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- Bowersox, Donald J., Closs, David J., (1996), "Logistical Management." Tata McGraw, Hill, New Delhi.
- Hunker, H.L. and A.J. Wright (1963), "Factors of Industrial Location in Ohio" Ohio State University, Nigeria.

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- Garg, Bhavet (2011): Towards a New Gas Policy, Political Weekly, Viewed on January 01, 2012 http://epw.in/user/viewabstract.jsp

A STUDY ON ECONOMIC PERFORMANCE OF A SELECT BASIC CHEMICAL INDUSTRY IN TAMILNADU

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ABSTRACT

The aim of the current study is to study the productivity and profit. To find out the growth rates, magnitude of variability in certain important variables such as output, net income and profits. The Cobb – Douglas Production function, a popular form of production function was employed to find out the returns to scale of the Industries. In order to analyze the data based on the objectives, the investigator applied several statistical tools to find out the relationship between productivity, capital and labour.

KEYWORDS

Tamilnadu State, chemical industry, globalization, environment.

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L65

INTRODUCTION

The chemical industry is amongst the oldest and the largest manufacturing industries in Tamil Nadu. It is more than a couple of centuries old and occupied a dominant position in India's industrial structure. The chemical industry occupies a unique place in the economy of the state by virtue of its contribution to the industrial output, employment generation and Foreign Exchange earnings.

Tamil Nadu has emerged as major exporter of Basic chemicals and other chemical products. This indicates the competitiveness of Chemical industry in Tamil Nadu. The industry growth exceeds that of the manufacturing sector, despite the challenges of escalating crude oil prices and demanding international environmental protection standards which are now adopted globally. Pharmaceuticals and petrochemicals are the two biggest segments in Chemicals that account for approximately 26 per cent and 35 per cent respectively of the overall industry size. Europe, is the largest consumer of chemicals in the world, accounting for approximately half the global chemical consumption, USA consumes approximately one-fifth. The global chemicals industry is being shaped by the following trends that are impacting business models, processes and product segments of multinational players.

IMPORTANCE OF CHEMICAL INDUSTRY

I. GLOBALISATION

The global manufacturing footprint of MNCs is getting transformed, as companies seek to gain proximity to consumer markets, raw material sources, cheaper energy sources and lower tax regime in an effort to drive down costs and safeguard profitability.

II. CONSOLIDATION

Mergers and acquisitions are increasingly prevalent and companies seek economies of scale in manufacturing, logistics and R&D and to pave entry into new markets, expanding the global reach.

III. INCREASED ENVIRONMENT CONSCIOUSNESS

This is a global phenomenon that is driving the industry to innovate and modernise. Effluent disposal issues have resulted in research into cogeneration and upgradation of technology, having a healthy impact on costs and profitability.

Chemicals produced by the chemicals industry are used to make virtually every man-made product and play an important role in the everyday life of people around the world. Such products can protect crops and increase yields, prevent and cure disease, provide insulation to reduce energy use and offer countless other benefits that make life better for people.

The chemicals industry - which includes basic and speciality chemicals, consumer care Products, agrochemicals and pharmaceuticals - is also a major economic force which employs millions of people around the world, and generates billions of dollars in shareholder value and tax revenues for governments. It is more than twice the size of the world market for telecommunications equipment and services, and accounts for about 7% of global income and 9% of international trade (WEC, 1995).

As with other large manufacturing industries, the chemicals industry can also have a negative impact on human health and the environment when the production and use of chemicals are not managed responsibly. From the use of non-renewable resources for fuel and feedstock's (e.g. oil and gas), to the release of pollutants from factories during production, to the disposal of final products that contain hazardous waste, each stage of the lifecycle of a product produced by the chemicals industry can affect man and the environment

CHEMICALS INDUSTRY TRENDS AND OUTLOOK

DESCRIPTION OF THE INDUSTRY

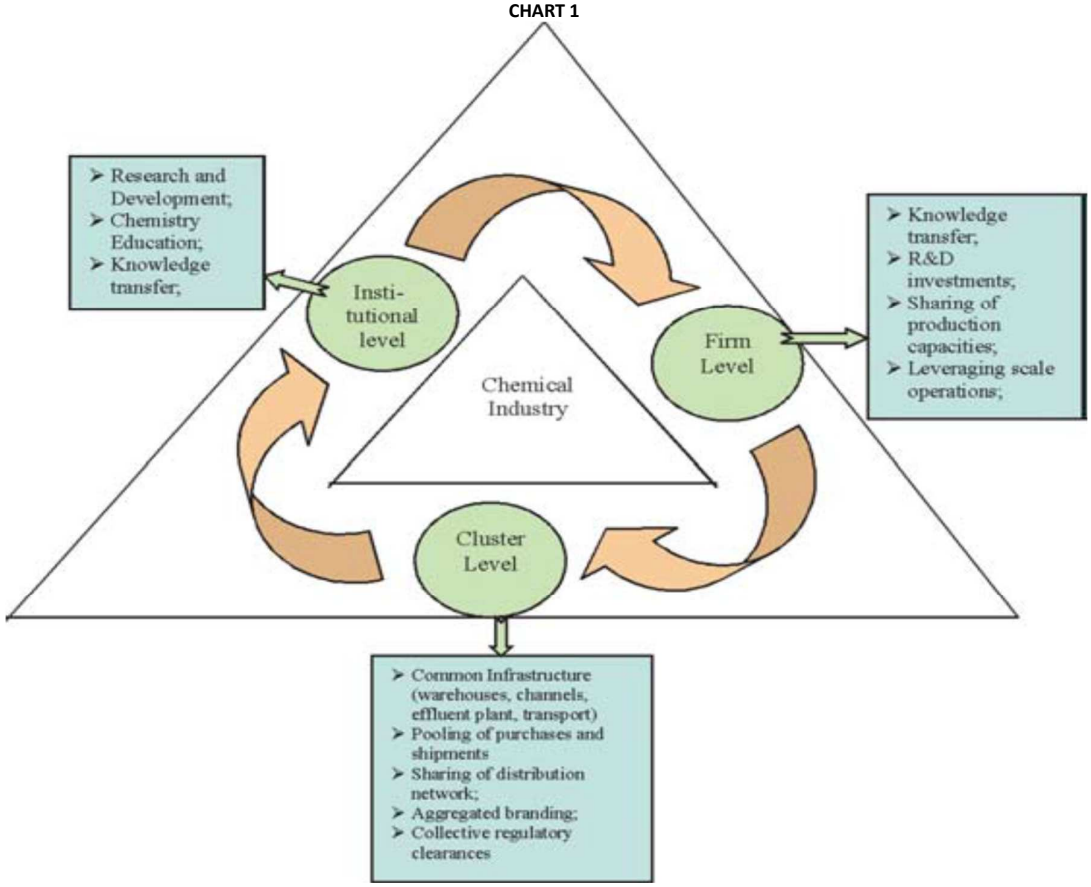
One word can describe the chemicals industry: diverse. There is no one typical product or one typical company. Starting with raw materials such as oil, coal, gas, air, water and minerals, the chemicals industry converts these materials into a vast array of substances for use by other chemical companies, other industries and consumers. The chemicals industries of industrialised nations produce a wide variety of chemicals ranging from commodity industrial chemicals used to make other products to specialty chemicals tailored for unique applications. These products can range from large bulk chemicals used to make plastics, to small bottles of cleaning solutions used by households. Many chemicals companies have a large body of technological knowledge in research and process engineering, abundant capital and management capacity, and skilled and technically competent labour forces.

The types of companies involved in producing this vast array of products also vary considerably. Some chemical companies are ranked amongst the largest industrial companies in the world - the top ten chemical companies had revenues in the range of US$10-30 billion (Fortune, 2000). These firms employ many thousands of workers (some with over 100,000 employees) and they have multiple manufacturing sites located throughout the world. Other chemical companies may make only a few products at one site and are relatively small in size. Companies with fewer than 50 employees and less than US$50 million in annual sales make 95% of the 50,000 chemicals produced in the US (SOCMA, 2000).

The chemicals industry is also a major employer, with over 10 million people employed Worldwide (CMA, 1999a). However, as the industry has become more productive and production processes have become highly automated, world employment levels in the industry have fallen 7.5% over the last ten years.

Given the complexity of the processes and the constant need for innovation, the chemicals industry is research intensive. Most companies allot 4 to 6% of their annual sales for R&D (CMA, 1999a), although the percentage of revenue spent on research varies from one branch to another. Companies specialising in large-volume basic chemicals that have been widely used for many years spend less, whereas competition in the newer sectors can be met only by intensive research efforts. Research costs are greatest for the life sciences companies and lowest for producers of commodity chemicals.

CHART 1



METHODOLOGY

The data were collected both from primary and secondary sources. The primary sources of information include interviews and questionnaires. The secondary sources of information include journals, guide books and other publications.

IMPORTANCE OF THE STUDY

The scope of the study is to determine that the basic chemical and chemical products industry is a key industry for all the manufacturing industries.

OBJECTIVES

1. Study the trends of productivity and profit.
2. Examine the returns to scale through Cobb – Douglas production function.
3. Find out the relationship between productivity, capital and labor.

REVIEW OF LITERATURE

Kashif Hamid and Abdullah (2006) pointed out in their combined article measured the elasticity of substitution through CES production function for the aggregate manufacturing sector for the reference period 1998 – 2004 including paper and paper board in selected countries. It was found that the aggregate value of a (elasticity of substitution) varied between 0.71 - 1.372. While sectorial elasticity of substitution varied from – 1.76 to 1.86, His findings showed that both in Norway and Egypt they were operating under increasing returns to scale.

Kashfia Ahmad and Tanbir Ahmad Chowdhyry (2009) attempted to examine the major productivity trends and factor substitutability in the manufacturing sector in Maharashtra. The period of the study was from 1998 – 2007. The study found that labor productivity had increased and capital intensity had fallen. The lockouts of industries in Maharashtra could also be accounted as an important factor for the fall in their productivity. The study recommended streamlining of government licensing procedures with emphasis on dispersal of industries in the different backward districts, so that the increasing labor supply can be absorbed productively and the adverse trend of decline in labor productivity can be checked.

Pooja (2009) analyzed import substitution to exports: the manufacturing exports experience of Argentina and Brazil. The study used annual data from 1991-2007. The results showed that the share of total manufacturing exports was $0.87. The greater value of exports the lower the rate of growth rates and values of manufacturing exports. The results lend some support to the hypothesis that in both the countries high growth of exports has been associated with low export value and vice versa, industries with high value exports have exhibited low rates of export growth.

Vandona Parsahar (2010) had studied inverse labor demand equations in select Indian industries for the reference period 1996 – 2008. The results showed that the elasticity of substitution of paint and varnishes industry was 0.6446 and estimated elasticity of employment with respect to output was 0.5146. The elasticity of substitution of jute textile industry was 0.5998 and estimated elasticity of employment with respect to output was 0.5030. The elasticity of substitution of cotton textiles industry was 0.5031 and estimated elasticity of employment with respect to output was 0.3053. The elasticity of substitution of cement industry was 0.4225 and estimated elasticity of employment with respect to output was 0.1908. The elasticity of substitution of iron and steel industry was 0.3753 and estimated elasticity of employment with respect to output was 0.5030. The elasticity of substitution of woolen textiles industry was 0.3451 and estimated elasticity of employment with respect to output was 0.4014. The elasticity of matches industry was 0.3313 and estimated elasticity of employment with respect to output was 0.3248. The elasticity of substitution of glass and glass ware industry was 0.3260 and estimated of employment with respect to output was 0.4067. The elasticity of substitution of tanning industry was 0.3066 and the estimated elasticity of employment with respect to output was 0.3442. He concluded that the elasticity of substitution in each industry stayed well below unity, indicating the rigidity of capital labor substitution. He suggested that the output, if chosen as a policy variable to achieve a target of employment performed better in the first four industries than the last five of them.

STATEMENT OF THE PROBLEM

Tamil Nadu has a diversified manufacturing base with about 2,500 chemical and factories, providing employment to 120,000 people. The chemical industry has grown at a tremendous pace worldwide and in as well. The state of Tamilnadu traditionally has a strong base in the chemical industry. Manali, in the outskirts of Chennai (Madras) has emerged as a major petro- chemical complex. The mother refinery in the complex, Chennai (Madras) Refinery Ltd., has given rise to several petro-based units using a refinery feed-stock for the manufacture of a large number of petro-chemical. Major chemicals and fertilizer plants have also been established at Cuddalore and Tuticorin. Petrochemical industry in Tamilnadu is in the threshold of rapid expansion. Tamil Nadu's Petroleum, Chemicals and Petro-chemical Investment Regions (PCPIR) are spread over an area of 257 sq. km. of brown field area in the coastal districts of Cuddalore and Nagapattinam.

RESULT AND DISCUSSION

PRODUCTION FUNCTION

The Cobb-Douglas Production function, a popular form of production function was employed to find out the returns to scale of the industries. For estimating Cobb-Douglas production function the following multiple regression equation has been used.

Log V = Log A + α Log K + β Log L + μ

V = Gross Value Added

K = Fixed Capital

L = Number of employees

α = Elasticity of output with respect to capital

β = Elasticity of output with respect to employees

If α + β = 1. There will be constant returns to scale

If α + β >1.There will increasing returns to scale

If α + β <1.There will decreasing returns to scale

In order to find out whether the industry is labour intensive or capital intensive and to find out the returns to scale the Cobb – Douglass Production function was used. The results are as follows

ESTIMATES OF COBB – DOUGLAS PRODUCTION FUNCTION

TABLE 1

Items	Co-efficient
Constant Independent Variable Log K(α)	2.670033 0.738336 Standard Error:1.313788 't' Value: 2.353
Log L(β)	-0.353173 Standard Error:.541532 't' Value: -.652

Cobb – Douglas production function equation.

Log V = log A + α log K + β log L + U

Log L + log β = 0.738336 – 0.353173

= 0.385163

The result of Cobb – Douglas production function indicated that the sum of input co-efficient α and β is 0.385163. The Basic Chemical and Chemical Product Industry are running under diminishing returns to scale. It was also found that Basic Chemical and Chemical industry is a capital – intensive industry since he value of α > β.

ANALYSIS OF PROFITS

Profit is the excess of net income over the cost of employee's compensation (i.e.) total emoluments and supplements to emoluments (i.e.) (i) Contribution to provident and other funds and (ii) Workmen and staff welfare expenses.

Analysis of profits is grouped in two categories as follows:

- ✓ Trend in Gross Profit
- ✓ Profitability Ratio

TREND IN GROSS PROFIT

Trend in total profit with annual increase or decrease are depicted in the following Table. Diagram shown below a diagrammatic trend on Gross Profit.

TREND IN GROSS PROFIT

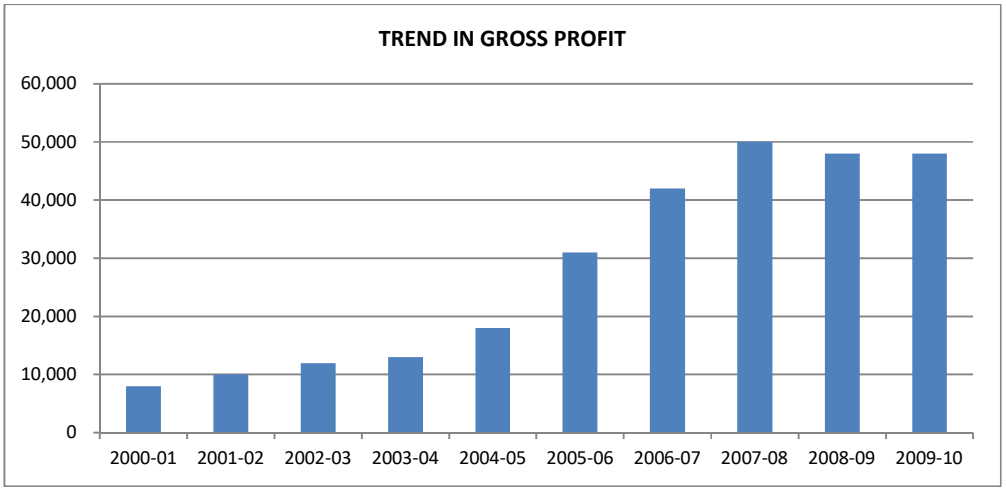
TABLE 2

YEAR	GROSS PROFIT	ANNUAL INCREASE / DECREASE (RS.IN LAKHS)
2000-2001	412.75	–
2001-2002	79.71	-0.81
2002-2003	381.49	3.79
2003-2004	189.02	-0.50
2004-2005	-27.35	-1.14
2005-2006	214.29	-8.84
2006-2007	386.23	0.80
2007-2008	489.67	0.27
2008-2009	318.50	-0.35
2009-2010	200.82	-0.37

Source: Annual Survey of Industries, various issues.

TREND IN GROSS PROFIT

CHART 2



The above table reveals that there was a decreasing trend in the level of profit from the beginning of the period to the end of the period. This was recorded with fluctuations every year. This is substantiated with figures on annual change, which showed negative trend during certain years.

PROFITABILITY RATIOS

Profitability ratio means the profit generating ability of the industry, which consists of return on capital, profit per factory, profit per worker, Profit to working capital. Return on capital consists of

(1) Returns on Fixed Capital = $\frac{\text{Profit}}{\text{Fixed capital}}$

(2) Returns on physical Working Capital = $\frac{\text{Profit}}{\text{Physical working capital}}$

(3) Returns of working Capital = $\frac{\text{Profit}}{\text{Working capital}}$

(4) Returns of productive Capital = $\frac{\text{Profit}}{\text{Productive capital}}$

(5) Returns of Invested Capital = $\frac{\text{Profit}}{\text{Invested Capital}}$

(6) Profit per Factory = $\frac{\text{Profit}}{\text{Number of Factories}}$

(7) Profit to working Capital = $\frac{\text{Profit}}{\text{Working capital}}$

Profitability Ratios are presented in the following Table - shown below:

TABLE 3: PROFITABILITY RATIO

YEAR	RETURNS OF FIXED CAPITAL	RETURNS OF PHYSICAL WORKING CAPITAL	RETURNS OF WORKING CAPITAL	RETURNS OF PRODUCTIVE CAPITAL	RETURNS OF INVESTED CAPITAL	PROFIT PER FACTORY	PROFITS TO WORKING CAPITAL
2000-01	0.22	0.46	0.44	0.15	0.15	0.39	0.44
2001-02	0.04	0.07	0.12	0.03	0.03	0.07	0.12
2002-03	0.19	0.32	0.48	0.14	0.12	0.34	0.48
2003-04	0.09	0.15	0.23	0.07	0.06	0.15	0.23
2004-05	-0.01	-0.02	-0.06	-0.01	-0.01	-0.02	-0.06
2005-06	0.10	0.21	0.28	0.07	0.07	0.13	0.28
2006-07	0.13	0.28	0.35	0.10	0.09	0.26	0.35
2007-08	0.18	0.39	0.55	0.14	0.12	0.31	0.55
2008-09	0.09	0.32	0.85	0.08	0.07	0.21	0.85
2009-10	0.06	0.19	0.43	0.05	0.05	0.12	0.43

Sources: Calculated on the basis ofe Annual Survey of Industries Data.

It is found that returns on fixed capital ranged between 0.04 and 0.19, return on working capital ranged between 0.12 and 0.55, return on productive capital ranged between 0.03 and 0.15, return on physical working capital ranged between -0.02 and 0.46, returns on invested capital ranged between -0.01 and 0.15, profit per factory ranged between 0.07 and 0.39, profit to working capital ranged between -0.06 and 0.85.

MEASUREMENT OF PRODUCTIVITY

Productivity is a measure of the efficiency with which resources are converted in to goods and services. The higher the productivity, the higher the level of economic is well – being and the greater the national strength. Productivity can either be total or a partial measure. The total factor productivity compares the total output and weighted composition of inputs usually capital and labour productivity occupies a very important place in economic progress achieved either by increasing the amount of factors of production or by increasing their productivity. Therefore, the need for increasing productivity is widely realized particularly for promoting rapid economic development.

Productivity is expressed as the ratio between outputs and input symbolically it may be expressed as follows:

$$\text{Productivity} = \frac{\text{Gross Output}}{\text{Total Input}}$$

If the productivity is to be calculated as a ratio between outputs and labor it is known labor productivity. Symbolically it may be expressed as:

$$\text{Labor Productivity} = \frac{\text{Gross Output}}{\text{Total Input}}$$

If productivity is to be calculated as a ratio between output and capital it is known as capital productivity. Symbolically it may be expressed as:

$$\text{Capital Productivity} = \frac{\text{Gross Output}}{\text{Total capital employed}}$$

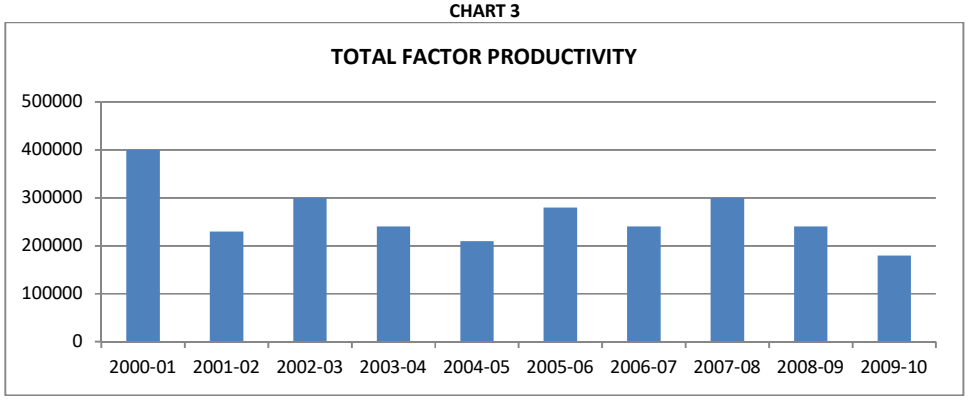
Total capital includes sum of all fixed capital, physical working capital, working capital, productive capital and invested capital.
The total factor productivity of the Basic chemicals and chemical product industry is shown below in Table

TABLE 4: TOTAL FACTOR PRODUCTIVITY

YEAR	NET VALUE ADDED (RS. IN LAKHS)	TOTAL INPUT (RS. IN LAKHS)	PRODUCTIVITY (RS. IN LAKHS)
2000-2001	895.92	2225.37	0.40
2001-2002	677.66	2994.01	0.23
2002-2003	1019.44	3444.67	0.30
2003-2004	885.05	3617.90	0.24
2004-2005	773.86	3623.35	0.21
2005-2006	884.18	3174.81	0.28
2006-2007	1101.21	4517.29	0.24
2007-2008	1208.17	4058.82	0.30
2008-2009	1043.37	4357.92	0.24
2009-2010	845.67	4593.94	0.18

Source: Annual survey of industries, various issues.

CHART 3



The productivity of the Basic chemicals and chemical products industry was declining from Rs. 0.40 lakhs to Rs. 0.18 lakhs. It accounted for more than threefold decline. But this decline recorded with fluctuations throughout the period.

PARTIAL FACTOR PRODUCTIVITY – LABOUR AND CAPITAL

The ratio between output and labour is called labour productivity. If productivity is to be calculated as a ratio between output and capital it is called capital productivity.
The following Table below depicts details regarding partial factor productivity of labour and capital.

PARTIAL FACTOR PRODUCTIVITY

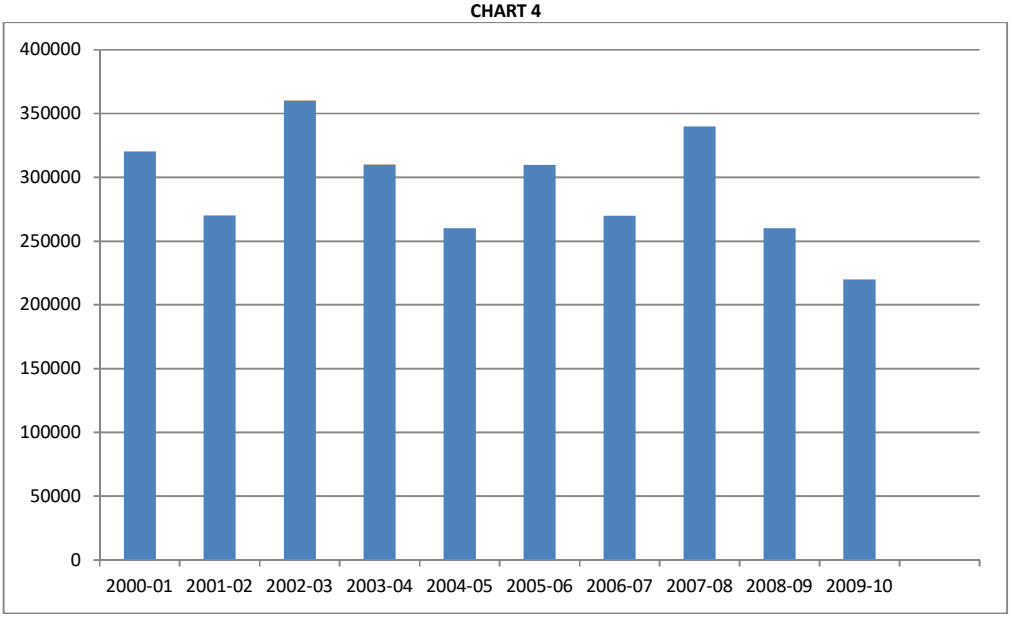
TABLE 5

YEAR	LABOUR PRODUCTIVITY	CAPITAL PRODUCTIVITY (RS.IN LAKHS)
2000-2001	0.01	0.32
2001-2002	0.01	0.27
2002-2003	0.01	0.36
2003-2004	0.01	0.31
2004-2005	0.01	0.26
2005-2006	0.01	0.31
2006-2007	0.01	0.27
2007-2008	0.01	0.34
2008-2009	0.01	0.26
2009-2010	0.01	0.22

Sources: Calculated on the basis of annual survey of industries data.

PARTIAL FACTOR PRODUCTIVITY

CHART 4



It was surprising to note that the growth of labour productivity was Rs. 0.01 lakhs throughout the period. Growth differences were observed only in capital productivity. It recorded a range between Rs. 0.22 lakhs and Rs. 0.34 lakhs in monetary terms.

CONCLUSION

Since, the performance of the industry in terms of productivity was not satisfactory. The Industry should place high priority in ensuring higher productivity levels through incentive Schemes, greater participation of workers in management, rehabilitation of workers in case Disinvestments of Public sector unit. To absorb surplus labor force in these sectors necessary steps should be taken quickly.

SUGGESTIONS AND RECOMMENDATIONS

- ✓ Provide attractive incentives to the Investors.
- ✓ Provide World Class infrastructure to the Investors.

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