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# "PRODUCTIVITY MEASUREMENT IN SELECTED PHARMACEUTICAL COMPANIES IN INDIA – A COMPARATIVE STUDY"

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**Abstract:** Productivity is one of the important measures to express efficiency of any industry or organization. There are various components which help to measure productivity like labor, material, overhead, energy, capital etc. Productivity is the ratio between output produced by the company and input which is used to get that output. In other words, it measures the efficiency of the input in production. In the present research paper an attempt has been made to measure, analyze and compare the performance of productivity in selected pharmaceutical companies i.e. Sun Pharmaceutical Industries Ltd. and Cipla Ltd. for the five years from 2015-16 to 2019-20. The various productivity ratios are used like Material productivity ratio, Labour productivity ratio, Overhead productivity ratio and Total productivity ratio. After evolution of all the productivity ratios it is found that the average performance of Cipla Ltd. is batter compared to Sun Pharmaceutical Industries Ltd. To test the hypotheses of this different productivity ratio statistical T-test of parametric test is used. The result reveled that in all productivity ratios drawn null hypothesis is accepted. That means there is no significance difference in productivity ratios of Sun Pharmaceutical Industries Ltd. and Cipla Ltd. during the study period. It indicates that the performance of productivity is as per the expectation.

**Key words:** Efficiency, Productivity, Material Productivity, Labour Productivity, Overhead Productivity, Total Productivity

## INTRODUCTION:

### Pharmaceutical Industry:

The Indian Pharmaceutical industry is the second-largest in the world by volume and is leading the manufacturing sector of India.

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The Pharmaceutical Industry develops, produces, and markets drugs licensed for use as medications. Historically medicines were prepared by physician and later by apothecaries.

They are subject to a variety of laws and regulations of the government regarding the patenting, testing, pricing and ensuring safety and efficacy and marketing of drugs. Today, drug development relies on the efforts of highly trained scientist at universities and private companies.

The industry's main contribution is engaging in technological advancements through innovative research to meet the complex healthcare demands of populations. The main goals of the pharmaceutical industry are to provide drugs that prevent infection, maintain health, care disease and enhance the quality of life of people.

**Productivity:**

The main objective of a business firm is to provide value satisfaction to the customers at a profit. Business firms always attempt to maximize profit. But in order to maximize profit business firm has to be efficient. Efficiency is measured by the capacity of a business firm to raise the productivity of existing resources so that cost per unit is reduced. Since cost and productivity are reciprocal of each other, a raise in productivity implies a fall in cost of production which ends in higher profit.

Productivity refers to the physical relationship between the quantity produced (output) and the quantity of resources used in the course of production (input). "It is the ratio between the output of goods and services and the input of resources consumed in the process of production." Higher the productivity it means the resources are used more efficiently in an organization. Productivity mainly includes labor productivity, material productivity, overhead productivity and total productivity.

$$\textbf{Productivity} = \frac{\textbf{Total output}}{\textbf{Total Input}} = \frac{\textbf{Total results achieved}}{\textbf{Total resources consumed}} = \frac{\textbf{Effectiveness}}{\textbf{Efficiency}}$$

**LITERATURE REVIEW:**

**(Manik Mazumdar & Meenakshi Rajeev, 2009)** have attempted to explain **"Output and Input Efficiency of Manufacturing Firms in India: A Case of the Indian**

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**Pharmaceutical Sector."** The aim of this paper was to analyze the competitiveness of Indian pharmaceutical sector by calculating the technical efficiency. The DEA model was used for the duration of 15 years (1991- 2005). The analysis conclude that the output efficiency levels of the sector shows a declining trend and firms have been capable to use labour and raw material inputs efficiently.

**(Manish B. Raval & Jyotindra M. Jani, 2012)** have done **"An Analytical Study of Employee's Productivity in Some Selected Nationalized Banks of India."** The researchers have made an attempt to check the employee's productivity with the help of profit per employee and business per employee of 5 years (2006-07 to 2010-11) in 5 selected nationalized banks. To test hypothesis two way ANOVA table was used. As the result of test, the researcher have conclude that there was a significance difference in business per employee and profit per employee between the banks, there was a significance difference in business per employee within the banks and there was no significance difference in profit per employee within the banks.

**(Gupta S. K., Gupta S. & Dhamija P., 2019)** have analyzed **"An Empirical Study on Productivity Analysis of Indian Leather Industry."** The main aim of this study was to analyze the Single Factors Productivity (SFP), Total Factor Productivity (TFP), and Technical Efficiency (TE), of Indian leather industry. To analyze the performance the researchers have selected three major states which were Uttar Pradesh, West Bengal and Tamil Nadu. The researchers found that the performance of West Bengal was higher in SFP and TE compared to Tamil Nadu and Uttar Pradesh. Also revealed that the firm size and SFP have positive correlation with technical efficiency.

**(Meenu Maheshwari & Taparia Priya, 2019)** have attempted to explain **"Measurement of Material Productivity: A Case Study of Pharmaceutical Sector Companies Included in Nifty 50."** The main aim of this study was to measure the Material Productivity of pharmaceutical companies included in Nifty 50 for the period of 8 years. The

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sample size of the study was four pharmaceutical companies included in Nifty. Both intra-companies and inter-companies hypotheses were tested and findings were drawn from it. For intra-companies hypothesis, chi-square test was used and the researchers found that in all the companies, null hypothesis was accepted except the Sun Pharmaceutical Industries Ltd. For inter-companies hypothesis, kruskal wallis rank sum test was used and the researchers found that in all the companies, null hypothesis was rejected.

**RESEARCH GAP:**

All the above reviews and many more studies were done in the area of productivity but the ratios of productivity, statistical tools, Study period, etc. was vary from researcher to researcher. So, the result of reviews shows that there is no study has done to measure productivity performance of selected pharmaceutical companies for this particular study period. Hence, in this present research paper an attempt has been made to measure and analyze the productivity in selected pharmaceutical companies.

**RESEARCH METHODOLOGY:**

**Objectives of the study:** The broad objective of the study is to measure the productivity in selected pharmaceutical companies in India. The other objectives are as follows:

- To study Material, Labour, Overhead and Total productivity of the selected pharmaceutical companies.
- To evaluate which company is performing best between the selected pharmaceutical companies.

**Nature of the Study:** In this paper facts and information used is already available in various secondary sources to make critical evaluation and thus from this point of view, the nature of the study become analytical.

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**Period of Study:** The present study is made for period of 5 years from 2015-16 to 2019-20.

**Scope of the Study:** Functional scope of this study is to measure the productivity performance of selected pharmaceutical companies in India. In this study selected two pharmaceutical companies which are providing health products in India. So, whole India is considered as geographical criteria for this research study.

**Sampling Design:**

- **Population:** All pharmaceutical companies listed on NSE are considered as population of the study.
- **Sample:** Out of the population, two pharmaceutical companies are selected on the basis of convenient sampling method of non probability technique. The selected companies for the study are as follows:
  1. Sun Pharmaceutical Industry Ltd.
  2. Cipla Ltd.

**Data Collection:** This study is based on secondary data. Data is collect from published annual report, various websites, articles, Journals and books.

**Tools and Techniques of Data Analysis:** In this study tools used for data analysis are as under:

- Tabulation and Classification of Data
- Accounting Tools – Ratio Analysis
- Statistical Tools – T-test

**DATA ANALYSIS AND INTERPRETATION:**

**Productivity Ratios:**

Productivity ratios are used to measure the efficiency of resources used in production. There are mainly four productivity ratios are there to measure the efficiency of the manufacturing industry. Which are as follows:

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- **Material Productivity:** Material productivity is the ratio of total output to materials input. Material productivity plays important role in cost of production. Material productivity depends upon how material is effectively utilized in its conversion into finished products. Material productivity can be increased by using skilled workers, adequate machine tools, good design of product etc.

$$\textbf{Material Productivity} = \frac{\textbf{Total Output}}{\textbf{Material Input}}$$

- **Labour Productivity:** Labor productivity is the ratio of output to labour input. Labour productivity depends upon how labors are utilized. Labour productivity can be higher or lower depending on factors like availability of work load, material, working tools, availability of power, work efficiency, level of motivation, level of training, level of working condition etc.

$$\textbf{Labour Productivity} = \frac{\textbf{Total Output}}{\textbf{Labour Input}}$$

- **Overhead Productivity:** Overhead productivity is a ratio of total output to overhead input. Overhead costs mainly include production cost, administrative cost, selling and distribution cost. It is also known as the costs other than the direct costs.

$$\textbf{Overhead Productivity} = \frac{\textbf{Total Output}}{\textbf{Overhead Input}}$$

- **Total productivity Ratio:** The method of calculating productivity considering all the resources is called total productivity. It is also known as 'overall productivity'. A total productivity is a single figure that states the efficiency of an entire organization. It is systematic and qualitative approach to complete the products considering the quality, price and time.

$$\textbf{Total Productivity} = \frac{\textbf{Total Output}}{\textbf{Total Input}}$$

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**Table No. 1: Productivity Ratios**

| Year | Sun Pharmaceutical Industries Ltd. | | | | Cipla Ltd. | | | |
|---|---|---|---|---|---|---|---|---|
| | M.P.R. | L.P.R. | O.P.R. | T.P.R. | M.P.R. | L.P.R. | O.P.R. | T.P.R. |
| 2015-16 | 2.61 | 5.33 | 2.86 | 1.09 | 2.59 | 6.81 | 4.19 | 1.30 |
| 2016-17 | 2.25 | 5.20 | 2.94 | 1.02 | 2.51 | 6.35 | 4.11 | 1.29 |
| 2017-18 | 2.38 | 4.91 | 3.28 | 1.08 | 2.62 | 6.41 | 3.40 | 1.26 |
| 2018-19 | 2.63 | 6.56 | 4.00 | 1.28 | 3.03 | 6.73 | 4.05 | 1.34 |
| 2019-20 | 2.83 | 7.36 | 4.34 | 1.39 | 2.90 | 6.62 | 3.99 | 1.34 |
| Average | 2.54 | 5.87 | 3.48 | 1.17 | 2.73 | 6.58 | 3.95 | 1.31 |

**M.P.R. = Material Productivity Ratio**

**L.P.R. = Labour Productivity Ratio**

**O.P.R. = Overhead Productivity Ratio**

**T.P.R. = Total Productivity Ratio**

**(Source: Computed from Published annual reports of selected Companies)**

**Analysis:**

The above table represents the various productivity ratios for Sun Pharmaceutical Industries Ltd. and Cipla Ltd. for the study period of five years from 2015-16 to 2019-20. These ratios are Material, Labour, Overhead and Total Productivity Ratio.

In Sun Pharmaceutical Industries Ltd. all the ratios shows minor flucation except the Overhead Productivity Ratio which shows constantly increase during the study period. In all the years the performance of Material Productivity Ratio and Total Productivity Ratio is near to the Average performance i.e. 2.54 and 1.17. The performance of Labour Productivity Ratio and Overhead Productivity Ratio is lower in first three years and higher in last two years in comparison to Average performance.

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In Cipla Ltd. there is a slight difference in all the ratios during the study period. Material Productivity Ratio is highest in the year 2018-19 i.e. 3.03, lowest in the year 2016-17 i.e. 2.51 and mean value is 2.73. During the study period the performance of Labour Productivity Ratio and Total Productivity Ratio is near the standard performance of the company. In Overhead Productivity Ratio the minimum performance 3.40 is in the third year, the maximum performance 4.19 is in the first year and the Average performance is 3.95.

All the Average Productivity Ratios are higher in Cipla Ltd. compared to the Sun Pharmaceutical Industries Ltd. which indicates that the Productivity performance is better in the Cipla Ltd. during the study period.

**Hypothesis Testing:**

- **Material Productivity Ratio:**

  **$H_0$:** There is no significant difference in the performance of Sun Pharmaceutical Industries Ltd. and Cipla Ltd. in Material Productivity Ratio during the study period.

  **$H_1$:** There is a significant difference in the performance of Sun Pharmaceutical Industries Ltd. and Cipla Ltd. in Material Productivity Ratio during the study period.

**T-test for Material Productivity Ratio**

| t-Cal. | D.F. | Level of Significance | t-Tab. |
|---|---|---|---|
| -1.33387 | 8 | 0.05 | 2.306004 |

**Interpretation:** Calculated value -1.334 is less than the table value 2.306. Therefore, Null hypothesis is accepted. So, the performance is as per the expectation.

- **Labour Productivity Ratio:**

  **$H_0$:** There is no significant difference in the performance of Sun Pharmaceutical Industries Ltd. and Cipla Ltd. in Labour Productivity Ratio during the study period.

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**$H_1$:** There is a significant difference in the performance of Sun Pharmaceutical Industries Ltd. and Cipla Ltd. in Labour Productivity Ratio during the study period.

**T-test for Labour Productivity Ratio**

| t-Cal. | D.F. | Level of Significance | t-Tab. |
|---|---|---|---|
| -1.4982 | 8 | 0.05 | 2.306004 |

**Interpretation:** Calculated value -1. 498 is less than the table value 2.306. Therefore, Null hypothesis is accepted. So, the performance is as per the expectation.

- **Overhead Productivity Ratio:**

**$H_0$:** There is no significant difference in the performance of Sun Pharmaceutical Industries Ltd. and Cipla Ltd. in Overhead Productivity Ratio during the study period.

**$H_1$:** There is a significant difference in the performance of Sun Pharmaceutical Industries Ltd. and Cipla Ltd. in Overhead Productivity Ratio during the study period.

**T-test for Overhead Productivity Ratio**

| t-Cal. | D.F. | Level of Significance | t-Tab. |
|---|---|---|---|
| -1.42409 | 8 | 0.05 | 2.306004 |

**Interpretation:** Calculated value -1.424 is less than the table value 2.306. Therefore, Null hypothesis is accepted. So, the performance is as per the expectation.

- **Total Productivity Ratio:**

**$H_0$:** There is no significant difference in the performance of Sun Pharmaceutical Industries Ltd. and Cipla Ltd. in Total Productivity Ratio during the study period.

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**$H_1$:** There is a significant difference in the performance of Sun Pharmaceutical Industries Ltd. and Cipla Ltd. in Total Productivity Ratio during the study period.

**T-test for Total Productivity Ratio**

| t-Cal. | D.F. | Level of Significance | t-Tab. |
|---|---|---|---|
| -1.87454 | 8 | 0.05 | 2.306004 |

**Interpretation:** Calculated value -1.874 is less than the table value 2.306. Therefore, Null hypothesis is accepted. So, the performance is as per the expectation.

## CONCLUSION AND FINDINGS:

Productivity is one of the significant measures to ensure the growth of the organisation. It is donated as the arithmetic relationship between the monetary value of output and monetary value of input. The finding of the study revealed that in all the productivity ratios the average performance of Cipla Ltd. is better compared to Sun Pharmaceutical Industry Ltd. The result of hypotheses testing shows that null hypothesis is accepted in all the productivity ratios. That means there is no significance difference in productivity ratios of Sun Pharmaceutical Industries Ltd. and Cipla Ltd. during the study period. It indicates that the performance of productivity is as per the expectation.

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**APPENDIX:**

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**Appendix No.1**
**Material Productivity Ratio** (Rs. In Crore)

| year | Sun Pharma Ltd. | | | Cipla Ltd. | | |
|---|---|---|---|---|---|---|
| | Output | Input | Ratio | Output | Input | Ratio |
| 2015-16 | 7863.69 | 3008.31 | 2.61 | 12117.72 | 4670.9 | 2.59 |
| 2016-17 | 7793.20 | 3464.95 | 2.25 | 10974.58 | 4371.46 | 2.51 |
| 2017-18 | 7947.60 | 3333.51 | 2.38 | 11444.81 | 4367.54 | 2.62 |
| 2018-19 | 10303.21 | 3924.56 | 2.63 | 12374.01 | 4085.03 | 3.03 |
| 2019-20 | 12531.93 | 4429.12 | 2.83 | 12659.15 | 4362.29 | 2.90 |

**Appendix No.2**
**Labour Productivity Ratio** (Rs. In Crore)

| year | Sun Pharma Ltd. | | | Cipla Ltd. | | |
|---|---|---|---|---|---|---|
| | Output | Input | Ratio | Output | Input | Ratio |
| 2015-16 | 7863.69 | 1476.69 | 5.33 | 12117.72 | 1778.56 | 6.81 |
| 2016-17 | 7793.20 | 1499.88 | 5.20 | 10974.58 | 1728.97 | 6.35 |
| 2017-18 | 7947.60 | 1617.69 | 4.91 | 11444.81 | 1785.94 | 6.41 |
| 2018-19 | 10303.21 | 1571.34 | 6.56 | 12374.01 | 1839.84 | 6.73 |
| 2019-20 | 12531.93 | 1702.77 | 7.36 | 12659.15 | 1911.08 | 6.62 |

**Appendix No.3**
**Overhead Productivity Ratio** (Rs. In Crore)

| year | Sun Pharma Ltd. | | | Cipla Ltd. | | |
|---|---|---|---|---|---|---|
| | Output | Input | Ratio | Output | Input | Ratio |
| 2015-16 | 7863.69 | 2745.36 | 2.86 | 12117.72 | 2889.16 | 4.19 |
| 2016-17 | 7793.20 | 2647.32 | 2.94 | 10974.58 | 2670.98 | 4.11 |
| 2017-18 | 7947.60 | 2426.13 | 3.28 | 11444.81 | 2905.44 | 3.40 |

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| | | | | | | |
|---|---|---|---|---|---|---|
| **2018-19** | 10303.21 | 2575.77 | 4.00 | 12374.01 | 3051.56 | 4.05 |
| **2019-20** | 12531.93 | 2887.05 | 4.34 | 12659.15 | 3173.11 | 3.99 |

**Appendix No.3**

**Total Productivity Ratio** (Rs. In Crore)

| **Year** | **Sun Pharma Ltd.** | | | **Cipla Ltd.** | | |
|---|---|---|---|---|---|---|
| | **Output** | **Input** | **Ratio** | **Output** | **Input** | **Ratio** |
| **2015-16** | 7863.69 | 7230.36 | 1.09 | 12117.72 | 9338.62 | 1.30 |
| **2016-17** | 7793.20 | 7612.15 | 1.02 | 10974.58 | 8484.98 | 1.29 |
| **2017-18** | 7947.60 | 7377.33 | 1.08 | 11444.81 | 9058.92 | 1.26 |
| **2018-19** | 10303.21 | 8071.67 | 1.28 | 12374.01 | 9262.86 | 1.34 |
| **2019-20** | 12531.93 | 9018.94 | 1.39 | 12659.15 | 9446.48 | 1.34 |