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**PRODUCTIVITY PERFORMANCE OF CHEMICAL INDUSTRY IN TAMILNADU DURING THE
POST-REFORM PERIOD**

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ABSTRACT

The foremost purpose of this paper is to explore the factor productivity of chemical industry in Tamilnadu during the Post-reform period from 1990-91 to 2009-10. The study established that, the labour and capital productivity is very low during the post-reform period. In conclusion of this paper implies that to improve the productivity and reduce the variations in productivity of chemical industry in Tamilnadu. Thus, government has to frame separate policy for stabilizing the growth of chemical industries in Tamilnadu.

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INTRODUCTION

Chemical industries are very important for the economy of any country. This is because these chemical industries supply the farmer's pesticides and fertilizers, which are essential for the crop growing. In this way chemical industry contributes to agriculture and food self sufficiency of every country. Other than direct contribution to agriculture, chemical industry contributes indirectly to almost every sector of every economy. In our everyday life a lot of industrial products are used and most of them are related to chemical industry in some way our other chemical industry produce the fibers and dyes which are used in textile industries. It supplies the synthetic sweeteners and synthetic flavors which are used by food manufacturing companies. Chemical industry indirectly helps the pharmaceutical industry and healthcare industry by providing the essential chemical components. Not only is that plastic requirement of the automobile industry also meet by the very same chemical industries. Chemical industry is one of the most important manufacturing sectors of India in terms of both production and export performance and it contributes 7

per cent of GDP, 13 percent of industrial output and 13 percent of total export. Subrata Majmuder et al. (2012). It is a knowledge-based industry with significant investments in R&D. The industry supplies to virtually all sectors of the economy and produces more than 80,000 products. In terms of contribution the chemical industry own largest customer and accounts for approximately 33 per cent of the consumption. In most case; Basic chemicals undergo several processing stages to be converted into downstream chemicals there in turn one used for industrial application in agriculture, or directly for consumer markets. Industries and agriculture uses of chemicals includes auxiliary materials such as achieves, un processed and plastics, dyes and fertilizers, while uses within the consumer sector include pharmaceuticals, cosmetics household products, paints, etc. The chemical industry is a significant component of the Indian economy with revenues at approximately USD 28 billion. It constitutes 6.7 per cent of India's GDP and 10 per cent of the total export. The chemical industry has changed overtime to match the dynamic needs of the rapidly developing nation. The industry has evolved from being a producer of Basic chemicals in a highly regulates environment to becoming a mature industry, free to choose its product portfolio in an open economy. The India's chemical industry has emerged from a protected environment where it

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was largely supplies to the domestic markets. Hence manufacturing plants, built to meet this local demand, were small when compared to global scales and did not, necessarily employ state of the art technology. In many cases the industry operates with ensured margins protected against the emergence of competition. The chemical industry in India has a turnover of \$ 28 billion 26,000 crore constitutes 6 per cent of GDP and 10 per cent of total exports. It has the potential to become a \$100 billion by 2010 registering a CAGR of 15.5 percent. It is key stone industry contributing a significant share to the respecting economies. The emerging economy has grown almost 33 percent. Since 2003, while the developed economies grew at about 4 percent annually, Asia-pacific and China in particular is taking an increasing share of global chemical production. The growth in the emerging countries is attributed to the dynamism of industries such as electronics and electrical, textiles, construction leather and plastics, processing which are significant end users of chemicals.

THE CHEMICAL INDUSTRIES IN TAMILNADU: A VIEW

The chemical industry has grown at a tremendous pace worldwide and in India as well. The state of Tamilnadu traditionally has a strong base in the chemical industry. Manali, in the outskirts of Chennai has emerged as a major petrochemical complex. The Mother refinery in the complex, Chennai 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 ranging from fertilizer to polyols, nylon chips and polybutanes. Major chemicals and fertilizer plants have also been established at Cuddalore and Tuticorin. DuPont, USA has recently commissioned a large plant for manufacture of Nylon 6.6 at Gummidipoondi near Chennai. Other major projects in pipeline are: Norsk Hydro (PVC), SPIC (PTA/PFY), etc. TIDCO is, currently in the process of setting up a major petrochemical park is an area of about 17, 000 acres at Ennore, north of Chennai. TIDCO has also proposed to promote a Naphtha Cracker in this park; besides, TIDCO is currently implementing a LNG handling terminal at upcoming Ennore Satellite Port. Based on LNG terminal, a number of down- stream petro-chemical projects have been planned. Also, three new refineries are proposed to be set up at Cuddalore, Tuticorin and Ennore. The Petro-chemical industry in Tamilnadu is in the threshold of rapid expansion. So far, the growth performance of chemical sector in Tamilnadu is commendable in terms of aggregate output, but in terms of factor productivity has not growing well as compare with other states. As per the growth report of the manufacturing industrial production in Tamilnadu during 2009-10 was 5 per cent and in 2011-12 was 4 per cent. Thus, we looking at aggregate level, the growth of industrial production ranges are average but factor productivity is not vigorously. So, that the more perfections to be needed for the factors of production to particular industry. Therefore, in this context, the present paper has made an attempt to analyze the growth and productivity of chemical industry in Tamilnadu during the post-reform period.

BACKGROUND OF THE STUDY

There have been very little attempts on productivity analysis of industries in India as well as within a state. So far, by a long

way, in Tamilnadu, considering a limited study has been attempted, for instance, Subramanian. M. S. (1992) found that the productivity performance of the textile industry in Tamilnadu witnessed growth in terms of labour and capital. He suggested that government has to improve the capital productivity in Tamilnadu. The plenty of endeavor on productivity analysis in India level as Bluent Unel (2003) found that labour and total factor productivity growth in total manufacturing and many of the component sectors, since 1980s were markedly higher than that in the preceding two decades, and the productivity growth for manufacturing as well as for many subsectors picked up further after the 1991 reforms. Bishwanath Goldar (2004) found that the trend and growth pattern of employment during 1997-98 to 2001-02 was significantly negative, at about -3.3 per cent per annum. Goldar (2004) concluded there were an acceleration in total factor productivity growth in Indian manufacturing after 1991. Surender Kumar (2006) found that there is a tendency of convergence in terms of TFP growth rate among Indian states during the post-reform years and only the states that were technically efficient at the beginning of the reform remain innovative. Sampathkumar. T (2006) used Translog model for estimates TFPR and it found that TFPG of drugs and pharmaceutical paints and varnishes Basic chemical and dyes and dyestuff industries are better in the period of post reform as the change is significance and the decline in extent of negative productivity growth.

In other nations having much attempts and unique models have been utilized in order to analyze the factor productivity of manufacturing industries by Azza El-Shinnawy (2009) analyzed trends in total factor productivity growth in 13 of Egypt's largest and oldest pharmaceutical generics firms. Mohamad Ikhsan-Modjo (2006) examined that the patterns of total factor productivity growth and technical efficiency changes in Indonesia's manufacturing industries over the period 1988-2000. Azam Amjad Chaudhry (2009) analyzed total factor productivity growth in Pakistan an analysis of the agricultural and manufacturing sectors by used Cobb-Douglas and Translog production functions for measured total factor productivity. Serpil Sevilay Senturk (2010) estimated that the total factor productivity growth rates of public and private manufacturing industries in Turkey over the period 1985 to 2001 by used DEA linear programming technique.

Thus, we have in detailed observation from the existing studies, which are very different in particular, that use of models to find factor productivity such as Translog model, Solow Model, Kendrick Model of Indices, CES, Malmquist Productivity Index and VES production function. Considering, the most of the studies in India have been analyzed aggregate level not at individual level. Especially in Tamilnadu, since has not been an attempted on productivity analysis of chemical industry. Hence, the present paper wish to take these backgrounds has made an attempt to confer factor productivity analysis of chemical industry in Tamilnadu during the Post reform period.

MATERIALS AND METHODS

This study entirely based on secondary data. The period of the study covers 20 years from 1990-91 to 2009-10. This period has observed the impact of industrialization in India. The basic

data sources for the analysis were obtained from Annual Survey of Industries (ASI) in CSO, New Delhi, and Tamilnadu Statistical Hand books. The data of the Wholesale Price Index is obtained from Office of the Economic advisory in India, the Consumer Price Index gathered from Labour bureau, Ministry of Labour in India and Machinery and Transport equipments from RBI. The ASI frames the appropriate industrial groups on the basis of the value of the principal product manufactured. This the way a unit gets classified into only one industrial group. The estimates for the different aggregates are presented in two- digit code in this report corresponding to classification. The classification of the NIC is presented in the table. 1.

Table 1. The classification of the NIC of Chemical Industry in India

National Industrial Classifications	2-Digit level	Description
NIC70	30	Basic Chemicals & Chemical Products
NIC87	30	Basic Chemicals & Chemical Products (except products of Petroleum & Coal)
NIC87	30	Basic Chemicals & Chemical Products (except products of Petroleum & Coal)
NIC98	24	Manufacture of chemicals and chemical products
NIC04	24	Manufacture of chemicals and chemical products
NIC08	20	Manufacture of chemicals and chemical products

Source: Annual Survey of Industries, CSO, New Delhi, India.

The ASI report has provided information about Indian basic chemical and chemical products industry in 27 items. For the present investigation has chosen only nine major items (Characteristics) about the chemical industry in Tamilnadu. The selected major variables are as:

1. Total persons engaged
2. Total emoluments
3. No. of factories
4. Gross Value Added
5. Net Value added
6. Depreciation
7. Value of output
8. Total inputs
9. Gross Fixed Capital Formation

To analyze the growth performance of chemical industry and the factor productivity of chemical industry in Tamilnadu during the post reform period. The growth performance has been discussed by taking into consideration of selected variables. All the value factors used in this paper is deflated by suitable price index based on the initial year of the present study i.e. 2004-05. To calculate the Gross Fixed Capital and Depreciation are deflated by Machinery Price Index. The Gross Value Added (GVA) is deflated by Wholesale Price Index (WPI) and Total emolument is deflated by using Consumer Price Index (CPI). The growth performance has been analyzed by linear model, is $Y = a + b^t$ where, 'a' is constant parameter, 'b' is slope coefficient and 't' is time period. The linear growth rate can be get from $Y_1/b * 100$ where 'Y₁' is starting year value and 'b' is slope value. To analyze the factor productivity measured to discusses the performance of productivity Tamilnadu Chemical industry. In this study the labour productivity has been measured as Gross Value Added

to per labour (employee) and the capital Productivity has been measured as Gross Value Added to per Gross Fixed Capital employed. To standardize the data, the initial year of the present analysis is taken as the base year. Thus all the value factors were deflated by suitable price index based on 2004-05=100. The general price index is collected from CSO. The Machinery and Machine tools price index, and all commodities price index were collected from office of Economic advisor, Ministry of Industry and Government of India. Consumer Price Index is obtained from the Labour bureau, Ministry of Labour, Government of India. The collected indices had different base years. In order to construct the price indices based on 1980-81 and 1993-94, splicing index is used to convert the different base indices into a continuous series of a single base year and after that the base year is shifted to 2004-05 base price index on the base shifting.

RESULTS AND DISCUSSION

There are many contributing factors in the improvement of any industry, structure size; composition, labour strength and capital are the important factor to mention a few, before analyzing the efficiency and or relative efficiency of the inputs in the production process. It would be a worthwhile attempt to analyze the growth and structure of the chemical industry in Tamilnadu.

Growth performance of selected variables of Chemical industry in Tamilnadu during post-reform period

The linear growth rate of chemical industry in Tamilnadu during 1990-91 to 2009-10 observed from the table.2. The growth rate of selected variables at constant price 2004-05, shows that during the post-reform period, except working capital and all other factors had been grown positively. As compared with among the selected variables, the total inputs and GVA is well grown with 8.25 and 6.15 respectively.

Table 2. Linear growth rate of Chemical industry in Tamilnadu

Sl.No.	Variables	Linear growth rate
1	Total persons engaged	2.05
3	Working Capital	-3.55
4	Total Emoluments	3.36
5	Total Inputs	8.25
6	Value of Output	2.77
7	Gross Fixed Capital Formation	2.92
8	Gross Value Added	6.15

Source: Author's Calculation

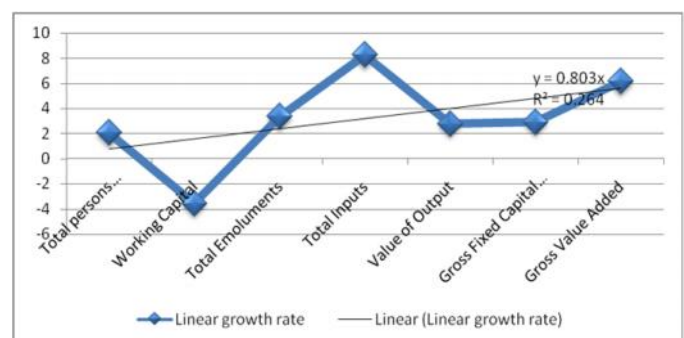


Figure 1. Linear growth rate of Chemical industry in Tamilnadu

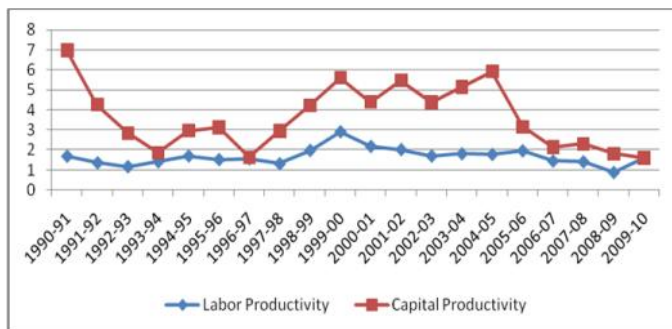


Figure 2. Productivity of Chemical industry in Tamilnadu during Post-reform period

Thus it is concluded that growth performance of chemical industry in Tamilnadu was relatively satisfactory during the post reform period. Moreover the table reveals that the working capital is growing negatively, hence more improvements to be needed

Labour and Capital productivity of Chemical industry in Tamilnadu during Post reform period

The table.3 reveals that the labour productivity of chemical industry in Tamilnadu had continuously declined up-to 1998-99 and after 2001-02 has witnessed grown. After 2002-03 has increased normally but not considerable level. Thus, the overall period of labour productivity has declined with 1.68 to 1.60 and also the table illustrates that capital productivity of chemical industry in Tamilnadu has increased in 1990-91 and continuously declined. After 1990-2000 capital productivity has increased to 2005-06 by several declining and after it has highly declined. Thus the overall period of capital productivity has tremendously declined from 6.99 to 1.59.

Table 3. Productivity of Chemical industry in Tamilnadu Post-reform period

Year	Labor Productivity	Capital Productivity
1990-91	1.68	6.99
1991-92	1.35	4.26
1992-93	1.16	2.83
1993-94	1.40	1.84
1994-95	1.69	2.96
1995-96	1.51	3.13
1996-97	1.55	1.62
1997-98	1.30	2.95
1998-99	1.97	4.23
1999-00	2.90	5.61
2000-01	2.17	4.40
2001-02	2.01	5.48
2002-03	1.69	4.37
2003-04	1.80	5.15
2004-05	1.77	5.93
2005-06	1.95	3.15
2006-07	1.44	2.13
2007-08	1.40	2.29
2008-09	0.87	1.81
2009-10	1.60	1.59

Source: Author's Calculation

Conclusion

This paper has examined productivity performance of Tamilnadu chemical industry during the post-reform period. From the results of productivity analysis, the following findings are emerged:

- ◆ Tamilnadu chemical industry is witnessed a growth rate of 8.25 per cent per annum in Total inputs, 6.15 per cent per annum in Gross Value Added (GVA), 3.36 per cent per annum in total emoluments, 3.22 per cent per annum in Number of workers, Gross fixed capital Formation for 2.92 per cent per annum, 2.77 percent per annum in Value of output, Total persons engaged for 2.05, 1.61 per cent per annum and Working capital for -3.55 per cent per annum during the period at constant price level during 1990-91 to 2009-10.
- ◆ The labour productivity of Tamilnadu chemical industry is low from 1.68 to 1.60 per cent per annum during post reform period and the capital productivity of Tamilnadu chemical industry is highly low from 6.99 to 1.59 percent per annum during post reform period.
- ◆ As compared with the value of labour and capital productivity of chemical industry is terribly declined. During the period of study investigated the both labour and capital productivity are very low during Post reform period.
- ◆ While compared with the value of labor and capital productivity during the post reform period. In beginning year of 1990-91 the capital productivity was greatly grew but time to time had fluctuates like peaked and down with 1.59. Hence the comparatively capital productivity is better.

In conclusion, this paper has given some appropriate policy suggestions from the consequences of productivity analysis of Tamilnadu chemical industry during the post reform period as follows:

- ◆ The both labour and capital have more improvements to be needed for the betterment growth of Chemical industry in Tamilnadu.
- ◆ Hence, the government should allocate more funds for R&D and has to augment the labour and capital requirements of chemical industry in Tamilnadu.
- ◆ In order to improve the productivity and reduce the variation in productivity of chemical industry in Tamilnadu, the government has to frame separate policy for stabilizing the growth of chemical industries in Tamilnadu.

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