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Indian Manufacturing Sector: Growth and Productivity under the New Policy Regime

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The present study analysis the trends in output (value added) and inputs (labour, capital) as well as partial productivity and total factor productivity for all India manufacturing i.e. at aggregative level as well as at disaggregative level for twenty-two industrial groups. The period for the study is 1980-81 to 2002-03, analysis has also been done for two sub periods, period I, pre reform period 1980-81 to 1990-91 and period II, 1991-92 to 2002-03 i.e. the post reform period. The study tries to view the changes in growth of output and inputs and productivity in the pre and post reform period. The comparative picture of pre liberalisation and liberalisation period depict a slower growth of manufacturing sector of India in the post reform era for aggregative as well as for disaggregative i.e. sectoral level.

Field of Research: Industrial Productivity

1. Introduction

The industrial sector with its forward and backward linkages and its high employment potential holds the key to the economic development of a country. Since independence, India has achieved a reasonably well level of self-sufficiency in manufacturing a variety of basic and capital goods. Growth in the manufacturing sector has the potential to elevate much of the Indian population above poverty line by diverting the majority of the workforce out of low-wage agriculture. This would create a more stable and prosperous India and, in turn, attract more business. It's no secret that India is an emerging manufacturing power to be reckoned with. Its manufacturing sector grew more than 10 percent in the second quarter of 2005 alone. India is well on its way to becoming the premier manufacturing location for companies around the world. The share of industrial sector in India's GDP is 26.4 per cent (financial year 2006-2007).

Liberalization, Privatization and Globalization are causing a transition in the world economy and Indian Manufacturing is no exception. The last decade following the liberalization has seen revolutionary changes in the state of manufacturing in India.

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Policy regime, in India has undergone a U-turn during the decade of 1990's. At the time of this mega change industry was in developing stage, which was to be followed by the matching growth of tertiary sector. The industries earlier nurtured in a protected and subsidized environment have been suddenly opened to face market and the global competitors. The period of nineties, i.e. the period associated with globalisation, liberalisation and privatisation has seen Indian companies developing core competencies in terms of technologies and managing the dynamism and opportunities that have come by over the years. These reforms were aimed at making Indian industry more efficient, technologically modern. This efficiency improvement, technological up-gradation, and enhancement of competitiveness was expected to enable Indian industry to achieve rapid growth. Indian producers implement world-class practices.

In the face of intensified global competition and liberalized trade environment, productivity has emerged as a key indicator of successful restructuring and upgrading by firms and industries. Productivity growth has traditionally been regarded as one of the main sources of income growth, along with capital accumulation and the deepening of human capital development. These factors and the historically established positive relationship between productivity, employment and earnings have made productivity improvement and it is now recognized as an important policy lever for economic development. Advocates of liberalization argue that opening up local markets to foreign competition and foreign direct investment will help to improve the productivity of domestic industry, resulting in more efficient allocation of resources and greater overall output.

The reforms initiated in 1990s added impetus to enhance the competition, productivity and efficiency. Productivity is a relationship between real output and input, measures the efficiency with which inputs are transformed into outputs in the production process. Increased productivity is related with more output produced with either the same amount of inputs, or with less inputs, or with little increment in inputs. Higher productivity growth is associated with increase in capital intensity, labour productivity and capital productivity. Empirical evidence suggests that productivity in turn reduces unit cost, enhance product quality, increase workers wage, and offers returns on investment. Productivity is the prime determinant of a country's level of competitiveness, higher standard of living and sustained growth in the long run. The proposed work is an attempt to analyze the response of manufacturing sector in terms of inputs and output as well as in terms of productivity to new policy initiatives started in 1991 and thus study the adjustment process of Indian manufacturing at aggregative as well as dissaggregative level [two digit].

2. Review of Literature

Several studies have attempted to empirically estimate the impact of liberalization on the Indian manufacturing industries. Studies by Ahluwalia, I.J. (1985, 1991) for the period 1959 to 1985 examines total factor productivity (TFP). These studies show that during the two decades of the sixties and the seventies total factor productivity in the manufacturing sector declined. However, there is also a finding that in the first half of eighties productivity growth improved. The dominant source of the acceleration in total factor productivity has been the growth of value added. The measure of TFPG used in the study is derived from a Translog production function under the assumption of competitive equilibrium. Balakrishnan and Pushpangandan (1994) study TFPG for Indian manufacturing from 1970-71 to 1988-89. The statistical analysis confirms a turnaround if TFP estimates are derived from the value added single-deflation series. The point however is that if TFP index is derived by double-deflation, there is an absence of an increase in the growth rate of TFP. Das, D. K. (1998) analyzed seventy-six three digit industries covering the period 1980-81 to 1993-94. This study found that productivity response to the trade policy reforms is mixed. This study correlated the productivity growth with different measures of trade liberalisation. However, the results of this exercise show that in majority of the cases the trade liberalisation variable has a statistically insignificant positive relationship with productivity growth.

A study by Balakrishnan, et.al. (2000) investigates the trends in productivity growth since 1988-89 using panel data comprising firm-level drawn from groups within manufacturing industry which have experienced the most significant tariff reduction. The sample size is 2,300 firms and 11,009 observations, covering the period from 1988-89 to 1997-98. The study finds no evidence of acceleration in productivity growth since the onset of reforms in 1991-92. A study by Sivadasan, J. (2003) examines the effect of removing licensing requirements, liberalizing foreign direct investment and reducing tariff rates on plant-level and aggregate productivity. The study covers the period from 1986-87 to 1994-94. The study finds that delicensing and other micro-reforms had a significant positive impact on productivity. The study also depicted an increase in mean intra plant productivity level and also in the aggregate productivity growth following FDI liberalisation.

Studies by Das, D. K. (2001, 2003), Kumari, A. (2001) and Srivastava, V. (2001) point out that TFP growth in the manufacturing sector worsened during the nineties compared with that of eighties while a study on productivity trends in Indian manufacturing undertaken by Unel (2003) has concluded that total factor productivity (TFP) growth in aggregate manufacturing and many sub-sectors accelerated after the 1991 reforms. A study by Goldar, B. and Kumari, A. (2003) estimates total factor productivity (TFP) growth for Indian manufacturing and major industry groups for the period 1981–82 to 1997– 98. This is followed by an econometric analysis of inter-temporal and interindustry variations in productivity growth rates, aimed at assessing the effect of import liberalization on productivity growth in Indian industries in the 1990s. The results of the paper shows that total factor productivity growth in Indian manufacturing decelerated in the 1990s, a

decade of major economic reforms in India. Econometric analysis presented in the paper indicates that the lowering of effective protection to industries favorably affected productivity growth. The results further suggest that gestation lags in investment projects and slower agricultural growth in the 1990s had an adverse effect on productivity growth. The analysis reveals that underutilization of industrial capacity was an important cause of the productivity slowdown. With corrections for capacity utilization, the estimated productivity growth in the 1990s is found to be about the same as in the 1980s.

A review of literature is essential to place the study in proper perspectives, to identify the gaps and not to duplicate the same work. After reviewing the literature it can be concluded that there are certain research gaps in the earlier studies. Most of the studies done so far are aggregative or if disaggregation has been done, the coverage is not till 2002-03 or it is over some periods of time and not for the whole of the period. Existing studies have focused upon measurement of partial and total factor productivity or entry aspect of firms. The present study has taken a detailed analysis of inputs (labour and Capital) and output and also Partial and Total factor productivity for the entire period i.e. 1980-81 to 2002-03 as well as sub periods, period I, pre reform period 1980-81 to 1990-91 and period II, 1991-92 to 2002-03 to analyze the adjustment process of manufacturing sector in India during reforms. This study is unique and tries to present an integrated and holistic view of manufacturing sector trends in India in the pre and post reform era for the entire manufacturing as well as for twenty-two two digit industries.

3. Methodology

The present study uses the data from Annual Survey of Industries (ASI) by Central Statistical organization, Government of India for the analysis. For deflating data price indices have been constructed with the help of the official series on wholesale price indices (*Index Numbers of Wholesale Prices in India*, prepared by the Office of the Economic Adviser, Ministry of Industry). Capital series for productivity analysis have been generated by using Perpetual Inventory Accumulation Method. Partial factor productivity measures the ratio of output to one of the inputs setting aside interdependence of use of other output. Labour productivity (V/L) is measured as a ratio of value added to total no of persons employed. Capital Productivity (V/K) is measured as a ratio of value added to gross fixed capital. The gross measure of value added is obtained by adding depreciation to net value added. The data on gross value added is deflated using industry specific wholesale prices (at 1993-94 prices). For labour input, total number of persons employed is used and for Capital, Gross fixed capital at replacement cost is used. The capital stock at any year is calculated as:

$$K_t = K_0 + \sum_{t=1}^{T} I_t \qquad (1)$$

Where I_t, is investment in year t and K_0 is capital stock for benchmark year, i.e. 1980-81, Investment figures were obtained using the formula:

$I_t = (B_t - B_{t-1} + D_t) / R_t$ (2)

Where B is book value of fixed capital, D is depreciation. For R Wholesale prices index of Machinery (base 1993-94=100) is used.

For calculating TFPG Translog index method has been used.

$$\log V(T) - \log \bar{V}(T-1) = \bar{V}_K[\log K(T) - \log K(T-1)] + \bar{V}_L[\log L(T) - \log L(T-1)] + \bar{g}$$

Where: $\bar{V}_K = 1/2[V_K(T) + V_K(T-1)]$ and $\bar{V}_L = 1/2[V_L(T) + V_L(T-1)]$

V_K and V_L are income shares of the factors capital and labour respectively:

$$\bar{g} = 1/2[g(T) + g(T-1)]$$

The above expression for the average rate of technical change g is referred to as the Translog index of technical change.

Growth rate have been estimated from the following equation.

$Y = ab^t$

The returns to labour are measured by total of wages, salaries and benefits. The returns to capital is measured as value added minus returns to labour.

TFP growth is the difference between the growth of output and the growth of a combination of all factor inputs, usually labour and capital. In general, improvements in TFP reflect the contribution to output as a result of the more efficient use of resources or the adoption of new production technologies. The methodology used in this study assumes a transcendental logarithmic (translog) production function, under the assumptions of constant returns to scale and competitive markets for factor inputs, TFP growth is estimated from the following relationship The assumption of competitive markets implies the share of each factor input in total factor payments is equal to the value of its marginal contribution to output. The Translog index of TFP growth is a residual that registers those changes in output which are not due to changes in labour and capital inputs.

4. Analysis (Aggregate)

The technical progress of advanced and the developed countries is generally thought to be associated with capital accumulation rather than labour. The understanding of the process of growth in developing countries is still quite hazy

and is still subject to conjecture. Capital accumulation is considered as the main source of growth mainly because developing countries suffer from paucity of capital initially, and their adaptation to newer techniques is rather at a passive and slow pace. The present study tries to analyze the scenario in India to see whether the same is true for Indian manufacturing as well.

Table 1: Growth Rates of Value Added, Capital and Employment and productivity Trends in India Manufacturing (Aggregate Data)

	1980-81- 2002-03	1980-81-1990-91	1991-92-2002-03
Value Added	7.78	6.67	4.38
Capital	6.05	4.34	4.63
Employment	0.65	0.23	-0.81
Labour Productivity	7.09	6.43	5.24
Capital Productivity	1.64	2.23	-0.23
Capital Intensity	5.36	4.11	5.48
Total Factor Productivity	1.24	1.53	0.44

Computed

The picture that emerges (Table1) for the Indian manufacturing sector is that the overall long term growth of 7.78 percent per annum in output (value added) in manufacturing sector during 1980-81 to 2002-03 is associated with a rapid growth of capital (6.05 percent per annum) and a low growth of employment (0.65 percent per annum). The entire growth of output is accounted for by the growth in factor input, the capital. Comparing the annual growth rates during 1980-81 to 1990-91 with those of 1991-92 to 2002-03, the post reform period, it is found that there is decline in growth rate of value added from 6.67 per cent per annum in period I to 4.38 per cent per annum in period II.

Labour productivity for the whole period increased at an annual rate of 7.09 per cent per annum while capital productivity increases at a rate of 1.64 per cent per annum. Capital intensity for the entire period is 5.36 per cent per annum. Estimates for the sub periods reveal differences in the growth rates. Labour productivity increases at a higher rate, i.e. at a 6.43 per cent per annum in the pre reform period as against 5.24 per cent per annum in the post reform period. Capital Productivity shows a rising trend in the first period of the analysis and it decreases in the second period. Capital intensity increases at a higher rate, i.e. at a 5.48 per cent per annum in the post reform period as against 4.11 per cent per annum in the pre reform period. The estimate of total factor productivity (TFP) growth of Indian manufacturing is 1.24 per cent per annum over the total period, 1980-81 to 2002-03. Total factor productivity growth is higher during the pre- liberalisation

period than during the second period of the analysis, the post-liberalisation period. Estimates of pre-liberalisation phase are 1.53 while in the post-liberalisation phase total factor productivity decreases to 0.44 per cent per annum. For aggregate manufacturing the post reform era is associated with lower total factor productivity as well as lower labour and capital productivity growth.

Table 2: Growth Rates of Value Added, Capital and Labour in Manufacturing Sector of India (1980-81 to 2002-03)

Industry code	Value added			Capital			Labour		
	Entire Period	Period I	Period II	Entire Period	Period I	Period II	Entire Period	Period I	Period II
15	11.12	12.76	8.76	7.25	4.97	7.23	0.77	-2.06	0.74
16	11.29	21.22	3.98	6.35	4.82	6.06	1.77	1.39	0.23
17	5.74	7.54	5.86	6.79	3.37	6.81	-1.46	-1.96	-2.48
18	16.01	10.72	9.61	13.74	7.14	13.40	9.25	5.54	9.46
19	12.58	11.03	3.24	9.94	4.43	8.27	5.77	9.81	2.26
20	11.66	6.13	14.86	5.98	3.52	7.07	-0.07	-1.54	1.23
21	7.01	7.15	3.41	6.55	3.78	6.76	1.63	-0.004	1.46
22	6.03	3.65	2.21	6.38	3.52	7.02	-1.20	-1.16	-3.32
23	7.89	4.99	7.05	10.28	7.08	11.33	0.55	0.90	0.62
24	13.26	15.33	8.35	10.63	10.86	8.59	3.09	3.15	2.58
25	1.88	1.75	5.56	7.68	3.24	10.57	0.86	-1.36	3.65
26	8.20	9.25	2.80	9.66	9.65	8.94	2.11	4.80	1.07
27	7.59	8.40	5.53	6.33	3.91	4.73	0.95	3.54	-1.43
28	10.67	8.28	5.62	7.48	3.80	6.86	3.50	4.98	2.17
29	2.36	-1.56	2.96	4.75	3.86	5.67	-0.95	-0.86	-0.82
30	3.37	1.88	-1.58	7.28	8.17	3.88	-2.44	0.03	-4.86
31	1.99	-0.81	-2.49	5.41	3.09	5.02	-0.97	0.14	-3.97
32	6.29	4.95	2.64	13.51	12.93	8.46	5.19	12.33	-1.41
33	11.57	1.59	10.78	9.88	5.25	10.37	6.36	6.65	5.32
34	6.89	6.09	5.90	8.42	5.06	10.75	4.96	0.64	13.62
35	5.91	4.62	3.70	3.39	1.30	3.63	-0.20	-1.02	-1.33
36	13.63	3.51	14.98	10.30	3.89	13.86	5.41	1.75	6.99

Computed, Note: For two-digit industry codes, see Table 4.

5. Analysis: Trends in Value Added, Capital and Labour

Growth Rates of Value Added (Table 2) is higher for sixteen industrial groups in the pre liberalisation phase while six groups depict higher growth in the post liberalisation period. Highest growth in capital is recorded for the Manufacture of Wearing Apparel; Dressing and Dyeing of Fur#18, followed by Manufacture of Furniture; Manufacturing N.E.C #36 and for Chemicals and Chemical Products#24. For nine industrial groups growth rate of value added is more than 10 percent for the entire period of the analysis. Manufacture of Rubber and Plastic Products#25 depicts the lowest growth rate (1.88) for the total period. Growth rate of capital is higher for only four industrial groups in the pre liberalisation phase while eighteen industrial groups depict more growth in the post liberalisation phase. Highest growth in capital is recorded for Manufacture of Wearing Apparel; Dressing and Dyeing of Fur#18, followed by Manufacture of Radio, Television and

Communication Equipment and Apparatus #32 and Manufacture of Chemicals and Chemical Products #24. Manufacture of Other Transport Equipment#35 depicts the lowest growth rate during the entire period of the analysis. Overall the rate of growth of capital is high for the most of the sectors for the entire period of the analysis. In Indian manufacturing sector still more of capital input is being used.

Growth rate of labour is higher for fourteen industrial groups in the pre-liberalisation phase while eight industrial groups depict acceleration in the post liberalisation phase. Highest growth is recorded for the Manufacture of Wearing Apparel; Dressing and Dyeing of Fur#18 followed by Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks#33 and Tanning and Dressing of Leather Manufacture of Luggage, Handbags Saddlery, Harness and Footwear #19 for the entire period of the analysis. Seven Industrial groups depict negative growth rate for the entire period of the analysis. Post liberalization growth in value added is associated with less labour even the rate of growth is value added decelerates for sixteen sectors.

6. Analysis: Partial Productivity

Detailed analysis must be taken at the partial factor productivity and total factor productivity to have a clear picture of Indian manufacturing.

Table 3: Growth Rates of Capital Productivity, Labour Productivity and Capital Intensity in Manufacturing Sector of India (1980-81 to 2002-03)

Industry code	Labour Productivity			Capital Productivity			Capital Intensity		
	Entire Period	Period I	Period II	Entire Period	Period I	Period II	Entire Period	Period I	Period II
15	10.27	15.13	7.96	3.61	7.43	1.42	6.43	7.17	6.45
16	9.36	19.56	3.75	1.61	8.37	-1.96	4.51	3.38	5.82
17	7.31	9.69	8.55	-0.98	4.03	-0.89	8.37	5.44	9.53
18	6.19	4.90	0.13	1.99	3.34	-3.35	4.11	1.51	3.60
19	6.44	1.12	0.95	2.41	6.32	-4.64	3.94	-4.89	5.87
20	11.74	7.80	13.47	5.36	2.53	7.27	6.06	5.14	5.77
21	5.30	7.15	1.93	0.43	3.24	-3.14	4.84	3.79	5.23
22	7.32	4.87	5.71	-0.33	0.13	-4.50	7.67	4.74	10.69
23	7.30	4.06	6.39	-2.17	-1.95	-3.84	9.67	6.12	10.64
24	8.91	4.91	5.62	1.49	-2.39	-0.23	7.31	7.48	5.86
25	1.00	3.15	1.84	-5.39	-1.44	-4.53	6.75	4.66	6.67
26	5.96	4.24	1.71	-1.33	-0.37	-5.64	7.39	4.63	7.79
27	6.57	4.70	7.06	1.19	4.32	0.76	5.33	0.36	6.25
28	6.93	3.14	3.38	2.97	4.31	-1.17	3.84	-1.12	4.60
29	3.35	-0.71	3.81	-2.28	-5.22	-2.56	5.76	4.76	6.54
30	5.95	1.85	3.45	-3.65	-5.81	-5.26	9.96	8.14	12.99
31	2.99	-0.95	1.55	-3.25	-3.78	-7.15	6.44	2.94	9.37
32	1.04	-6.56	4.11	-6.36	-7.07	-5.36	7.90	0.54	10.01
33	4.90	-4.75	5.19	1.54	-3.48	0.37	3.31	-1.31	4.80
34	1.84	5.41	-6.80	-1.41	0.98	-4.38	3.29	4.39	-2.53
35	6.13	5.70	5.09	2.44	3.28	0.06	3.60	2.35	5.03
36	7.80	1.72	7.46	3.02	-0.37	0.98	4.64	2.10	6.42

Computed, Note: For two-digit industry codes, see Table 4.

6.1 Labour Productivity

A look at labour productivity (Table 3) depicts that thirteen sectors shows growth rate more than 6 percent per year for the entire period. So the picture is good for the labour productivity front. Detailed industry wise trends are given below.

Industry Wise Trends in Labour Productivity

i. **Industries Having Rate of Growth 1-4%** - Five industrial groups fall in this category.

ii. **Industries Having Rate of Growth 4-6 %** - Manufacture of Paper and Paper Products#21, Manufacture of other Non-Metallic Mineral Products#26, Manufacture of Office, Accounting and Computing Machinery#30 and Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks#33.

iii. **Industries Having Rate of Growth 6-8 %** - Nine industrial groups fall in this category.

iv. **Industries Having Rate of Growth 8-10 %** - Two sectors namely Tobacco Products #16, Manufacture of Chemicals and Chemical Products #24 fall in this category.

v. **Industries Having Rate of Growth above 10 %** - Two sectors i.e. Food Products and Beverages #15, Manufacture of Wood and of Products of Wood and Cork, Except Furniture; Manufacture of Articles of Straw and Plating Materials #20 has depicted a higher growth rate of labour productivity for the entire period although the rate of growth for Food Products and Beverages #15 group have fallen sharply in the post-liberalized era.

Trends in labour productivity for the two sub- periods depicts that labour productivity is higher in the second period of the analysis for most of the sectors i. e. the liberalisation period. For the entire period labour productivity is higher for the Manufacture of Wood and of Products of Wood and Cork, Except Furniture; Manufacture of Articles of Straw and Plating Materials #20. Following this is the by Food Products and Beverages sector #15 and the next is Tobacco Products #16. Overall labour productivity in the manufacturing sector of India has performed better in the post liberalisation era.

6.2 Industry Wise Trends in Capital Productivity

After having a view of labour productivity let us try to analyze the performance of Indian manufacturing on capital productivity terms (Table3). Generally it is felt that growth in output is almost accounted for the higher growth of inputs especially capital in the developing countries. Most studies depict that Indian manufacturing

has not performed well on the capital productivity front. A detailed analysis of trends in capital productivity is given below:

i. **Industries Having Negative Rate of Growth** - Ten sectors fall in this category.

ii. **Industries Having Rate of Growth 0-2 %** - Six sectors namely Tobacco Products#16, Manufacture of Wearing Apparel; Dressing and Dyeing of Fur#18, Manufacture of Paper and Paper Products#21, Manufacture of Chemicals and Chemical Products #24, Manufacture of Basic Metals #27, Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks#33 have growth rate between 0-2 per cent per annum.

iii. **Industries Having Rate of Growth 2-3 %** - There are three sectors namely Tanning and Dressing of Leather Manufacture of Luggage, Handbags Saddlery, Harness and Footwear #19, Manufacture of Fabricated Metal Products, Except Machinery and Equipments #28, Manufacture of Other Transport Equipment#35 falling in this category.

iv. **Industries Having Rate of Growth 3-5 %** - Two sectors report a comparative higher capital productivity namely Food Products and Beverages #15, Manufacture of Furniture; Manufacturing N.E.C #36.

v. **Industries Having Rate of Growth Above 5 %** - Only one sector i.e. Manufacture of Wood and of Products of Wood and Cork, Except Furniture; Manufacture of Articles of Straw and Plating Materials #20 is reporting a higher productivity i.e. 5 percent rate of growth. The sector has performed better in the second period of analysis that is the post liberalized period.

Trends in the capital productivity for the two sub periods depicts that capital productivity is higher in the pre liberalisation period. Capital productivity is higher in fifteen sectors in the first period of the analysis. For entire period six sectors depict growth rate between 0-2 percent which is infact very low. In the post liberalized period there are sixteen sectors depicting a negative growth rate. Capital intensity is higher for only three industrial groups in the pre liberalisation phase while nineteen industrial groups depict higher growth in the post liberalisation phase. Highest growth rate of capital intensity is recorded for the Manufacture of Office, Accounting and Computing Machinery#30, followed by Manufacture of Chemicals and Chemical Products #23 and Manufacture of Textiles#17. Manufacture of Motor Vehicles, Trailer and Semi-Trailers #34 depicts lowest growth rate (3.29) during the entire period of the analysis. Overall rate of growth capital intensity is high in the post liberalisation era.

7. Industry Wise Trends in Total Factor Productivity

Table 4 : Growth Rates of Total Factor Productivity in Manufacturing Sector of India (1980-81 to 2002-03)

Industry code	Industry Name	Entire Period	Period I	Period II
15	Manufacture of Food Products	1.88	3.58	0.96
16	Manufacture of Tobacco Products	2.06	5.68	-0.07
17	Manufacture of Textiles	1.16	2.79	1.85
18	Manufacture of Wearing Apparel; Dressing and Dyeing of Fur	1.09	1.40	-0.82
19	Tanning and Dressing of Leather Manufacture of Luggage, Handbags Saddlery, Harness and Footwear	1.15	1.68	-1.28
20	Manufacture of Wood and Products of Wood and Cork, Except Furniture; Manufacture of Articles of Straw and Plating Materials	2.86	2.07	3.01
21	Manufacture of Paper and Paper Products	0.88	2.00	-0.60
22	Manufacture of Publishing, Printing and Reproduction of Recorded Media of India	1.16	1.10	-0.14
23	Manufacture of Chemicals and Chemical Products	-0.41	-0.37	-1.23
24	Manufacture of Coke, Refined Petroleum Products and Nuclear Fuel	1.39	-0.53	0.35
25	Manufacture of Rubber and Plastic Products	-1.93	-0.02	-1.88
26	Manufacture of other Non-Metallic Mineral Products	0.16	0.63	-1.73
27	Manufacture of Basic Metals	0.88	1.60	0.69
28	Manufacture of Fabricated Metal Products, Except Machinery and Equipments	1.51	1.45	0.16
29	Manufacture of Machinery and Equipment N.E.C,	-0.06	-1.43	-0.18
30	Manufacture of Office, Accounting and Computing Machinery	-0.42	-1.31	-1.38
31	Manufacture of Electrical Machinery and Apparatus N.E.C.	-0.63	-1.22	-2.28
32	Manufacture of Radio, Television and Communication Equipment and Apparatus	-2.21	-3.36	-1.63
33	Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks	1.06	-1.64	0.64
34	Manufacture of Motor Vehicles, Trailer and Semi-Trailers	-0.08	1.21	-2.15
35	Manufacture of Other Transport Equipment	1.48	1.89	0.46
36	Manufacture of Furniture; Manufacturing N.E.C	1.97	0.39	1.11

Computed

A view of total factor productivity is necessary for having true picture of Indian manufacturing as partial productivity alone does not give a complete view. Growth rates of total factor productivity (Table 4) are higher for sixteen industrial groups in the pre-liberalisation phase while six industrial groups depict higher growth in the post-liberalisation phase. For the entire period, growth rate of total factor productivity is highest for Manufacture of Wood and of Products of Wood and Cork, Except Furniture; Manufacture of Articles of Straw and Plating

Materials #20 followed by Beverages and Tobacco Products #16, Manufacture of Furniture: Manufacturing N.E.C #36. The machinery sector represented by subgroup 29-32 had performed badly on total factor productivity front. Manufacture of Machinery and Equipment N.E.C, Manufacture of Office, Accounting and Computing Machinery, Manufacture of Electrical Machinery and Apparatus N.E.C., Manufacture of Radio, Television and Communication Equipment and Apparatus # (29-32) depict negative growth for the entire period as well as for two sub periods. Overall rate of growth total factor productivity is high in the pre-liberalisation era. Overall the growth rates of TFP are quite low for most of the sectors of Indian manufacturing.

Detailed analysis for two digit manufacturing is given below:

(i) **Industries Having High Rate of Growth (above 2 %)** – Only two industries out of twenty two industries fall in this category. These are: Manufacture of Wood and of Products of Wood and Cork, Except Furniture; Manufacture of Articles of Straw and Plating Materials #20 and Manufacture of Tobacco Products #16.

(ii) **Industries Having Medium Rate of Growth (1-2 %)** – Most of the Industries i.e. ten industries depict moderate growth.

(iii) **Industries Having Low Rate of Growth (less than 1 %)** –Three industries depict a growth rate between zero to one percent.

(iv) **Industries Having Negative Rate of Growth** – Seven industries fall in this category, which is still high and needs to be focused as performance has to be improved for these industries.

Overall trends in growth rates of total factor productivity for the two sub- periods depict that growth rate of total factor productivity are higher in the first period of the analysis i.e. pre reform period. Growth rates of total factor productivity are higher in sixteen industries in the pre liberalisation phase and only in six industries in the post liberalisation period. In most of the industries the post reform period is associated with deceleration in productivity.

8. Conclusion

Although India moved over to the slight liberalisation phase in 1980s but rigorous reforms were initiated only after 1990s.The reforms were undertaken to prepare India to face the global challenges. The present research analyses the growth trends in the output (value added), inputs (labour and capital), partial productivity as well as total factor productivity in Indian manufacturing industries for aggregative and disaggregative level for the period 1980-81 to 2002-03 as well as for two sub periods, pre-1991 and post -1991 period. At aggregative level an overall long term growth of 7.78 percent per annum in value added in manufacturing sector during 1980-81 to 2002-03 is associated with a rapid growth of capital (6.05 percent per annum) and a low growth of employment (0.65 percent per annum). Labour productivity for the whole period increased at an annual rate of

7.09 per cent per annum while capital productivity increased at a rate of 1.64 per cent per annum. Capital intensity for the entire period is 5.36 per cent per annum. The estimate of total factor productivity (TFP) growth of Indian manufacturing is 1.24 per cent per annum over the entire period 1980-81 to 2002-03. Total factor productivity growth is higher during the pre liberalisation period than during the second period of the analysis i.e. post liberalisation period. Estimate of pre liberalisation phase is 1.53 per cent per annum while in the post liberalisation phase total factor productivity decreases to 0.44 per cent per annum. The growth of value added and labour decelerated in the post liberalisation period. Growth of capital shows a higher growth in the second period of the analysis but it has not transformed into productivity growth. This increase in capital may lead to higher growth in productivity in the coming years. For total manufacturing sector both partial productivity and total factor productivity decelerate in the post reform period. So the aggregative analysis shows that the deceleration in productivity growth in the post reform period.

A disaggregative analysis is done to study the inter industry trends in Indian manufacturing. Value added is highest for Manufacture of Wearing Apparel; Dressing and Dyeing of Fur#18, followed by Manufacture of Furniture; Manufacturing N.E.C#36, Manufacture of Coke, Refined Petroleum Products and Nuclear Fuel #24 for the entire period of the analysis. Growth rates of labour are higher for fourteen industrial groups in the pre-liberalisation phase, while only eight groups depict higher growth in the post liberalisation phase. Growth rates of capital are higher for only four industrial groups in the pre liberalisation phase while eighteen industrial groups depict acceleration in the post liberalisation phase. Analysis of the partial productivities depict a higher growth of labour productivity in the second period of analysis, i.e. the post-liberalisation phase in twelve out of twenty-two sectors while capital productivity is higher in the first period of analysis, i.e. the pre-liberalisation phase in fifteen out of twenty-two sectors. Capital intensity is higher for only three industrial groups in the pre-liberalisation phase while nineteen industrial groups depict higher growth in the post liberalisation phase. Growth rates of total factor productivity are higher for the sixteen industrial groups in the pre liberalisation phase while six industrial groups depict higher growth in the post liberalisation phase. So analysis at disaggregative level also show that the partial productivity and total factor productivity for Indian manufacturing sector has decelerated in the new policy regime. The results of this study are corroborated by several studies covering the period of 1991 reforms [Balakrishnan, et.al. (2000), Kumari, A. (2001) Goldar, B. and Kumari, A. (2003) and Das, K. D. (2001, 2003)]. However whatever growth is attained is far from satisfactory. So in the near future there is need for greater impetus on productivity in the India manufacturing sector for the sustainability of growth of the manufacturing sector.

The limitation of the present study originate mainly from the database and methodology used. Estimates of output and input in the present study are not free from certain biases. There are conceptual problems in the measurement of capital and they are very difficult to overcome. The standard methodology used in this study also has certain limitations. The measure of total factor productivity growth used in this study is derived from a Translog production function under the assumption of competitive equilibrium (where the factors are paid the value of their

respective marginal products) and constant return to scale. These assumptions have been frequently questioned in literature. In terms of productivity the performance of Indian manufacturing is still far from satisfactory. Focus has to be laid on efficient use of capital and suitable environment should be provided in the organization to enhance the productivity. Organizing suitable training programmes will helps the use the new technology efficiently as capital intensity for Indian manufacturing is still high. Steps have to be initiated to use capital judicially along with labour. A detailed primary level study undertaken for manufacturing firm is needed to supplement the current study which has been based on the secondary data.

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