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Growth and Performance of Manufacturing Industries in Jagatpur Industrial Estate, Cuttack, Odisha

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Abstract

The objective of the paper is to examine the growth and performance of manufacturing industries in Jagatpur Industrial estate, Cuttack, Odisha. The study is based on primary data collected from 128 Manufacturing industries which are classified into 9 categories of industries. In this paper researcher has taken four major type of industries for intensive study by using various methods like Cobb-Douglas Production Function, Compound Growth Rate and Descriptive Statistics etc. Elasticity of output with respect to investment is more compared to that with respect to employment in industries like Manufacture of auto mobile and engineering, paper and paper products, manufacturer of iron and steel, manufacturer of electronics good, manufacturer of plastic products and manufacturer of agro based product. It implies that the productivity of capital is more in the former category of industries. It is disheartening to note that the marginal product of labour is negative in manufacturer of automobile and engineering, manufacturer of iron and steel, manufacturer of paper and paper products and agro based industries. If we compare the employment elasticity it is highest in Manufacture of food and food product followed by manufacturer of chemical products while it is the lowest in Manufacture of paper and paper products Industries

Keywords: Employment, Growth, Investment, Manufacturing Industries, Productivity.

Introduction

Manufacturing is a process where there is conversion of raw material is made into finished or final product. This either can be used as final product for customer's satisfaction or used as raw material for producing another final product. Finally we can say that manufacturing industry refers to a business that transforms raw material into finished or semi-finished product, using various inputs like machine, tools and labour. Manufacturing literally means to make by hand. However, now it includes goods made by machines. It is essentially a process which involves transforming raw materials into finished goods of high value. Conceptually, an industry is a geographically located manufacturing unit maintaining books of accounts and records under a management system.

In the year 1803, the Cuttack district was founded under the Bengal presidency of the British India. At the time of British Presidency there was only three districts in Odisha. These three districts are Cuttack, Puri and Balasore. Cuttack is one of them. Cuttack district has an excellent potential for industrial development, given its strategic location, good connectivity with all other districts of the State, proximity to the State capital and a strong industrial base with 8 Industrial Estates with 6241 registered industrial unit and 16228 total industrial units located in the district. This employed 57458 numbers of daily workers in small scale industries and 2708 number of workers in medium and large scale industries. The emerging industries (MSMEs) are mainly in the fields of engineering, IT and IT related services, Agro &Food processing, Glass & Ceramics, Readymade garments, Chemicals and Pharmaceuticals, Refractory, Metallurgy and mineral based industries. Jagatpur Industrial Estate is one of the oldest and largest industrial base in the district having 570 number of registered industries. It was established in the year 1980 and on 25th February 1986. Orissa Industries Association has come out as a registered Industries Association bearing registration No. 8960/14-1985-86, under Society registration act 1860.

Review of Literature

A study by Ulrich Kohli (2004) in "Labour Productivity vs. Total Factor Productivity" has examined the interlink between labour productivity and total factor productivity, the two important measures. He used beyond the usual and rather restrictive two-input, one output production function setting. Finally he came to a conclusion that behind labour productivity there are number of forces as: technological changes, capital deepening, terms of trade changes and changes in the real exchange rate.

Manoj Kumar Dash, Gaurav Kabra and Ajay Singh (2010) in a study on "Productivity Growth of Manufacturing Sector in India an Inter-State Analysis "estimated the total factor productivity growth of the manufacturing industries of different states of India using the Translog production function to know the structure and growth of registered manufacturing factory sector, examined the extent of employment concentration in Orissa's manufacturing industries relative to all India, to explore the sources of output growth in manufacturing industries. So their findings states that TFPG estimates depend significantly on the measurement of output. Secondly, TFPG (Y) and TFPG (Z) remained low and stagnant for a large number of states during 1970s which supports the existing ideas.

In an IMF working paper E Crivelli, D Furceri and J Toujas Bernate (2012) in their paper named "Can policies affect employment intensity of growth? A cross country analysis" has studied the employment – output elasticity and also assess the effect of structural and macroeconomic policies on the employment intensity of growth. In their study they have taken a panel of 167 countries covering the period of 1991-2009 and concluded that structural policies have accelerate labour and product market flexibility and positive impact on employment elasticity can be attained by reducing Government size.

Dipa Mukherjee and Rajarshi Majumder (2007) in a study of "Efficiency, technological progress and regional comparative advantage: A study of the organized manufacturing sector in India" wanted to estimate trends in factor productivity, technological progress and technological efficiency in the manufacturing sector in India and examined the relative importance of each component. It is also observed that the factor of technological efficiency, which leads to growth in output through greater experience and skill of workers, better organization by entrepreneurs, better utilization of existing resources, etc., is quite significant in a capital-scarce developing economy like India.

Aim of the Study

The present paper is a modest attempt to analyze growth and performance of manufacturing industries in Jagatpur Industrial Estate. The specific objectives of the present study are as follows:

1. To examine the scale of operation and factor intensity of different industries in odisha.
2. To work out elasticity of output and employment for different industries in Odisha.

Data and Methodology

The data for the present study have been collected from Jagatpur Industrial Estate. For this study 128 manufacturing industries are selected and then classified into nine major type of industries for the period from 2001-02 to 2015-16. The primary data were collected in a printed questionnaire which are classified and tabulated in Excell format for analysis.

The Model

The Cobb-Douglas (CD) production function has been widely used in empirical studies. Allowing for technological change, the CD function for the two inputs case, taking labour and capital as two inputs and value added as the output, may be written as:

$Y = Ae^{\lambda t}L^{\alpha}K^{\beta}$, $0 \le \alpha \le 1, 0 \le \beta \le 1$ …..… (1),

Where Y = output, L = labour, K = capital and t = time.

A is the efficiency parameter, α and β are the elasticity of output with regard to labour and capital respectively and λ is the exponential rate of technological progress.

The sum of α and β gives the returns to scale.

If, $\alpha+\beta=1$, then there is constant returns to scale.

$\alpha+\beta>1$, then there is increasing returns to scale.

$\alpha+\beta<1$, then there is decreasing returns to scale.

The CD function implicitly assumes the elasticity of substitution between capital and labour to be unity. The logarithmic transformation of the CD function yields an equation linear in parameters. Thus taking logarithms and adding an error term u, the CD function may be written as:

$\ln Y = a + \alpha \ln L + \beta \ln K + \lambda t + u$ ……. (2),

Where $a = \ln A$

The ratio form of the CD function has been used for estimation purposes, which has the advantage that it provides a direct test of the hypothesis that the degree of homogeneity of the function (returns to scale) is one. In ratio form, the function may be written as:

$\ln (Y/L) = a + \beta \ln (K/L) + (\alpha + \beta - 1) \ln L + \lambda t + u$ ……..(3)

Trend and Performance of Food Industries

The performance of manufacturing industries in the study area can be analysed by trend of employment, investment, input and output. The Researcher has taken four major type of industry for intensive study namely(i)Manufacturer of food and food products (ii) Manufacturer of Chemical products (iii) Manufacturer of Electronics goods (iv) Manufacturer of plastic and plastic products for the present study out of nine types of industries operating in the study area. There are 78 industries in this four categories. The employment, investment, input and output of food industries are given in table-1.

Table-1 Employment, Investment, Input, Output and Productivity of Food Industry of Jagatpur Industrial Estate.
(Values in '000 & Employment in number)

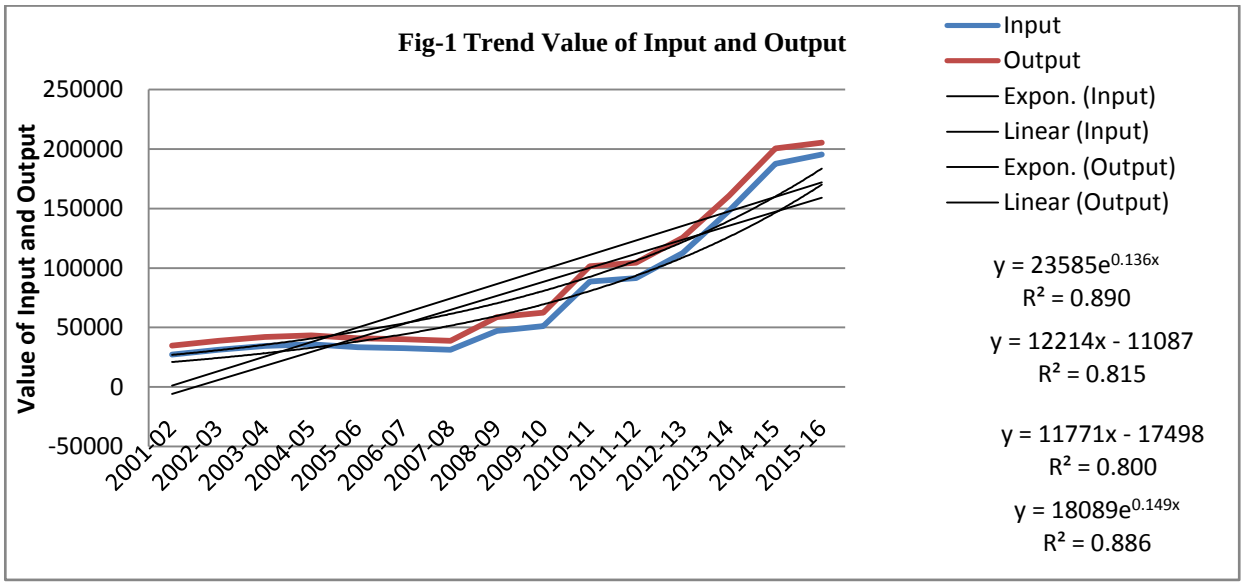
Year	Employment	Investment	Input	Output	Labour Productivity	TFP (O/I)
2001-02	464	13473	27347	34892	75.20	1.28
2002-03	529	14993	31337	38882	73.50	1.24
2003-04	575	19116	34662	42207	73.40	1.22
2004-05	670	24075	35935	43480	64.90	1.21
2005-06	760	25994	33617	41162	54.16	1.22
2006-07	821	23505	32762	40307	49.10	1.23
2007-08	884	22403	31318	38863	43.96	1.24
2008-09	1031	22886	47361	58833	57.06	1.24
2009-10	1121	25469	51225	62697	55.93	1.22
2010-11	1319	34391	88727	101466	76.93	1.14
2011-12	1421	42383	91679	104418	73.48	1.14
2012-13	1496	51023	112679	125418	83.84	1.11
2013-14	1587	67103	148079	160818	101.33	1.09
2014-15	1669	91103	187799	200538	120.15	1.07
2015-16	1647	101687	195479	205338	124.67	1.05
CAGR	0.09	0.16	0.15	0.13	0.04	-0.01

Source-Computed by the author

It is clear from the table-1 that the number of employment in the above said industry shows us an increasing trend throughout the study period. In the year 2001-02 the total number of employment was 464 then it increased to 529, 575, 670 respectively. From the year 2008-09 the number of employment shows a four digit number equal to 1031 and started increasing and reached at 1669 number in the year 2014-15 after that it decreased to 1647 in the year 2015-16. If we look in to the investment it shows a mix result .The highest number of investment was made in the year 2015-16 and lowest in 2001-02.If we look into the output and input former is always higher than the later throughout the study period. The trend of output and input throughout the study period can be represented graphically in figure-1.

It is also clear from the above table-1 that the trend of total factor productivity is almost constant throughout the study period and fluctuating in between 1.05 and 1.28 and it is only due to less exposure to technical progress. The total factor productivity is highest in the year 2001-02 and lowest in 2015-16. If we take the case of labour productivity it shows a mixed trend throughout the study period. It was 75.20 in the year 2001-02 which was sharply reduced to 73.50 in the preceding year and then 73.40 in the year 2003-04. Up to 2011-12 the labour productivity was fluctuating in between 43.96 to 76.93 but after that it started increasing. In the year 2012-13 it was 83.84 and increased to 101.33 in 2013-14 and to 120.15 and 124.67 in the year 2014-15 and 2015-16 respectively. The researcher has calculated compounded annual growth rate (CAGR) for the different variables throughout the study period. It is a year over year growth rate over a specified period of time. It is calculated by dividing the value of an investment at the end of the period in question by its value at the beginning. The growth rate for employment, investment, input, output and labour productivity shows a positive number i.e.0.09, 0.16, 0.15, 0.13, 0.04 respectively where as growth rate of total factor productivity shows us a negative number equal to -0.01. The trend of output and input throughout the study period can be represented graphically in figure-1.

Fig-1 Trend Value of Input and Output



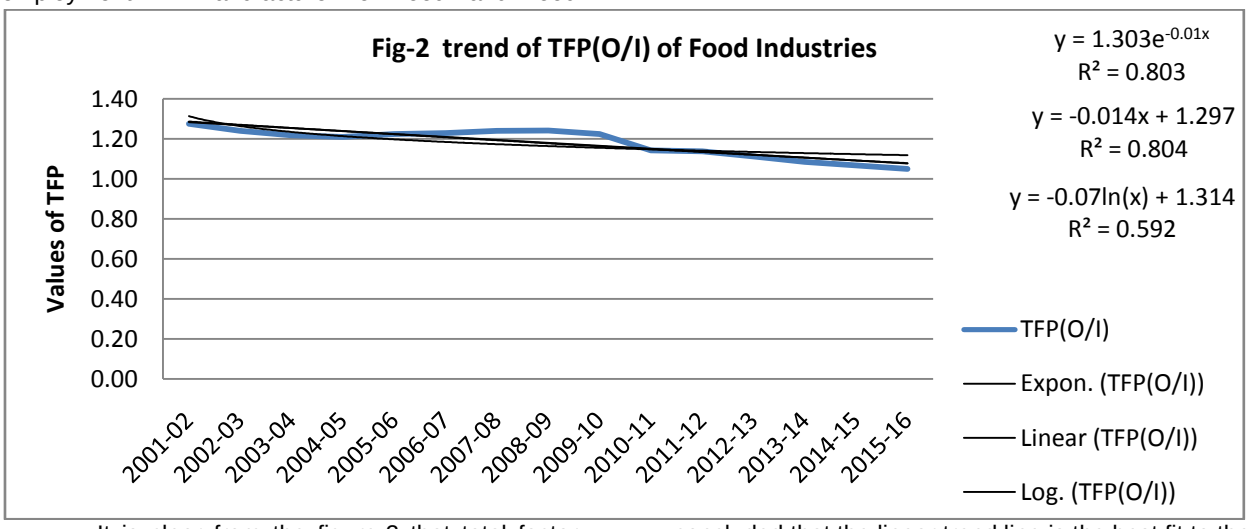
It is clear from the figure-1 that both input and output are increasing and positive. But the value of output is always greater than the value of input. After obtaining the graphical trend the Least Square trend was computed by using exponential and linear function for value of output and total input .The coefficient in the exponential equation is found to be 0.136x and 0.149x for output and input respectively and their R^2 values are 0.890 and 0.886 respectively . It implies that over the period both the output and input has increasing trend. The descriptive statistics of total employment, invested capital, total input and output is given in table-2

Table-2 Descriptive Statistics

Statistical Measures	Employment	Investment	Input	Output
Mean	1066	38640	76667	86621
S.E	111	7099	15195	15621
Median	1031	25469	47361	58833
S.D	430	27494	58851	60500
Range	1205	88214	168132	170446
Sum	15994	579604	1150006	1299319

Source-Computed by the author

The table-2 shows that the mean value of employment in manufacturer of food and food products is 1066.The average number of investment is found to be 3864 and the average number of input and output is equal to 7666 and 86621 respectively, which shows that the output is always greater than the input. If we look into the standard deviation which is very high among the variables which shows that there are fluctuations among the variables. Figure-2 shows the trend of Total Factor Productivity.



It is clear from the figure-2 that total factor productivity shows a positive but decreasing trend throughout the study period. The researcher has calculated exponential, linear and logarithmic trend line for TFP. The coefficient of the equation are -0.01, -0.014, and -0.07l and their R^2 values are 0.803, 0.804 and 0.592 respectively. From this we can concluded that the linear trend line is the best fit to the data.

Manufacturer of Chemical Products

Table-3 Employment, Investment, Input, Output and Productivity of Chemical industry of Jagatpur Industrial Estate.

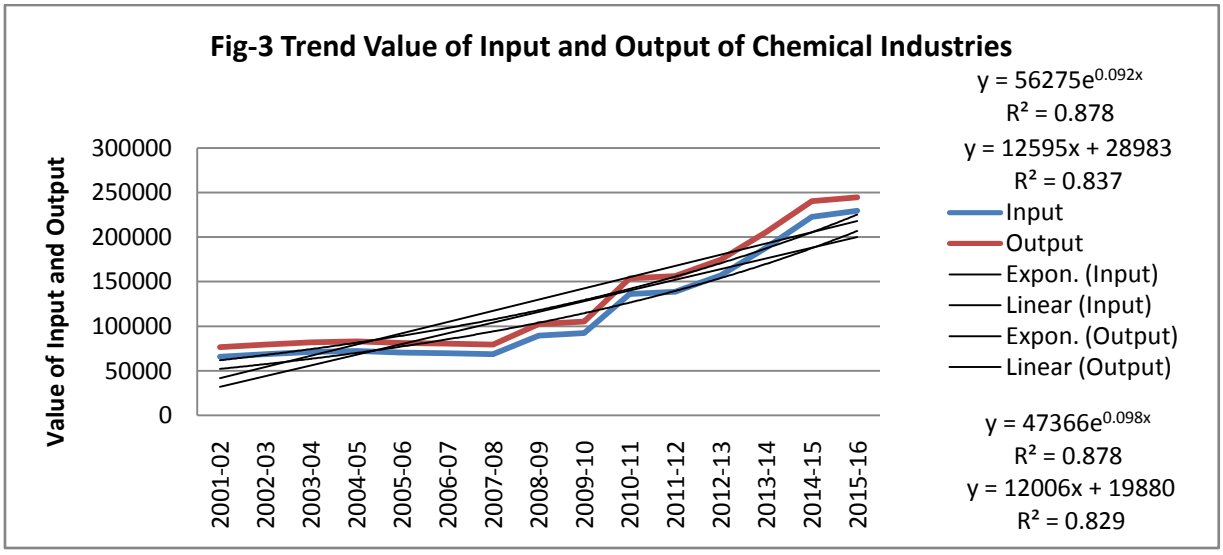
(Values in '000 & Employment in number)

Year	Employment	Investment	Input	Output	Labour Productivity	TFP(O/I)
2001-02	332	34900	65574	76603	230.73	1.17
2002-03	397	36020	68514	79543	200.36	1.16
2003-04	457	39058	70964	81993	179.42	1.16
2004-05	523	42712	71902	82931	158.57	1.15
2005-06	553	44126	70194	81223	146.88	1.16
2006-07	596	42292	69564	80593	135.22	1.16
2007-08	661	41480	68500	79529	120.32	1.16
2008-09	841	41848	89282	102411	121.77	1.15
2009-10	906	43816	92226	105355	116.29	1.14
2010-11	1252	58377	136114	153826	122.86	1.13
2011-12	1326	65370	138697	156409	117.96	1.13
2012-13	1391	72930	157072	174784	125.65	1.11
2013-14	1465	87000	188047	205759	140.45	1.09
2014-15	1516	108000	222802	240514	158.65	1.08
2015-16	1525	117261	229522	244714	160.47	1.07
CAGR	0.12	0.09	0.09	0.09	-0.03	-0.01

Source- Computed by the author

The table-3 reveals that the number of employment in the above said industry shows us an increasing trend throughout the study period. In the year 2001-02 the total number of employment was 332 then it increased to 397, 457and 523 respectively. From the year 2010-11 the number of employment shows a four digit number equal to 1252 number of employees and started increasing and reached at 1516 and 1525 number in the year 2014-15 and 2015-16 respectively. If we look in to the investment it

shows a mix result .The highest number of investment was made in the year 2015-16 and lowest in 2001-02. The trend of total factor productivity is almost constant throughout the study period and fluctuating in between 1.07 and 1.17 and it is only due to less exposure to technical progress. The total factor productivity is highest in the year 2001-02 and lowest in 2015-16. If we take the case of labour productivity it shows a mixed trend throughout the study period. It was 230.73 in the year 2001-02 which was sharply reduced to 200.36 in the preceding year and then 179.42 in the year 2003-04. Up to 2010-11 the labour productivity was fluctuating in between 116.29 to 158.57 but after that it started increasing. In the year 2011-12 it was 117.96 and increased to 125.65 in 2012-13 and to 140.45, 158.65 and 160.47 in the year 2013-14, 2014-15 and 2015-16 respectively. We have calculated compounded annual growth rate (CAGR) for the different variables for the study period. It is a year over year growth rate over a specified period of time. It is calculated by dividing the value of an investment at the end of the period in question by its value at the beginning. The growth rate for employment, investment, input, output and labour productivity shows a positive number i.e.0.09,0.16,0.15,0.13,0.04 respectively where as growth rate of total factor productivity shows us a negative number equal to -0.01. If we look into the output and input former is always higher than the later throughout the study period. The trend of output and input is represented graphically in figure-3. It is clear from the figure that both input and output are increasing and positive. But the value of output is always greater than the value of input. After obtaining the graphical trend the Least Square trend was computed by using exponential and linear function for value of output and total input .The coefficient in the exponential equation is found to be 0.092 xs and 0.098x for output and input respectively and their R^2 values is 0.878.



It implies that over the period both the output and input has increasing trend. The descriptive statistics of total employment, invested capital, total input and output are given in table-4.

Table-4 Descriptive statistics

Statistical measures	Employment	Investment	Input	Output
Mean	916	58346	115932	129746
S.E	116	6870	15221	15892
Median	841	43816	89282	102411
S.D	449	26608	58950	61549
Range	1193	82361	163948	168111
Sum	13741	875190	1738974	1946187

Source- Computed by the author

It is clear from table-4 that the mean value of employment in manufacturer of chemical products is 916.The average number of investment is found to be 5834 and the average number of input and output is equal to 115932 and 129746 respectively, which shows that the output is always greater than the input. If we look into the standard deviation which is very high among the variables which shows that there are fluctuations among the variables. Trend value of Total Factor Productivity is shown graphically in fig-4

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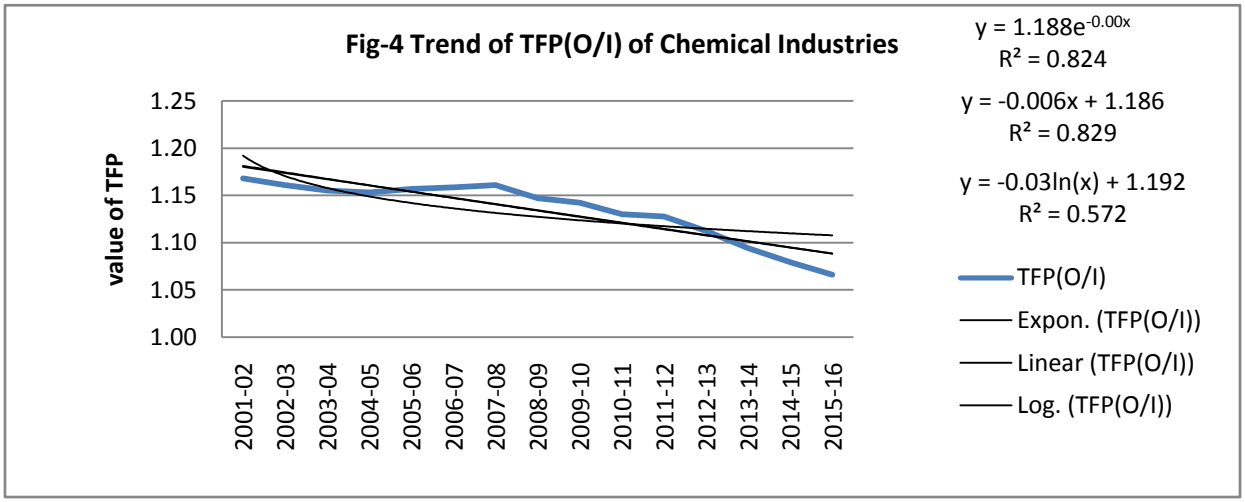


It is clear from the figure-4 that total factor productivity shows a positive but decreasing trend throughout the study period. Researcher has calculated exponential, linear and logarithmic trend line for TFP. The coefficient of the equation are -0.00x, -0.006x, and - 0.03ln(x) and their R^2 values are 0.824, 0.829 and 0.572 respectively. From this we can concluded that the linear trend line is the best fit to the data.

Manufacturer of Electronics Good

Table-5 Employment, Investment, Input, Output and Productivity of Electronics industry of Jagatpur Industrial Estate.

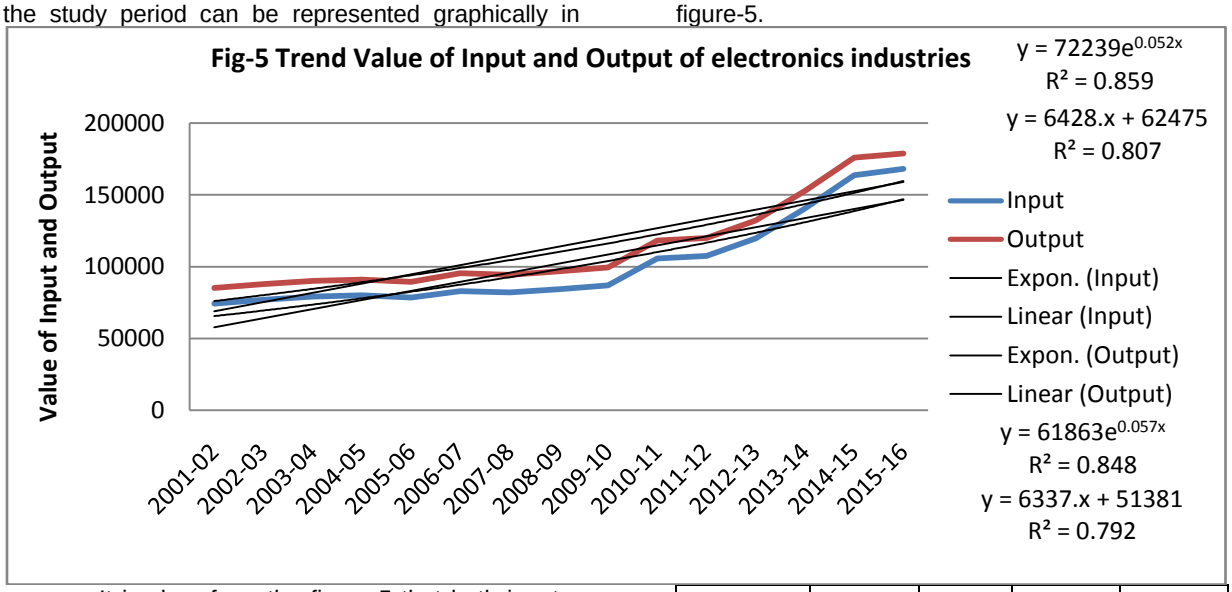
(Values in '000 & Employment in number)

Year	Employment	Investment	Input	Output	Labour Productivity	TFP(O/I)
2001-02	310	43461	74351	85292	275.14	1.15
2002-03	353	44501	77081	88022	249.35	1.14
2003-04	407	47322	79356	90297	221.86	1.14
2004-05	463	50715	80227	91168	196.91	1.14
2005-06	503	52028	78641	89582	178.10	1.14
2006-07	564	50555	83121	95552	169.42	1.15
2007-08	618	49743	82057	94488	152.89	1.15
2008-09	662	50065	84423	96854	146.31	1.15
2009-10	703	51787	86999	99430	141.44	1.14
2010-11	753	54741	105759	118190	156.96	1.12
2011-12	796	59403	107481	119912	150.64	1.12
2012-13	815	64443	119731	132162	162.16	1.10
2013-14	880	73823	140381	152812	173.65	1.09
2014-15	894	87823	163551	175982	196.85	1.08
2015-16	912	93997	168031	178782	196.03	1.06
CAGR	0.08	0.06	0.06	0.05	-0.02	-0.01

Source- Computed by the author

Table -5 reveals that the number of employment in the above said industry shows us an increasing trend throughout the study period. If we look in to the investment it shows a mix result .In the year 2001-02 the amount of investment was 43461,it was increased to 44501,47322, 50715and52028 in the year 2002-03 to 2005-06 respectively. In 2007-08 it reduced to 49743and again it increased to 50065 in 2008-09 from 2002-03 to 2008-09 it was almost constant and fluctuating in between 20054 and 25855, from 2008-09 it started increasing and reached at 93007 in the year 2015-16 . Table-5 implies that the trend of total factor productivity is almost constant throughout the study period and fluctuating in between 1.06 and 1.15 and it is only due to less exposure to technical progress. The total factor productivity is highest in the year 2001-02 It was 275.14 in the year 2001-02 which was sharply reduced to 249.35 in the preceding year and then 221.86 in the year 2003-04. From 2004-05 it started decreasing from 196.91 to 141.44 in 2009-10. From 2012-13 it was started increasing and reached at 196.85 and 196.03 respectively in the year 2014-15 and 2015-16. We have calculated compounded annual growth rate (CAGR) for the different variables throughout the study period. It is a year over year growth rate over a specified period of time. It is calculated by dividing the value of an investment at the end of the period in question by its value at the beginning. The growth rate for employment, investment, input and output shows a positive number i.e.0.10, 0.11, 0.10, and 0.09 respectively where as growth rate of labour productivity and total factor productivity shows us a negative number equal to-0.02 and -0.01. If we look into the output and input former is always higher than the later throughout the study period. The trend of output and input throughout

the study period can be represented graphically in figure-5.

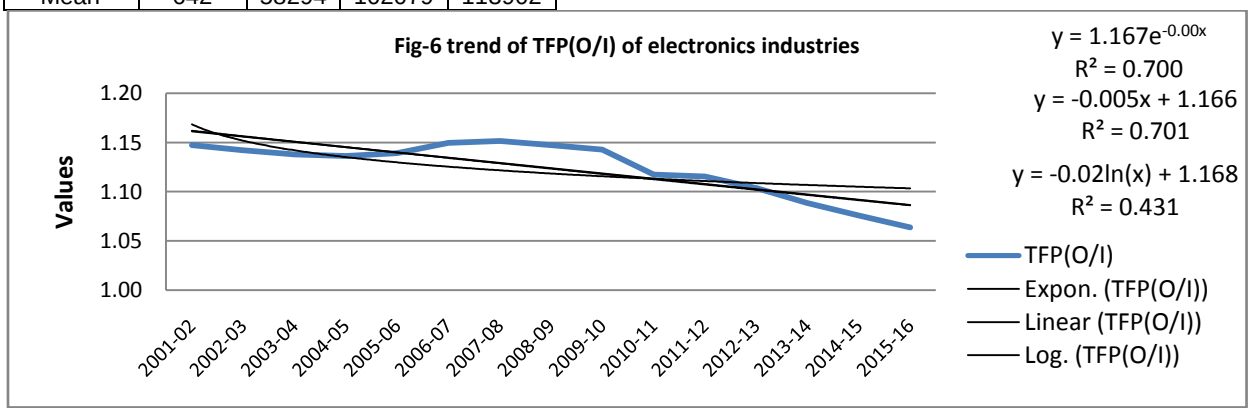


It is clear from the figure-5 that both input and output are increasing and positive. But the value of output is always greater than the value of input. After obtaining the graphical trend the Least Square trend was computed by using exponential and linear function for value of output and total input .The coefficient in the exponential equation is found to be 0.052 and 0.057 for output and input respectively and their R^2 values are 0.859 and 0.848 respectively. It implies that over the period both the output and input has increasing trend. The descriptive statistics of total employment, invested capital, total input and output is given in table-6.

Table-6 Descriptive Statistics

Statistical Measures	Employment	Investment	Input	Output
Mean	642	58294	102079	113902
S.E	52	3970	8219	8261
Median	662	51787	84423	96854
S.D	202	15376	31832	31996
Range	602	50536	93680	93490
Sum	9633	874407	1531190	1708525

Table-6 implies that the mean value of employment in manufacturer of Electronics goods and 642. The average number of investment is found to be 58294 and the average number of input and output is equal to102079 and 113902 respectively, which shows that the output is always greater than the input. If we look into the standard deviation which is very high among the variables which shows that there are fluctuations among the variables. The trend in total factor productivity is shown graphically in fig-6.



It is clear from figure-6 that total factor productivity shows a positive but decreasing trend throughout the study period. Researcher has calculated exponential, linear and logarithmic trend line for TFP. The coefficient of the equation are -0.00, -0.005, and - 0.02 and their R^2 values are 0.700, 0.701 and 0.431 respectively. From this we can concluded that the linear trend line is the best fit to the data.

Manufacturer of Plastic and Plastic Products

Table-7 Employment, Investment, Input and Output of Plastic industry of Jagatpur Industrial Estate.

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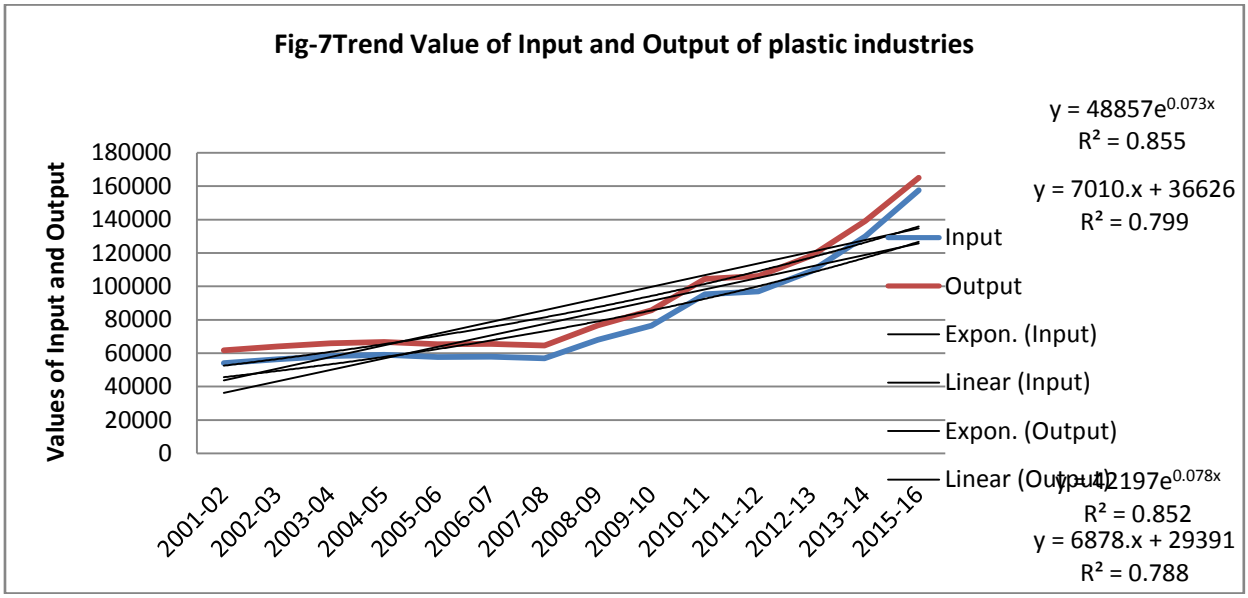
Table7 (Values in '000 & Employment in Number)

Year	Employment	Investment	Input	Output	Labour Productivity	TFP(O/I)
2001-02	243	31444	54092	61637	253.65	1.14
2002-03	298	32324	56402	63947	214.59	1.13
2003-04	352	34711	58327	65872	187.14	1.13
2004-05	421	37582	59064	66609	158.22	1.13
2005-06	475	38693	57722	65267	137.40	1.13
2006-07	545	37506	57854	65468	120.12	1.13
2007-08	602	36810	56942	64556	107.24	1.13
2008-09	686	37109	68108	76602	111.66	1.12
2009-10	634	41401	76462	85706	135.18	1.12
2010-11	891	44355	95222	104466	117.25	1.10
2011-12	940	49017	96944	106188	112.97	1.10
2012-13	999	54057	109194	118438	118.56	1.08
2013-14	1064	63437	129844	139088	130.72	1.07
2014-15	1085	77437	153014	162258	149.55	1.06
2015-16	1067	83611	157494	165058	154.69	1.05
CAGR	0.11	0.07	0.08	0.07	-0.03	-0.01

Source-Computed by the author

Table-7 shows that the number of employment in the above said industry shows us an increasing trend throughout the study period except in 2009-10. If we look in to the investment it shows a mix result .In the year 2001-02 the amount of investment was 31444,it was increased to 32324,34711, 37582 and38693 in the year from 2002-03 to 2005-06 respectively. From 2006-07 it started decreasing and reached at 36810 in 2007-08 but after that it started increasing and reached at 83611 in the year 2015-16. The trend of total factor productivity is almost constant throughout the study period and fluctuating in between 1.05 and 1.14 and it is only due to less exposure to technical progress. In 2001-02 the total factor productivity was 1.14 which reduced to 1.13 in 2002-03 and remain constant till 2007.08.In 2008-09 it again reduced to 1.12 and remain constant in 2009-10 again it reduced to 1.10 in 2010-11 and also maintain this in the next year. After that it started decreasing and reached at 1.05 in 2015-16. If we take the case of labour productivity it shows a mixed trend throughout the study period. It was 253.65 in the year 2001-02 which was sharply reduced to 214.59 in the preceding year and then 187.14 in the year 2003-04. From 2004-05 it started decreasing from 158.22 and reached at 107.24 in 2007-08.In 2008-09 it increased to 111.66 and 135.18 in 2009-10 , again it reduced to 117.25 in 2010-11 to 112.97 in 2011-12 but after that it started increasing and reached at 154.69 in 2015-16. It is a year over year growth rate over a specified period of time. The growth rate for employment, investment, input and output shows a positive number i.e.0.11, 0.01, 0.08, and 0.07 respectively where as growth rate of labour productivity and total factor productivity shows us a negative number equal to-0.03 and -0.01. The trend of output and input throughout the study period can be represented graphically in figure-7.

Fig-7Trend Value of Input and Output of plastic industries



It is clear from the figure-7 that both input and output are increasing and positive. But the value of output is always greater than the value of input. The Least Square trend was computed by using exponential and linear function for value of output and total input .The coefficient in the exponential equation is found to be 0.073 and 0.078 for output and input respectively and their R^2 values are 0.855 and 0.852 respectively. It implies that over the period both the output and input has increasing trend. The descriptive statistics of total employment, invested capital, total input and output is given in table-8.

Table-8 Descriptive Statistics

Statistical Measures	Employment	Investment	Input	Output
Mean	1020	46633	85779	94077
S.E	338	4189	9386	9504
Median	686	38693	68108	76602
S.D	1311	16224	36351	36807
Range	5391	52167	103402	103421
Sum	15302	699494	1286685	1411160

Source- Computed by the Author

The mean value of employment in manufacturer of Plastic products is 1020. The average number of investment is found to be 46633 and the average number of input and output is equal to85779 and 94077 respectively, which shows that the output is always greater than the input. The trend in total factor productivity is shown graphically in fig-8.

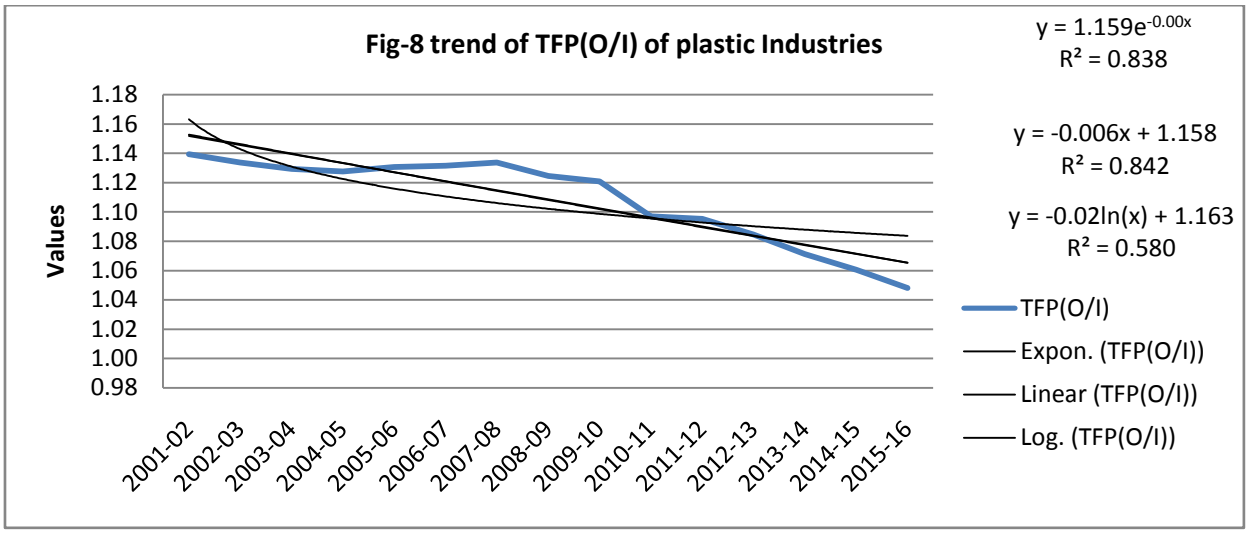


Fig-8 shows that Total factor productivity shows a positive but decreasing trend throughout the study period. Researcher has calculated exponential, linear and logarithmic trend line for TFP. The coefficient of the equation are -0.00, -0.006, and -0.02 and their R^2 values are 0.838, 0.842 and 0.580 respectively.

Table-9 Estimates of the Cobb-Douglas Production Function for manufacturing Industries of Odisha

Category of industry	β	α	α+β-1	β/α	R^2	Adj R^2
Manufacture of Agro based products	0.93 (10.98)	-0.06 (-1.05)	-0.13	-15.5	0.96	0.95
Manufacture of food and food products	0.76 (4.1)	0.38 (1.47)	0.14	2	0.93	0.92
Manufacture of chemical Products.	0.77 (6.11)	0.26 (2.73)	0.03	2.96	0.97	0.96
Manufacture of paper and paper Products.	1.09 (9)	-0.14 (-1.1)	-0.05	-7.79	0.95	0.95
Manufacturer of iron and steel	1.03 (11.7)	-0.05 (-0.64)	-0.02	-20.6	0.97	0.97
Manufacturer of Electronics goods	0.96 (9.04)	0.09 (1.25)	0.05	10.67	0.96	0.95
Manufacture of Automobile and engineering	1.12 (10.27)	-0.08 (-0.78)	0.04	-14	0.98	0.97
Manufacturer of plastic and plastic products.	0.96 (6.69)	0.13 (1.48)	0.09	7.38	0.95	0.94
Manufacturer of pharmaceuticals	0.82 (8.73)	0.21 (2.22)	0.03	3.90	0.97	0.97

Source- Computed by the Author

Results and Discussion

On the basis of the data relating to output, investment and employment collecting primarily from Jagatpur Industrial Estate, the regression coefficients have been estimated by using the equation...(3) and the results are shown in the Table-13.The results are discussed in the following section.

Returns to Scale

Out of the nine, six industries such as Manufacture of food and food paper product, manufacturer of chemical products, manufacturer of electronics goods, manufacturer of automobile and engineering, manufacturer of plastic and plastic products and manufacturer of pharmaceuticals etc are running under Increasing Returns to Scale (IRS) where as industries such as Manufacture of agro based products, manufacturer of paper and paper products and manufacturer of iron and steel basic iron and steel all the three industries are operating under Decreasing Returns to scale (DRS). No industry is found to operate under Constant Returns to Scale (CRS).

Factor Intensity

All most all industries are capital intensive. Manufacture of automobile and engineering is the highest capital intensive followed by manufacturer of paper and paper product, manufacturer of iron and steel, manufacturer of electronics good, manufacturer of plastic and plastic products, manufacturer of agro based product and manufacturer of pharmaceuticals, manufacturer of food and food product and manufacturer of chemical product.

Trend of Total Factor Productivity

Table-1 indicates that out of nine industries four industries i.e. manufacture of agro based product , manufacturer of paper and paper products, manufacturer of iron and steel and manufacturer of automobile and engineering are showing downward trend in total factor productivity while all other five industries show positive and upward trend in total factor productivity. It may due to fall in demand for above said products.

Elasticity of output and Employment

Elasticity of output with respect to investment is more compared to that with respect to employment in industries like Manufacture of auto mobile and engineering, paper and paper products, manufacturer of iron and steel, manufacturer of electronics good, manufacturer of plastic products and manufacturer of agro based product. It implies that the productivity of capital is more in the former category of industries. It is disheartening to note that the marginal product of labour is negative in manufacturer of automobile and engineering, manufacturer of iron and steel, manufacturer of paper and paper products and agro based industries. If we compare the employment elasticity it is highest in Manufacture of food and food product followed by manufacturer of chemical products while it is the lowest in Manufacture of paper and paper products Industries.

Conclusion

Most of the industries have become capital intensive after economic reforms due to opening of the economy and liberal policy of the government regarding technology transfer. Though the productivity of capital has increased, it has not helped to create more jobs and has rendered the growth jobless. In a labour abundant state like Odisha, labour intensive technology is more appropriate compared to capital intensive technology. Policy should be designed and investment be directed to those industries which not only ensure growth but also augment employment**.**

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