing sector and promote their income through export of manufactured products. Such a strategy is mainly used by East Asian countries. China is a recent example. India also hoped to achieve it at the time when it introduced economic reforms in the manufacturing sector in the 1980s but it never came into light as a key driver of growth as other economies did. In the last two decades, India grew significantly but the role of manufacturing sector in it is very small. Such growth has come from the service sector. Moreover, some industries in the manufacturing sector have done well but these are relatively more capital and skill intensive, not labour intensive which would be desirable for high workforce country like India. A share of the manufacturing sector in GDP has been stagnated, despite the growth over 6 percent. In the recent time that manufacturing's importance has been decreasing.

Table 1: Contribution of Manufacturing Sector in India's Economic Growth

Periods	Average GDP Growth [1]	Average Manufacturing Growth [2]	Average Manufacturing Share [3]	Contribution in overall GDP growth [1x3]/100
1981-82 to 1985-86	4.90	5.82	14.50	0.71
1986-87 to 1990-91	5.88	6.64	14.95	0.88
1991-92 to 1995-96	5.23	7.11	14.97	0.78
1996-97 to 2000-01	6.22	5.07	15.67	0.97
2001-02 to 2005-06	6.75	6.59	15.25	1.03
2006-07 to 2010-11	8.62	9.82	16.05	1.38
2011-12 to 2013-14	5.30	2.61	15.66	0.83
1981-82 to 2013-14	6.13	6.24	15.29	0.94

Source: Planning Commission

We found that the contribution of manufacturing sector in overall GDP growth has been not improved much. It has increased marginally from 0.71 to 0.83 percent despite its average growth is more than 6 percent annually. It is unable to impact much in the overall growth of an economy. The very important factor behind this lackluster share is its low base in total GDP. Its share has not improved as we desired while introducing economic reforms. Its contribution in total GDP is marginal increase approximately from 14 to 16 percent over the last 3 decades.

The biggest failure of industrial reforms has been its inability to generate new job opportunities in the manufacturing sector. India's major portion of the workforce is unskilled or semi-skilled, thus manufacturing sector had a big responsibility to absorb that proportion but it has failed to come up to aspirations of its labour force.

Table 2: Contribution of Manufacturing sector in Total Employment Growth

Periods	Employment Growth	Average Manufacturing employment growth	Average Manufacturing Share	Contribution in overall Employment growth [1x3]/100
1972-73 to 1977-78	2.61	5.43	9.52	0.25
1977-78 to 1983-84	2.19	3.08	10.41	0.23
1983-84 to 1987-88	1.53	4.66	11.44	0.18
1987-88 to 1993-94	2.39	0.05	11.43	0.27
1993-94 to 1999-00	1.04	1.62	10.82	0.11
1999-00 to 2004-05	2.81	5.06	11.64	0.33
2004-05 to 2009-10	0.22	-1.06	11.89	0.03

Source: CSO

Table 2 clearly indicates India's dismal performance in employment generation. Its employment growth is highly unsatisfactory. India's 2-3 percent employment growth will not able to cater the employment demand. This inadequate employment growth would lead to the unsustainable growth of economy and inequality in India. Manufacturing sector also failed to contribute at employment front. Its share in overall employment growth in India has been very low i.e. 0.3 percent. Though last one and half decade has been consider the best time for Indian economy with economic peaks and market boom, but jobs in organized sector has been shrunken (Economic Survey 2015-16).

It is well established that despite the huge potential and growth capacity, manufacturing sector did not grew up to its potential because industrial reforms were incomplete with the prevalence of labour market constraints (lack of freedom to hire and fire), infrastructural barriers and inadequate integration of financial market include full convertibility of money (Kochher et. al. 2006, Panagriya 2008) but with the time, many things have changed. Now the manufacturing sector is demonstrating positive marks of growth. Over the last few years, the manufacturing sector has gradually emerged as important sector of Indian economy. Recently WEF report titled 'Global manufacturing index' 2017 has praised the manufacturing sector of India and placed it at 30th rank and stated that the Indian manufacturing sector has high chances to become giant of a global production system. UNIDO report (2016) has already given positive remarks about the potential of the manufacturing sector. It has improved its position as 6th largest manufacturing in the world.

Recent developments for manufacturing has happened such as 'Make in India', FDI relaxation in various manufacturing segments, showcasing India as business-friendly destination in world international fair, Germany 2015 by the high dignitaries of India, jump in ease of doing the business ranking, improvement in Global Competitiveness Index and Global innovation index etc. Many international giants such as GE, Siesman, HTC, Toshiba Boien etc have committed to establishing their manufacturing set-ups. We are interested to see whether employment would be taken into consideration or only manufacturing growth is the only factor for such developments. Many have believed that these global giants don't consider much about cheap labour. Technology has become the prime concern for them. They see India as a future hub for Hi-tech manufacturing. It is widespread that high-tech industries are the key driver of economic development. Therefore global manufacturing is being transformed to high-technologies such as 'Internet of Things' (IOT) and robotics collectively referred to as 'Industrial Revolution 4.0. It is believed that high-efficiency and productivity can be achieved by cost contraction, quality enhancement and customization with the help of these technologies. Thus high

concentration of investment in high-technologies would propel old manufacturing set-ups back into competition.

All these developments of investment in high technology are mainly based on the two assumptions. One, it is assumed that high tech industries are high growth industries which increases its weight of total output and that of low tech industries fall significantly. Thus structural change occurs in favor of high-tech sectors. Second, due to price competition rises, low tech industries are also increasing their technological intensiveness and that results to the structural shift to high-tech sectors. As we know, India is still in its infancy in investing in high technologies. Therefore we must know about the nature of the Indian manufacturing sector, whether it would perform similarly as above said or in a different way. We attempt to explore empirical evidence related to such claim about high-technology structural change in the context of Indian organized manufacturing sector, in other words, we try to access whether empirical evidence of Indian manufacturing sector verifies 'high-technology' structural change view of economic development.

Table 3 Contribution of Different Technology-Intensive Segments of Indian Organized Manufacturing Sector

	Gross Value Added (GVA)				Total Person Engaged (TPE)			
	[1] Trend Growth rate	[2] Average Share	[3] Contribution to overall growth [1x2]/100	[4] Contribution to growth Rate (%)	[1] Trend Growth rate	[2] Average Share	[3] Contribution to overall growth [1x2]/100	[4] Contribution to growth Rate (%)
LT	6.19	27.47	1.70	21.73	1.45	48.91	0.71	38.18
MLT	8.28	33.85	2.80	35.82	2.48	22.87	0.57	30.54
MHT	8.2	31.6	2.59	33.11	1.67	23.28	0.39	20.93
HT	10.32	7.08	0.73	9.34	3.89	4.94	0.19	10.35
Total Manufacturing	**7.83**	**100**	**7.83**	**100**	**1.86**	**100**	**1.86**	**100**
Data Source: Author's own calculations based on ASI database.								

Table 3 helps to find out the growth pace of different segment of Indian organized manufacturing sector in terms of technology intensiveness. It shows that high-tech (HT) industrial segment has been growing with double-digit growth rate over the past 3 decades. It has registered 10.32 percent GVA growth rate per annum. While medium tech segments (medium low-tech and medium high-tech industries) has the same rate of GVA growth of 8.2 percent over the period. It is important to see that rate of GVA growth in minimum (6.19 percent) in the case of low-tech industries. Table 3 clearly shows that medium-tech industries' contribution in manufacturing growth is significantly high, where MLT contribute 35.8 percent and MHT 33.11 in overall manufacturing growth. Though low-tech sector has low growth rate, but it still able to contribute a substantial share about 22 percent in the manufacturing sector. On the other side, the high-tech sector has been contributing minimum share (9.34%) despite its high growth history.

This can be easily understood that average share is the important determinant to find out overall contribution in growth. Low-tech's average share is high thus it managed to take high share in overall growth and high-tech's average share of output is very less so it could not contribute much in the overall growth. We tried to further analyze the trend of the output of manufacturing sector and access the pattern of structural change if it has. It is seen from the Table 3 that high tech industries are high growth industries and low-tech industries are low-growth industries. Similar trends have been noticed in employment too (high-tech industries have high growth but their contribution is very limited whereas low-tech has low-growth but has the high contribution in manufacturing employment). Still, it is difficult to state that the Indian manufacturing sector is moving towards high-technology production system, because high growth has come due to a low

base of high-tech's output and employment. Thus due to a low base, high growth industries are demonstrating their high growth potential. Low-tech industries has about half of the manufacturing workforce, with this it is tough to get a high growth rate. Thus it is not right to blame low-tech industries for its lackluster performance. Further, we are interested to analyze whether high-growth of high-tech industries leads to high output and employment possession. It is arithmetically proved that continuous increase in growth of one segment (here high-tech industries) than others would lead to increase its share in total output, but the question is how long it will take to possess a dominating position in the manufacturing sector. We are interested to analyze such claim of a structural change in the context of Indian manufacturing sector.

Table 4: Structural Change in Indian Organised Manufacturing Sector

	Time Period	LT	MLT	MHT	HT	Total
Gross Value Added	**1980-81**	33.9	31.7	30	4.4	100
	1991-92	30.3	31.6	31.4	6.8	100
	2001-02	28.2	32.3	31.2	8.3	100
	2013-14	23.1	32.8	33.5	10.6	100
Employment	**1980-81**	54	20.2	22.6	3.2	100
	1991-92	48.7	22.2	24.7	4.5	100
	2001-02	51.2	22	21.6	5.2	100
	2013-14	43.4	26.3	23.5	6.7	100

Notes: LT=Low tech, MLT= Medium low-tech, MHT= Medium High-tech and HT= High tech industries
Data Sources: Own calculations, based on Annual Survey of Industries database

It is seen from the Table 4 that in the last three decades, the GVA share of low-tech industries has decreased from 33.9 percent to 23.1 percent, which is distributed among other relatively high-technology intensive industries because the contribution of other segments such as MLT industries grew marginally from 31.7 to 32.8 percent, MHT from 30 to 33.5 percent and most importantly high-tech industries from 4.4 to 10.6 percent. Other important element of structural change is employment. It is important to note that similar trend in the distribution of employment among different manufacturing segments has been registered as GVA distribution. In employment too, the low-tech share has decreased and that of other relatively high technology intensive sector has increased. Here it should be noted that a large portion of manufacturing labour is still involved in low-technology industries. A constant increase has been seen in the overall process of structural change in manufacturing output and employment in favor of high-tech sector. We admitted that Indian manufacturing has been going through 'high-technology' structural change but the pace of this change is very slow and small, because share of high-tech industries is still very less in both determinants i.e. value added & employment, it is 10.6 percent in GVA and 6.7 percent in employment in 2013-14. On the other hand, low-tech industries has substantial share in both employment as well as value added.

As we earlier mentioned that in recent time, technology has been proving itself as the deterministic factor of development. It is difficult to digest that such technological developments are limited to high-tech sectors only. Many believe (Hasan 2010 & Das & Kalita 2010) that technology has been spreading in each corner of the manufacturing sector. Every industry has been affecting with current technological change. Thus we are interested whether low-tech sectors are also on the track of adaption of technology. We are interested to find trends of technological intensiveness in Indian organized manufacturing sector.

3. TECHNOLOGICAL INTENSIVENESS IN INDIAN MANUFACTURING SECTOR

The rising capital intensity2 of the production in the Indian manufacturing sector is well supported by various studies (Das & Kalita, 2010, Hasan, 2010 and Goldar 2000). We calculated the capital intensiveness of all four segments (Low-tech, Medium Low-tech, Medium high-tech and high-tech industries) of the manufacturing sector. We found that capital intensity has increased not just in high-tech industries but also in the other three segments (Figure 1). Rising capital intensity of production, especially in low-tech and medium low-tech industries which are generally considered as more labour intensive industries, is a cause of concern for policymakers as it has raised doubts about the capacity of Indian manufacturing sector to absorb labour. Here we are further interested to find whether this increase in technological intensiveness is due to R&D investment or not.

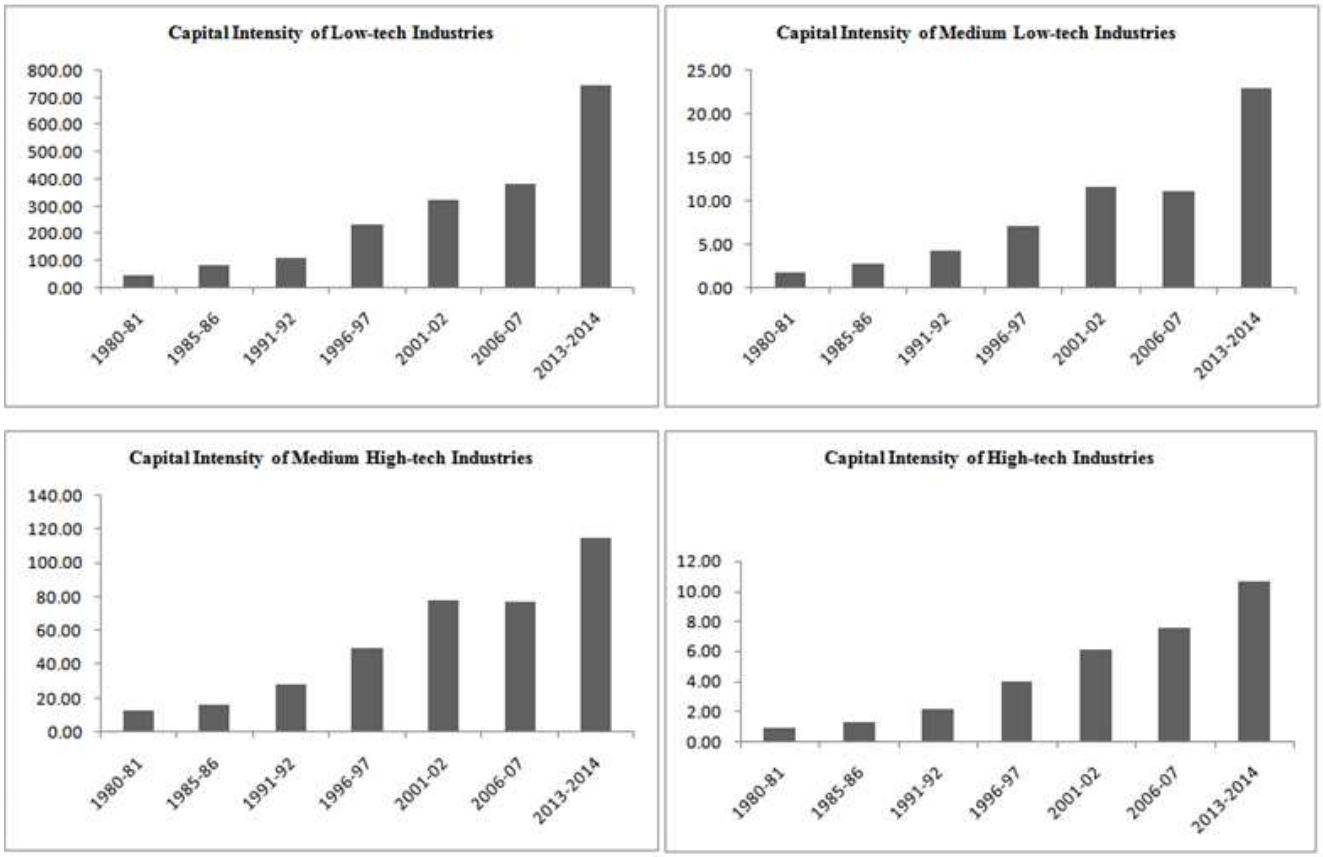

Figure 1: Capital Intensity of Different Manufacturing Segments

Source: Own Calculations based on ASI database

There are many technology-related activities happens in manufacturing sectors such as R&D expenditure, design, marketing, tooling-up, royalty payments for technology use, patents & licenses acquisition, technology imports etc. All

[2] Capital intensity is defined as the 'ratio of Real Fixed Assets to Total Persons Engaged'. Capital is measured by fixed asset as reported in ASI. It represents the depreciated value of fixed assets owned by the factory on the closing day of the accounting year. This is deflated with WPI for Machinery & Machine Tools. Total persons engaged include workers (both directly and indirectly (through contractors) employed), employees other than workers (supervisory, managerial staff and other employees) and unpaid family members/proprietor etc.

these factors increase the capital intensity of the manufacturing sector, But R&D expenditure in particular is a very important factor. In this paper, we have taken only one determinant i.e. R&D expenditure and tried to find out whether R&D investment has caused the rising capital intensity in the Indian organized manufacturing sector.

As other developing economies, it is also important to know whether India is also taking the advantage of developed countries' R&D investment and adopting and simulating the production process via technology import to improve its productivity and efficiency, but in this study, we have limited the scope of our analysis up to only R&D expenditure.

Table 4: R & D Growth in Organised Manufacturing Sector (%)

	LT	MLT	MHT	HT	Total Manufacturing
1993 to 1998	5.2	12.3	23.4	13.9	15.7
1999 to 2004	5.3	1.5	1.8	23.7	10.3
2005 to 2010	10.4	26.9	9.3	14.1	14.4
2011 to 2016	6.2	1.9	2.4	8.7	5.6
1993 to 2016	6.5	10.0	11.2	17.3	13.0
Data Source: CMIE (Prowess database)					

Very few studies have been found which have analyzed the growth of R&D investment in Indian manufacturing sector after 1991 economic reforms. Therefore our objective is also to throw some light on the trends and pattern of R&D expenditure in organized manufacturing sector in the post-reformed period. The average growth rate of R&D expenditure of different industrial groups (LT, MLT, MHT and HT) of Indian organized manufacturing sector has been calculated for the period of 1993 to 2016 (Table 4). The highest average growth of 17.3 percent has been observed in the high-tech (HT) industries over the period of time. Medium high-tech (MHT) occupied 2nd fast-growing segment in R&D investment with 11.2 percent growth followed by medium low-tech industries (10 percent). Low-tech industries have registered least growth in R&D investment. It is seen that growth varies significantly in the medium tech sector (MLT & MHT) but HT industries continuously registered double-digit growth rate except for last time interval. LT industries consistently registered5-6 percent growth rate most of the time. While analyzing R&D growth trends in the manufacturing sector, it is important to examine how much it contributed to the total output of the manufacturing sector. Table 5 shows the clear picture of R&D contribution in Indian manufacturing development.

Table 5: R & D Intensity of Indian Organised Manufacturing Sector (in %)

	LT	MLT	MHT	HT	Total Manufacturing
1993 to 1998	0.09	0.10	0.33	0.83	0.19
1999 to 2004	0.07	0.07	0.37	1.31	0.21
2005 to 2010	0.06	0.08	0.31	1.96	0.26
2011 to 2016	0.06	0.10	0.46	1.88	0.32
1993 to 2016	0.07	0.09	0.36	1.49	0.25
Note: R&D intensity= R&D expenditure/Total Sales					
Data Source: CMIE (Prowess database)					

Table 5 depicts that R&D investment is not the focused area of the Indian manufacturing sector. Indian manufacturing invests the very negligible share of its turnover in R&D activities, even its HT industries do not invest more than 2 percent of its total sale in R&D activities. Nowadays innovation through R&D investment is to be considered as the

growth engine of any economy. In India, major portion of its manufacturing sector i.e. low-tech, medium low-tech and medium high-tech industries have not been invested even 0.5 percent of total sales in R&D. Though low-tech and medium low-tech is less-technology intensive sector but it does not mean that these segments can afford to ignore R&D activities. Their investment considerably very low: LT's 0.07, MLT's 0.09, MHT's 0.36 R&D intensity.

It is clear that the Indian manufacturing sector is very less oriented to R&D investment. High growth numbers are just outcome of the narrow base. In other words, double-digit R&D growth of Indian organized manufacturing has become insignificant because it has invested marginally in innovative activities. Indian manufacturing has to invest hugely in R&D because with the current growth rate of spending, it will take many years to be equal to other industrialized economy in terms of their R&D intensity. It is recognized that India has failed in its target of science, technology and Innovation policy (STIP 2003) to increase the R&D expenditure by up to 2%. Table 4 and 5 helps us to understand that innovation through R&D investment is not the primary factor of rising technology use in manufacturing processes. Other factors can be key determinants for its development. Technology import could be a deterministic factor for high capital intensiveness nature of Indian manufacturing sector.

4. CONCLUSIONS

In India, there has been the clear tendency for a share of manufacturing sector in total GDP and employment to stagnant during the last 3 decades. We have investigated that the Indian manufacturing sector is passing through high-tech structure change but its nature is not so dramatic. Manufacturers have been more emphasizing on capital use thus we found a significant increase in capital intensity. We tried to find whether this capital intensiveness is R&D intensive or not but we have find that manufacturing has given very less importance to R&D investment. R&D intensity is found to be very low in all respected segment of the manufacturing sector i.e. LT, MLT, MHT & HT. In the last, we can say that Indian organized manufacturing sector has some characteristics of high-tech structural change, but the intensity of such change is very low, which indicates that Indian manufacturing sector could take the longer period of time to converge itself towards high-tech production system because its own investment on R&D is very less. Therefore it is very difficult to be key manufacturing player in the world with just reliable on other means of technology development without R&D investment.

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Appendix- I

Table 6

Low Technology	NIC 08 Code	NIC 04 Code	Concordance between NIC'08 and NIC'04	
Processing and preserving of meat	101	1511	**NIC'04 Code**	**NIC'08 Code**
Processing and preserving of fish, crustaceans and mollusks	102	1512	**Low Tech Industries.**	
Processing and preserving of fruit and vegetables	103	1513	151	101+102+103+104
Manufacture of vegetable and animal oils and fats	104	1514	152	105
Manufacture of dairy products	105	152	153	106+108
Manufacture of grain mill products, starches and starch product	106	153	154	107
Manufacture of other food products	107	154	155	110
Manufacture of prepared animal feeds	108	1533	160	120
Manufacture of beverages	110	155	171	131
Manufacture of tobacco product	120	160	172+173	139+143
Spinning, weaving and finishing of textiles	131	171	181	141
Manufacture of other textiles	139	172	182	142
Manufacture of wearing apparel, except fur apparel	141	181	191	151
Manufacture of articles of fur	142	182	192	152
Manufacture of knitted and crocheted apparel	143	173	201	161
Tanning and dressing of leather; manufacture of luggage, handbags, saddlery and harness; dressing and dyeing of fur	151	191	202	162
Manufacture of footwear	152	192	210	170
Sawmilling and planing of wood	161	201	361	310
Manufacture of products of wood, cork, straw and plaiting materials	162	202	**Medium Low Tech Industries.**	
Manufacture of paper and paper products	170	210	231	191
Manufacture of furniture	310	361	232	192
Medium-Low Technology			251	221
Manufacture of coke oven products	191	231	252	222
Manufacture of refined petroleum products	192	232	261	231

Table 6: Contd.,

Low Technology	NIC 08 Code	NIC 04 Code	Concordance between NIC'08 and NIC'04	
Manufacture of rubber products	221	251	269	239
Manufacture of plastics products	222	252	271	241
Manufacture of glass and glass products	231	261	272	242
Manufacture of non-metallic mineral products n.e.c.	239	269	273	243
Manufacture of basic iron and steel	241	271	281	251
Manufacture of basic precious and other non-ferrous metals	242	272	289	259
Casting of metals	243	273	**Medium High Tech Industries.**	
Manufacture of structural metal products, tanks, reservoirs and steam generators	251	281	241	201
Manufacture of weapons and ammunition	252	2927	242-2423	202
Manufacture of other fabricated metal products; metalworking service activities	259	289	243	203
Manufacture of jewellery, bijouterie and related articles	321	369	291	281
Manufacture of musical instruments	322	3692	292	282+304
Manufacture of sports goods	323	3693	293	275
Manufacture of games and toys	324	3694	311+312	271
Manufacture of medical and dental instruments and supplies	325	331	313	273
Other manufacturing n.e.c.	329	3699	314	272
Medium High Technology			315	274
Manufacture of basic chemicals, fertilizer and nitrogen compounds, plastics and synthetic rubber in primary forms	201	241	319	279
Manufacture of other chemical products	202	242-2423	341	291
Manufacture of man-made fibres	203	243	342	292
Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus	271	311	343	293
Manufacture of batteries and accumulators	272	314	351	301
Manufacture of wiring and wiring devices	273	313	352	302
Manufacture of electric lighting equipment	274	315	353	303
Manufacture of domestic appliances	275	293	359	309
Manufacture of other electrical equipment	279	319	**High Tech Industries.**	
Manufacture of general purpose machinery	281	291	222	181
Manufacture of special-purpose machinery	282	292	223	182
Manufacture of motor vehicles	291	341	300	262
Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers	292	342	321	261
Manufacture of parts and accessories for motor vehicles	293	343	322	263
Building of ships and boats	301	351	323	264
Manufacture of railway locomotives and rolling stock	302	352	331+332+333	265+266+267
Manufacture of air and spacecraft and related machinery	303	353	2423	2100
Manufacture of military fighting vehicles	304	2927		
Manufacture of transport equipment n.e.c.	309	359		
High Technology				
Printing and service activities related to printing	181	222		
Reproduction of recorded media	182	223		
Manufacture of pharmaceuticals, medicinal chemical and botanical products	210	2423		

Manufacture of electronic components	261	321
Manufacture of computers and peripheral equipment	262	300
Manufacture of communication equipment	263	322
Manufacture of consumer electronics	264	323
Manufacture of measuring, testing, navigating and control equipment; watches and clocks	265	331
Manufacture of irradiation, electro medical and electrotherapeutic equipment	266	333
Manufacture of optical instruments and equipment	267	332